



## Main

|                           |                                                   |
|---------------------------|---------------------------------------------------|
| Range of product          | Modicon M221                                      |
| Product or component type | Logic controller                                  |
| [Us] rated supply voltage | 100...240 V AC                                    |
| Discrete input number     | 9 discrete input conforming to IEC 61131-2 Type 1 |
| Analogue input number     | 2 at input range: 0...10 V                        |
| Discrete output type      | Relay normally open                               |
| Discrete output number    | 7 relay                                           |
| Discrete output voltage   | 5...125 V DC<br>5...250 V AC                      |
| Discrete output current   | 2 A                                               |

## Complementary

|                                |                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discrete I/O number            | 16                                                                                                                                                                                                                                                                                                                                                                         |
| Number of I/O expansion module | <= 4 transistor output<br><= 4 relay output                                                                                                                                                                                                                                                                                                                                |
| Supply voltage limits          | 85...264 V                                                                                                                                                                                                                                                                                                                                                                 |
| Network frequency              | 50/60 Hz                                                                                                                                                                                                                                                                                                                                                                   |
| Inrush current                 | <= 40 A                                                                                                                                                                                                                                                                                                                                                                    |
| Power consumption in VA        | <= 46 VA at 100...240 V with max number of I/O expansion module<br><= 31 VA at 100...240 V without I/O expansion module                                                                                                                                                                                                                                                    |
| Power supply output current    | 0.325 A at 5 V expansion bus<br>0.12 A at 24 V expansion bus                                                                                                                                                                                                                                                                                                               |
| Discrete input logic           | Sink or source (positive/negative)                                                                                                                                                                                                                                                                                                                                         |
| Discrete input voltage         | 24 V                                                                                                                                                                                                                                                                                                                                                                       |
| Discrete input voltage type    | DC                                                                                                                                                                                                                                                                                                                                                                         |
| Analogue input resolution      | 10 bits                                                                                                                                                                                                                                                                                                                                                                    |
| LSB value                      | 10 mV                                                                                                                                                                                                                                                                                                                                                                      |
| Conversion time                | 1 ms per channel + 1 controller cycle time analog input                                                                                                                                                                                                                                                                                                                    |
| Permitted overload on inputs   | +/- 30 V DC analog input with 5 min maximum<br>+/- 13 V DC analog input permanent                                                                                                                                                                                                                                                                                          |
| Voltage state 1 guaranteed     | >= 15 V input                                                                                                                                                                                                                                                                                                                                                              |
| Voltage state 0 guaranteed     | <= 5 V input                                                                                                                                                                                                                                                                                                                                                               |
| Discrete input current         | 7 mA discrete input<br>5 mA fast input                                                                                                                                                                                                                                                                                                                                     |
| Input impedance                | 4.9 kOhm fast input<br>3.4 kOhm discrete input<br>100 kOhm analog input                                                                                                                                                                                                                                                                                                    |
| Response time                  | 10 ms turn-on operation output<br>35 µs turn-off operation input; I2...I5 terminal<br>10 ms turn-off operation output<br>5 µs turn-on operation fast input; I0, I1, I6, I7 terminal<br>35 µs turn-on operation input; other terminals terminal<br>5 µs turn-off operation fast input; I0, I1, I6, I7 terminal<br>100 µs turn-off operation input; other terminals terminal |
| Configurable filtering time    | 0 ms input<br>12 ms input<br>3 ms input                                                                                                                                                                                                                                                                                                                                    |
| Output voltage limits          | 125 V DC<br>277 V AC                                                                                                                                                                                                                                                                                                                                                       |
| Current per output common      | 6 A at COM 1 terminal<br>7 A at COM 0 terminal                                                                                                                                                                                                                                                                                                                             |
| Absolute accuracy error        | +/- 1 % of full scale analog input                                                                                                                                                                                                                                                                                                                                         |

The information provided in this documentation contains general descriptions and/or technical characteristics of the products of the Schneider Electric group. It 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.

