# Product datasheet
## Characteristics

# TM221M16T
## controller M221 16 IO transistor PNP

## Main

| | |
|---|---|
| Range of product | Modicon M221 |
| Product or component type | Logic controller |
| [Us] rated supply voltage | 24 V DC |
| Discrete input number | 8 discrete input conforming to IEC 61131-2 Type 1 including 4 fast input |
| Analogue input number | 2 at input range: 0...10 V |
| Discrete output type | Transistor |
| Discrete output number | 8 transistor including 2 fast output |
| Discrete output voltage | 24 V DC |
| Discrete output current | 0.5 A |

## Complementary

| | |
|---|---|
| Discrete I/O number | 16 |
| Number of I/O expansion module | <= 7 for relay output |
| Supply voltage limits | 20.4...28.8 V |
| Inrush current | <= 35 A |
| Power consumption in W | <= 22 W at 24 V with max number of I/O expansion module<br><= 3.2 W at 24 V without I/O expansion module |
| Power supply output current | 0.52 A at 5 V for expansion bus<br>0.49 A at 24 V for expansion bus |
| Discrete input logic | Sink or source (positive/negative) |
| Discrete input voltage | 24 V |
| Discrete input voltage type | DC |
| Analogue input resolution | 10 bits |
| LSB value | 10 mV |
| Conversion time | 1 ms per channel + 1 controller cycle time for analog input |
| Permitted overload on inputs | +/- 30 V DC for analog input with 5 min maximum<br>+/- 13 V DC for analog input permanent |
| Voltage state1 guaranteed | >= 15 V for input |
| Current state 1 guaranteed | >= 2.6 mA for fast input<br>>= 4.2 mA for discrete input |

| | |
|---|---|
| Voltage state 0 guaranteed | <= 5 V for input |
| Current state 0 guaranteed | <= 1.3 mA for discrete input<br><= 0.6 mA for fast input |
| Discrete input current | 7 mA for discrete input<br>5 mA for fast input |
| Input impedance | 3.4 kOhm for input<br>4.9 kOhm for fast input<br>100 kOhm for analog input |
| Response time | 35 µs turn-off operation for input; I2...I5 terminal<br>5 µs turn-on operation for fast input; I0, I1, I6, I7 terminal<br>35 µs turn-on operation for input; other terminals terminal<br>5 µs turn-off operation for fast input; I0, I1, I6, I7 terminal<br>100 µs turn-off operation for input; other terminals terminal<br>5 µs turn-on, turn-off operation for output; Q0...Q1 terminal<br>50 µs turn-on, turn-off operation for output; Q2...Q3 terminal<br>300 µs turn-on, turn-off operation for output; other terminals terminal |
| Configurable filtering time | 0 ms for input<br>12 ms for input<br>3 ms for input |
| Discrete output logic | Positive logic (source) |
| Current per output common | 4 A |
| Output frequency | 100 kHz for fast output (PWM/PLS mode) at Q0...Q1 termnal<br>5 kHz for output at Q2...Q3 termnal<br>0.1 kHz for output at Q4...Q6 termnal |
| Absolute accuracy error | +/- 1 % of full scale for analog input |
| Leakage current | 0.1 mA for transistor output |
| Voltage drop | <= 1 V |
| Mechanical durability | >= 20000000 cycles for transistor output |
| Tungsten load | <= 12 W for output and fast output |
| Protection type | 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 yr |
| Backup time | 1 year at 25 °C by interruption of power supply |
| Execution time for 1 KInstruction | 0.3 ms for event and periodic task<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 | 8 interrupt tasks<br>1 configurable freewheeling/cyclic master task<br>1 cyclic auxiliary task |
| Maximum size of object areas | 255 %TM timers<br>512 %M memory bits<br>8000 %MW memory words<br>255 %C counters<br>512 %KW constant words |
| 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 | PLS<br>PWM<br>Frequency generator |
| Counting input number | 4 fast input (HSC mode) (counting frequency: 100 kHz), counting capacity: 32 bits |
| Control signal type | A/B<br>Pulse/Direction |