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical durability             | Inductive AC-15, (cos phi = 0.35) 240 V/ 120 VA: 100000 cycles<br>Resistive DC-12, 24 V/ 48 W: 100000 cycles<br>Resistive AC-12, 120 V/ 240 VA: 100000 cycles<br>Inductive AC-15, (cos phi = 0.35) 240 V/ 36 VA: 300000 cycles<br>Resistive AC-12, 120 V/ 80 VA: 300000 cycles<br>Inductive (L/R = 7 ms) DC-13, 24 V/ 24 W: 100000 cycles<br>Resistive DC-12, 24 V/ 16 W: 300000 cycles<br>Inductive (L/R = 7 ms) DC-13, 24 V/ 7.2 W: 300000 cycles<br>Inductive AC-14, (cos phi = 0.7) 240 V/ 240 VA: 100000 cycles<br>Inductive AC-15, (cos phi = 0.35) 120 V/ 60 VA: 100000 cycles<br>Inductive AC-14, (cos phi = 0.7) 240 V/ 72 VA: 300000 cycles<br>Inductive AC-15, (cos phi = 0.35) 120 V/ 18 VA: 300000 cycles<br>Resistive AC-12, 240 V/ 480 VA: 100000 cycles<br>Inductive AC-14, (cos phi = 0.7) 120 V/ 120 VA: 100000 cycles<br>Resistive AC-12, 240 V/ 160 VA: 300000 cycles<br>Inductive AC-14, (cos phi = 0.7) 120 V/ 36 VA: 300000 cycles |
| Switching frequency               | 20 switching operations/minute with maximum load                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Mechanical durability             | >= 20000000 cycles relay output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Minimum load                      | 1 mA at 5 V DC relay output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Protection type                   | Without protection at 5 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Reset time                        | 1 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Memory capacity                   | 256 kB user application and data RAM with 10000 instructions<br>256 kB internal variables RAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Data backed up                    | 256 kB built-in flash memory backup of application and data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Data storage equipment            | 2 GB SD card optional                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Battery type                      | BR2032 lithium non-rechargeable, battery life: 4 yr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Backup time                       | 1 year at 77 °F (25 °C) by interruption of power supply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Execution time for 1 KInstruction | 0.3 ms event and periodic task                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Execution time per instruction    | 0.2 µs Boolean                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Ext time for event task           | 60 µs response time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Maximum size of object areas      | 512 %M memory bits<br>8000 %MW memory words<br>512 %KW constant words<br>255 %TM timers<br>255 %C counters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Realtime clock                    | With                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Clock drift                       | <= 30 s/month at 77 °F (25 °C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Regulation loop                   | Adjustable PID regulator up to 14 simultaneous loops                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Counting input number             | 4 fast input (HSC mode) (counting frequency: 100 kHz), counting capacity: 32 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Control signal type               | Single phase<br>Dual phase (pulse/direction)<br>Dual phase (quadrature)<br>Frequency meter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Integrated connection type        | USB port with connector mini B USB 2.0<br>Non isolated serial link "serial 1" with connector RJ45 and interface RS485<br>Non isolated serial link "serial 2" with connector RJ45 and interface RS232/RS485                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Supply                            | Serial serial link supply at 5 V 200 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Transmission rate                 | 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m - communication protocol: RS485<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 9.84 ft (3 m) - communication protocol: RS232<br>480 Mbit/s - communication protocol: USB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Communication port protocol       | USB port: USB protocol - SoMachine-Network<br>Non isolated serial link: Modbus protocol master/slave - RTU/ASCII or SoMachine-Network                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Local signalling                  | 1 LED red module error (ERR)<br>1 LED green PWR<br>1 LED green RUN<br>1 LED green SD card access (SD)<br>1 LED red BAT<br>1 LED green SL1<br>1 LED green SL2<br>1 LED per channel green I/O state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Electrical connection             | Mini B USB 2.0 connector for a programming terminal<br>Terminal block, 3 terminal(s) for connecting the 24 V DC power supply<br>Connector, 4 terminal(s) for analogue inputs<br>Removable screw terminal block for inputs<br>Removable screw terminal block for outputs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable distance between devices | Shielded cable: 10 m for fast input<br>Unshielded cable: 30 m for output<br>Unshielded cable: 30 m for digital input<br>Unshielded cable: 1 m for analog input                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Insulation                     | 2300 V AC between output and internal logic<br>Non-insulated between analogue inputs<br>500 V AC between input and internal logic<br>Non-insulated between analogue input and internal logic<br>1500 V AC between supply and ground<br>500 V AC between sensor power supply and ground<br>500 V AC between input and ground<br>1500 V AC between output and ground<br>2300 V AC between supply and internal logic<br>500 V AC between sensor power supply and internal logic<br>500 V AC between Ethernet terminal and internal logic<br>2300 V AC between supply and sensor power supply |
| Marking                        | CE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Sensor power supply            | 24 V DCat 250 mA supplied by the controller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Mounting support               | Top hat type TH35-15 rail conforming to IEC 60715<br>Top hat type TH35-7.5 rail conforming to IEC 60715<br>Plate or panel with fixing kit                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Height                         | 3.54 in (90 mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Depth                          | 2.76 in (70 mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Width                          | 3.74 in (95 mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Product weight                 | 0.76 lb(US) (0.346 kg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Environment