| | |
|---|---|
| | Single phase |
| 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 1 serial link supply at 5 V 200 mA |
| Transmission rate | 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m - communication protocol: RS485<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m - communication protocol: RS232<br>480 Mbit/s - communication protocol: USB |
| Communication port protocol | USB port : USB protocol - SoMachine-Network<br>Non isolated serial link : Modbus protocol master/slave - RTU/ASCII or SoMachine-Network |
| Communication service | Modbus master<br>Modbus slave |
| Local signalling | 1 LED green for SD card access (SD)<br>1 LED red for BAT<br>1 LED green for SL1<br>1 LED green for SL2<br>1 LED per channel green for I/O state<br>1 LED red for module error (ERR)<br>1 LED green for PWR<br>1 LED green for RUN |
| Electrical connection | Mini B USB 2.0 connector for a programming terminal<br>Removable screw terminal block, 10 terminal(s) for inputs<br>Removable screw terminal block, 11 terminal(s) for outputs<br>Terminal block, 3 terminal(s) for connecting the 24 V DC power supply<br>Connector, 4 terminal(s) for analogue inputs |
| Cable length | <= 10 m shielded cable for fast input<br><= 3 m shielded cable for fast output<br><= 30 m unshielded cable for output<br><= 30 m unshielded cable for digital input<br><= 1 m unshielded cable for analog input |
| Insulation | 500 V AC between fast input and internal logic<br>Non-insulated between inputs<br>Non-insulated between analogue inputs<br>500 V AC between output and internal logic<br>500 V AC between fast output and internal logic<br>Non-insulated between outputs<br>500 V AC between input and internal logic<br>Non-insulated between analogue input and internal logic<br>500 V AC between output groups |
| 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 |
| Product weight | 0.264 kg |

## Environment

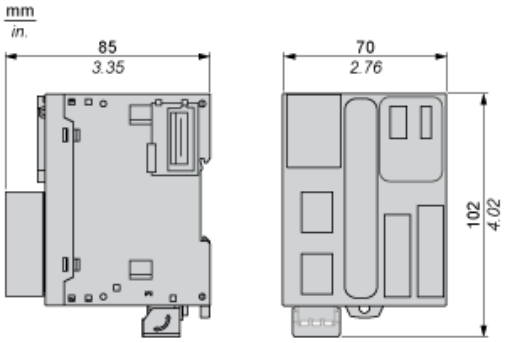
| | |
|---|---|
| Standards | EN/IEC 61010-2-201<br>EN/IEC 61131-2<br>EN/IEC 60664-1 |
| Product certifications | ABS<br>LR<br>CSA<br>RCM<br>DNV-GL<br>cULus<br>EAC<br>IACS E10 |
| Environmental characteristic | Ordinary and hazardous location |
| Resistance to electrostatic discharge | 4 kV on contact conforming to EN/IEC 61000-4-2<br>8 kV in air conforming to EN/IEC 61000-4-2 |
| Resistance to electromagnetic fields | 10 V/m ( 80 MHz...1 GHz) conforming to EN/IEC 61000-4-3<br>3 V/m ( 1.4 GHz...2 GHz) conforming to EN/IEC 61000-4-3<br>1 V/m ( 2...2.7 GHz) conforming to EN/IEC 61000-4-3 |

| | |
|---|---|
| Resistance to magnetic fields | 30 A/m at 50...60 Hz conforming to EN/IEC 61000-4-8 |
| Resistance to fast transients | 2 kV for power lines conforming to EN/IEC 61000-4-4<br>2 kV for relay output conforming to EN/IEC 61000-4-4<br>1 kV for Ethernet line conforming to EN/IEC 61000-4-4<br>1 kV for serial link conforming to EN/IEC 61000-4-4<br>1 kV for I/O conforming to EN/IEC 61000-4-4 |
| Surge withstand | 2 kV for power lines (AC) in common mode conforming to EN/IEC 61000-4-5<br>2 kV for relay output in common mode conforming to EN/IEC 61000-4-5<br>1 kV for I/O in common mode conforming to EN/IEC 61000-4-5<br>1 kV for shielded cable in common mode conforming to EN/IEC 61000-4-5<br>0.5 kV for power lines (DC) in differential mode conforming to EN/IEC 61000-4-5<br>1 kV for power lines (AC) in differential mode conforming to EN/IEC 61000-4-5<br>1 kV for relay output in differential mode conforming to EN/IEC 61000-4-5<br>0.5 kV for power lines (DC) in common mode conforming to EN/IEC 61000-4-5 |
| Resistance to conducted disturbances, induced by radio frequency fields | 10 Vrms (0.15...80 MHz) conforming to EN/IEC 61000-4-6<br>3 Vrms (0.1...80 MHz) conforming to Marine specification (LR, ABS, DNV, GL)<br>10 Vrms (spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz)) conforming to Marine specification (LR, ABS, DNV, GL) |
| Electromagnetic emission | Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.15...0.5 MHz : 79 dBµV/m QP/66 dBµV/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.5...300 MHz : 73 dBµV/m QP/60 dBµV/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines, 10...150 kHz : 120...69 dBµV/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 150 kHz...1.5 MHz : 79...63 dBµV/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz : 63 dBµV/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 30...230 MHz : 40 dBµV/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 200 MHz...1 GHz : 47 dBµV/m QP |
| Immunity to microbreaks | 10 ms |
| Ambient air temperature for operation | -10...55 °C for horizontal installation<br>-10...35 °C for vertical installation |
| Ambient air temperature for storage | -25...70 °C |
| Relative humidity | 10...95 % without condensation in operation<br>10...95 % without condensation in storage |
| IP degree of protection | IP20 with protective cover in place |
| Pollution degree | <= 2 |
| Operating altitude | 0...2000 m |
| Storage altitude | 0...3000 m |
| Vibration resistance | 3.5 mm (vibration frequency: 5...8.4 Hz) on symmetrical rail<br>1 gn (vibration frequency: 8.4...150 Hz) on symmetrical rail<br>3.5 mm (vibration frequency: 5...8.4 Hz) on panel mounting<br>1 gn (vibration frequency: 8.4...150 Hz) on panel mounting |
| Shock resistance | 147 m/s² (test wave duration:11 ms) |

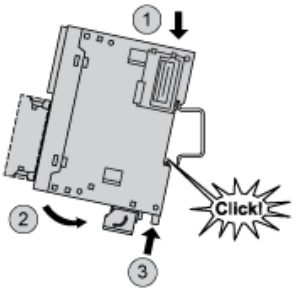
## Offer Sustainability

| | |
|---|---|
| Sustainable offer status | Green Premium product |
| RoHS (date code: YYWW) | Compliant - since 1348 - Schneider Electric declaration of conformity<br>Schneider Electric declaration of conformity |
| REACh | Reference not containing SVHC above the threshold<br>Reference not containing SVHC above the threshold |
| Product environmental profile | Available<br>Product environmental |
| Product end of life instructions | Available<br>End of life manual |