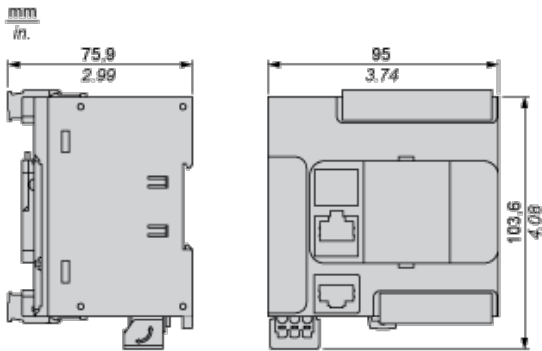
|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| standards                             | EN/IEC 60664-1<br>EN/IEC 61131-2<br>EN/IEC 61010-2-201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| product certifications                | ABS<br>CSA<br>CULus<br>LR<br>IACS E10<br>RCM<br>EAC<br>DNV-GL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| environmental characteristic          | Ordinary and hazardous location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| resistance to electrostatic discharge | 4 kV on contact conforming to EN/IEC 61000-4-2<br>8 kV in air conforming to EN/IEC 61000-4-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| resistance to electromagnetic fields  | 9.14 V/yd (10 V/m) ( 80 MHz...1 GHz) conforming to EN/IEC 61000-4-3<br>2.74 V/yd (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 Ethernet line conforming to EN/IEC 61000-4-4<br>1 kV serial link conforming to EN/IEC 61000-4-4<br>1 kV I/O conforming to EN/IEC 61000-4-4                                                                                                                                                                                                                                                                                                                              |
| surge withstand                       | 2 kV power lines (AC) in common mode conforming to EN/IEC 61000-4-5<br>2 kV relay output in common mode conforming to EN/IEC 61000-4-5<br>1 kV I/O in common mode conforming to EN/IEC 61000-4-5<br>1 kV shielded cable in common mode conforming to EN/IEC 61000-4-5<br>0.5 kV power lines (DC) in differential mode conforming to EN/IEC 61000-4-5<br>1 kV power lines (AC) in differential mode conforming to EN/IEC 61000-4-5<br>1 kV relay output in differential mode conforming to EN/IEC 61000-4-5<br>0.5 kV power lines (DC) in common mode conforming to EN/IEC 61000-4-5 |
| resistance to conducted disturbances  | 10 Vrms (0.15...80 MHz) conforming to EN/IEC 61000-4-6<br>3 Vrms (0.1...80 MHz) conforming to Marine specification (LR, ABS, DNV, GL)<br>10 Vrms (spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz)) conforming to Marine specification (LR, ABS, DNV, GL)                                                                                                                                                                                                                                                                                                           |
| electromagnetic emission              | Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.15...0.5 MHz:<br>79 dBµV/m QP/66 dBµV/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.5...300 MHz:<br>73 dBµV/m QP/60 dBµV/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines, 10...150 kHz:<br>120...69 dBµV/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz: 63 dBµV/m QP                                                                                                                                                          |

|                                       |                                                                                                                                                                                                                                                                                       |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | 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, 150...1500 kHz : 79...63 dBµV/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 200...1000 MHz : 47 dBµV/m QP |
| immunity to microbreaks               | 10 ms                                                                                                                                                                                                                                                                                 |
| ambient air temperature for operation | 14...131 °F (-10...55 °C) horizontal installation<br>-10...35 °C vertical installation                                                                                                                                                                                                |
| ambient air temperature for storage   | -13...158 °F (-25...70 °C)                                                                                                                                                                                                                                                            |
| relative humidity                     | 10...95 % without condensation in operation<br>10...95 % without condensation in storage                                                                                                                                                                                              |
| IP degree of protection               | IP20 with protective cover in place                                                                                                                                                                                                                                                   |
| pollution degree                      | <= 2                                                                                                                                                                                                                                                                                  |
| operating altitude                    | 0...6561.68 ft (0...2000 m)                                                                                                                                                                                                                                                           |
| storage altitude                      | 0...9842.52 ft (0...3000 m)                                                                                                                                                                                                                                                           |
| vibration resistance                  | 3.5 mm (vibration frequency: 5...8.4 Hz) on symmetrical rail<br>1 gn (vibration frequency: 8.4...150 Hz) on symmetrical rail<br>3.5 mm (vibration frequency: 5...8.4 Hz) on panel mounting<br>1 gn (vibration frequency: 8.4...150 Hz) on panel mounting                              |
| shock resistance                      | 98 m/s <sup>2</sup> (test wave duration: 11 ms)                                                                                                                                                                                                                                       |

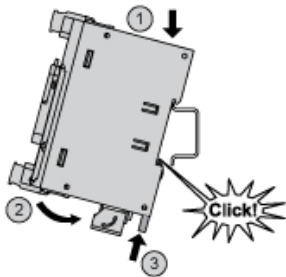
### Offer Sustainability

|                                                                       |                                                                       |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------|
| Green Premium product                                                 | Green Premium product                                                 |
| Compliant - since 1415 - Schneider Electric declaration of conformity | Compliant - since 1415 - Schneider Electric declaration of conformity |
| Reference not containing SVHC above the threshold                     | Reference not containing SVHC above the threshold                     |
| Available                                                             | Available                                                             |
| Available                                                             | Available                                                             |