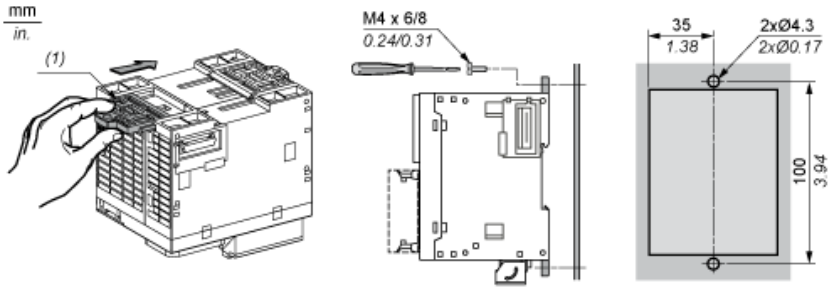
## Dimensions



## Mounting on a Rail



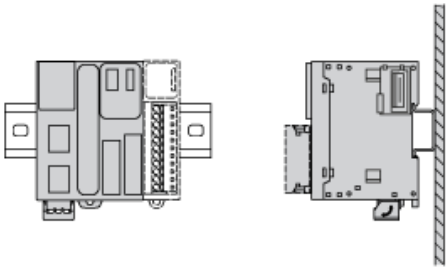
## Direct Mounting on a Panel Surface



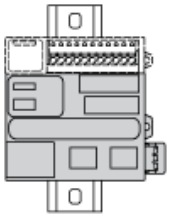

(1) Install a mounting strip

## Mounting

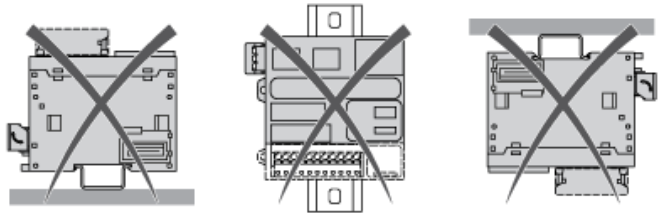
### Correct Mounting Position



### Acceptable Mounting Position



### Incorrect Mounting Position



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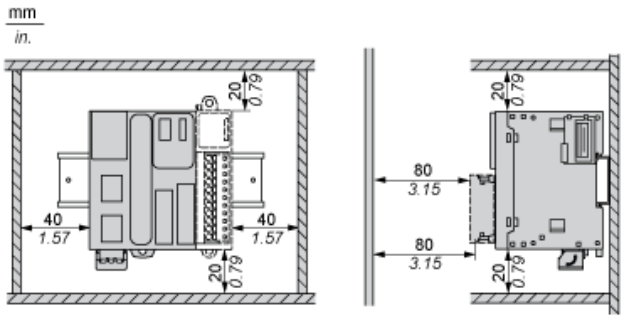
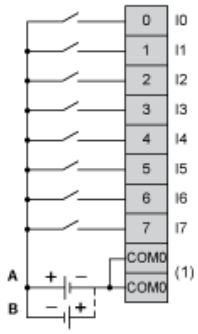
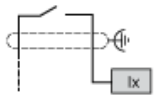
## Clearance



## Digital Inputs

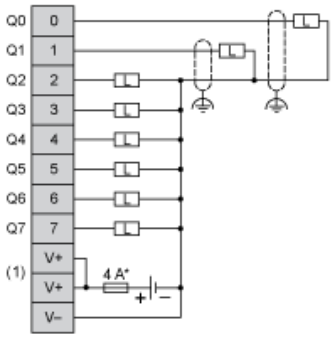



(1) The COM0 terminals are connected internally.
A : Sink wiring (positive logic).
B : Source wiring (negative logic).

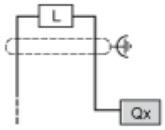



Ix I0, I1, I6, I7

## Digital Outputs

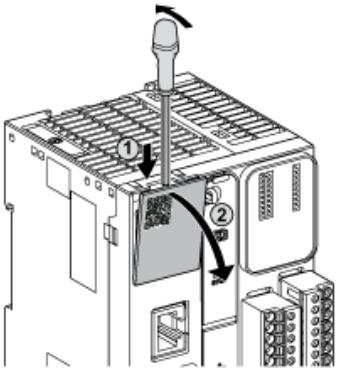


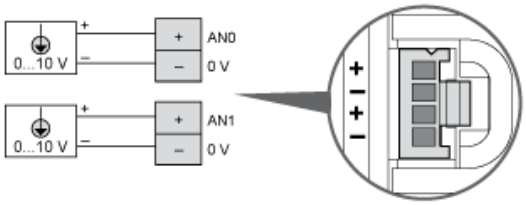

(*) Type T fuse
(1) The V+ terminals are connected internally.