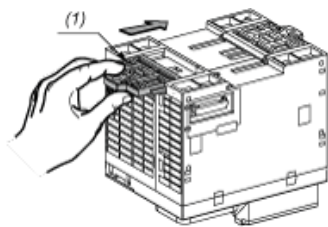
### Dimensions



### Mounting on a Rail

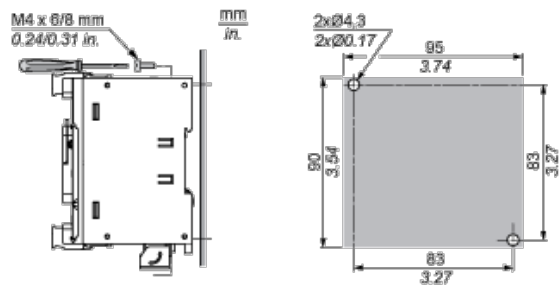


### Direct Mounting on a Panel Surface



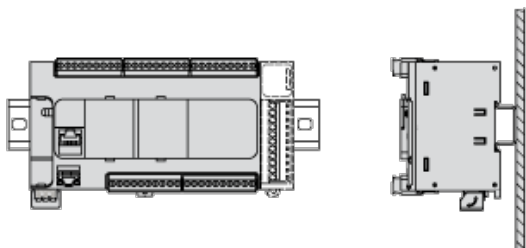
(1) Install a mounting strip

### Mounting Hole Layout

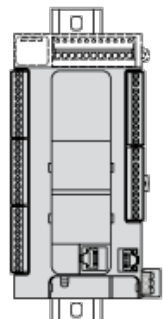


## Mounting

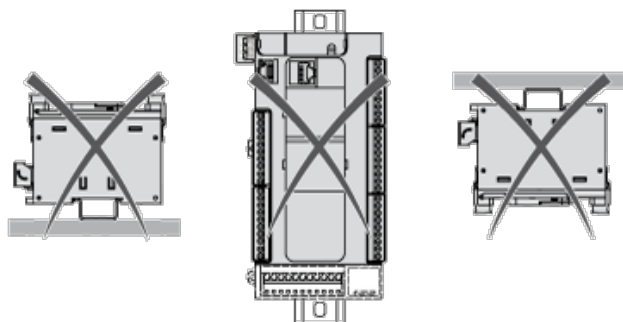
### Correct Mounting Position



### Acceptable Mounting Position

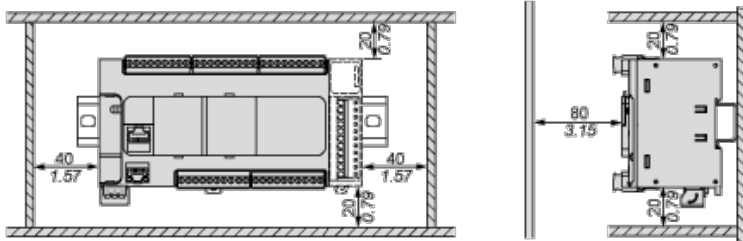


### Incorrect Mounting Position



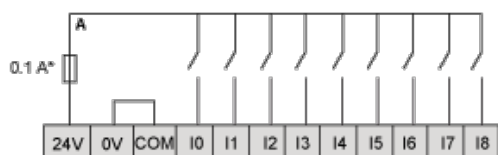
## Clearance

mm  
in.



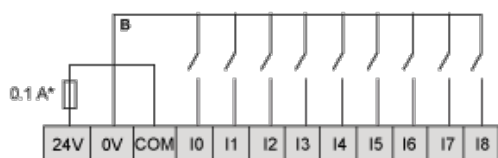
## Digital Inputs

### Wiring Diagram (Positive Logic)



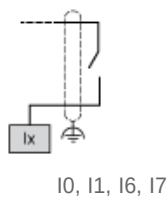
(\*) Type T fuse

### Wiring Diagram (Negative Logic)



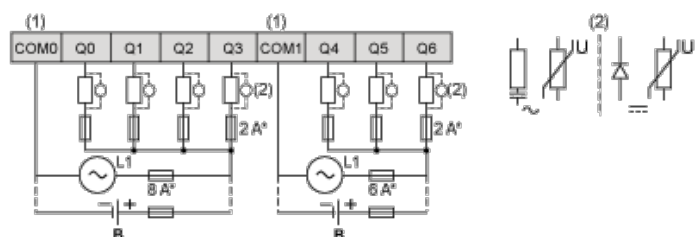
(\*) Type T fuse

### Connection of the Fast Inputs



## Relay Outputs

### Negative Logic (Sink)



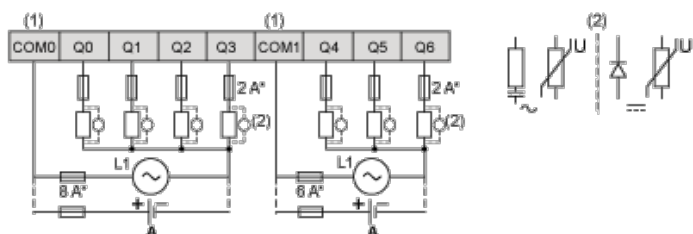
(\*) Type T fuse

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

(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load

B Sink wiring (negative logic)

### Positive Logic (Source)



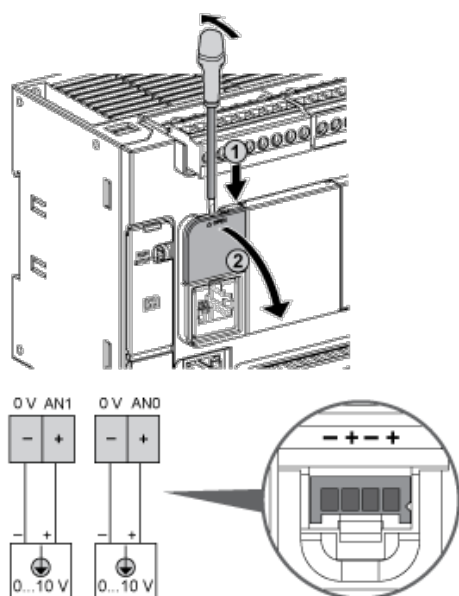
(\*) Type T fuse

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

(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load

A Source wiring (positive logic)