Qx Q0, Q1

## Analog Inputs

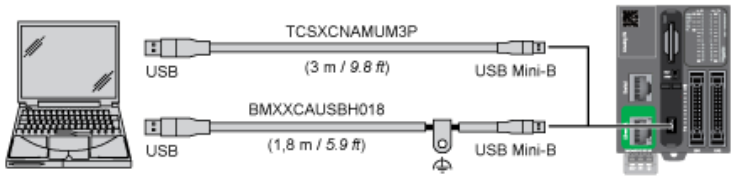




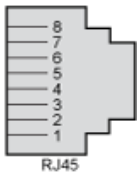

The (-) poles are connected internally.

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

## USB Mini-B Connection



## SL1 Connection

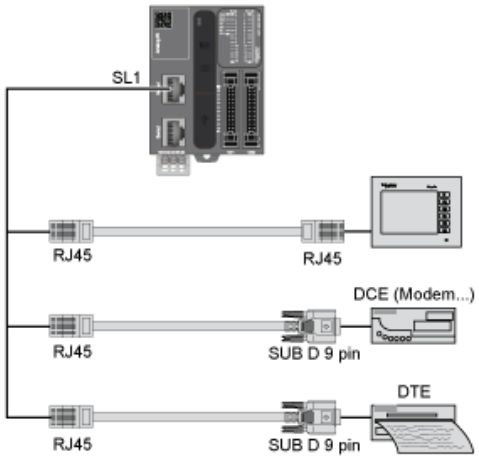



SL1

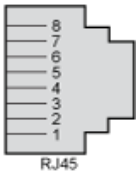
| N ° | RS 232 | RS 485 |
|---|---|---|
| 1 | RxD | N.C. |
| 2 | TxD | N.C. |
| 3 | RTS | N.C. |
| 4 | N.C. | D1 |
| 5 | N.C. | D0 |
| 6 | CTS | N.C. |
| 7 | N.C.* | 5 Vdc |
| 8 | Common | Common |

N.C.: not connected

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



## SL2 Connection

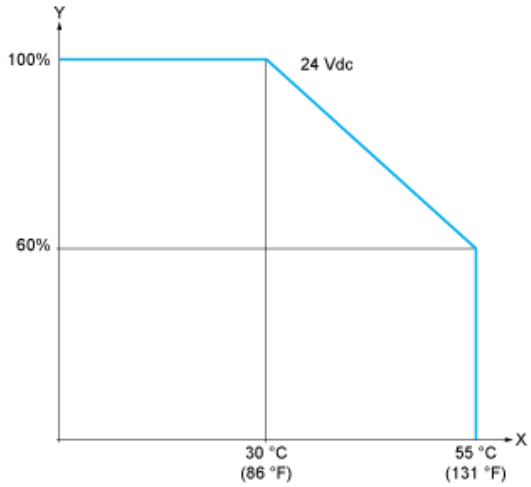



| N ° | RS 485 |
|---|---|
| 1 | N.C. |
| 2 | N.C. |
| 3 | N.C. |
| 4 | D1 |
| 5 | D0 |
| 6 | N.C. |
| 7 | N.C. |
| 8 | Common |

N.C.: not connected

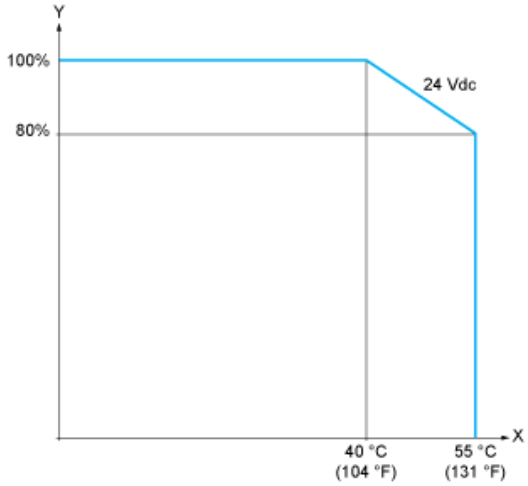
## Derating Curves

### Embedded Digital Inputs




X : Ambient temperature
Y : Input simultaneous ON ratio

### Embedded Digital Outputs




X : Ambient temperature
Y : Output simultaneous ON ratio