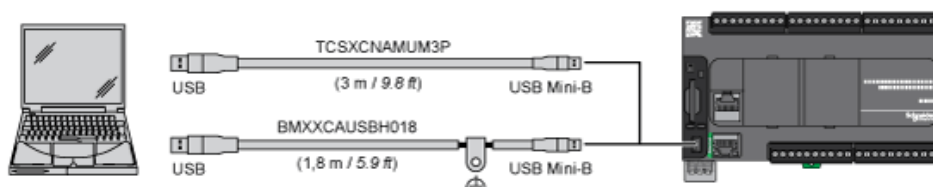
## Analog Inputs



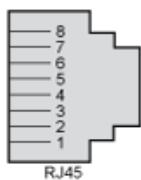
The (-) poles are connected internally.

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

## USB Mini-B Connection



## SL1 Connection



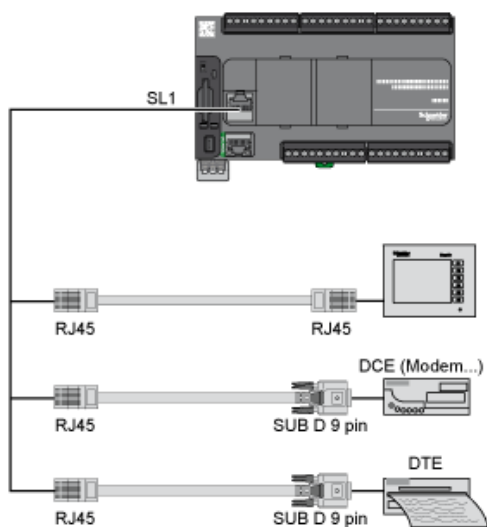
RJ45

## SL1

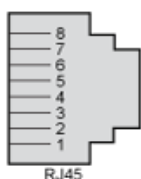
| N ° | RS 232 | RS 485 |
|-----|--------|--------|
| 1   | RxD    | N.C.   |
| 2   | TxD    | N.C.   |
| 3   | RTS    | N.C.   |
| 4   | N.C.   | D1     |
| 5   | N.C.   | D0     |
| 6   | CTS    | N.C.   |
| 7   | N.C.*  | 5 Vdc  |
| 8   | Common | Common |

N.C.: not connected

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



## SL2 Connection



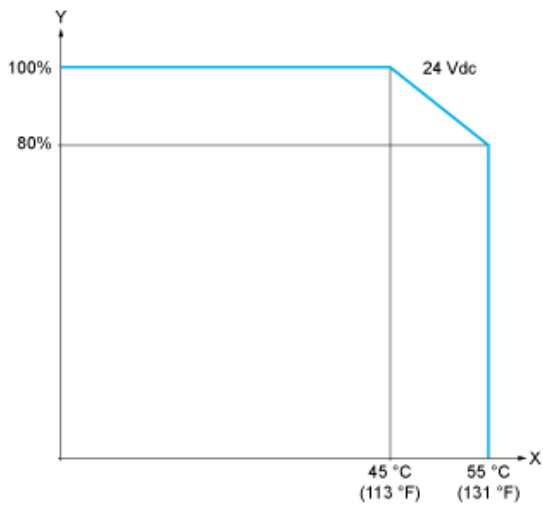
RJ45

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



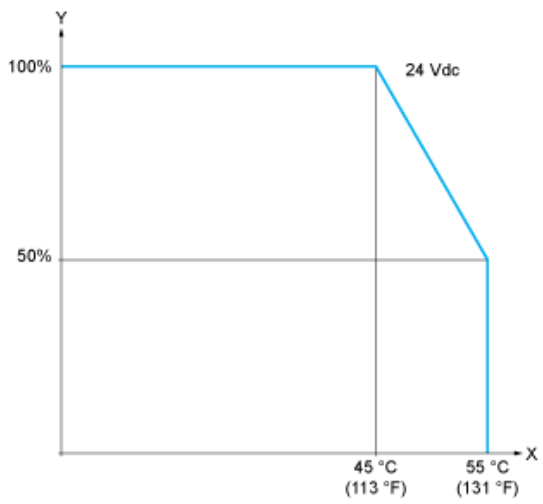
Derating Curves

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