# Product data sheet
## Characteristics

# TM221CE16T
logic controller, Modicon M221, 16 IO, 9 DI, 7 DO, transistor, PNP, Ethernet



## Main

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

## Complementary

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| Discrete I/O number | 16 |
| Maximum number of I/O expansion module | 4 (local I/O-Architecture)<br>11 (remote I/O-Architecture) |
| Supply voltage limits | 20.4…28.8 V |
| Inrush current | 35 A |
| Maximum power consumption in W | 11 W at 24 V (with max number of I/O expansion module)<br>4.6 W at 24 V (without I/O expansion module) |
| Power supply output current | 0.325 A 5 V for expansion bus<br>0.15 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 | 3.4 kOhm for discrete input<br>100 kOhm for analog input<br>4.9 kOhm for fast input |

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| 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 | 3.5 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...Q6 |
| 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 | <12 W for output and fast output |
| Protection type | Overload and short-circuit protection at 1 A |
| Reset time | 1 S automatic reset |
| Memory capacity | 256 kB for user application and data RAM with 10000 instructions<br>256 kB for internal variables RAM |
| Data backed up | 256 kB built-in flash memory for backup of application and data |
| Data storage equipment | 2 GB SD card (optional) |
| Battery type | BR2032 or CR2032X lithium non-rechargeable |
| Backup time | 1 year at 25 °C (by interruption of power supply) |
| Execution time for 1 KInstruction | 0.3 Ms for event and periodic task |
| Execution time per instruction | 0.2 µs Boolean |
| Exct time for event task | 60 µs response time |
| Maximum size of object areas | 512 %M memory bits<br>255 %C counters<br>512 %KW constant words<br>255 %TM timers<br>8000 %MW memory 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 | PWM<br>Frequency generator<br>PLS |
| Counting input number | 4 fast input (HSC mode) at 100 kHz 32 bits |
| Control signal type | 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)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 client<br>DHCP client<br>Modbus TCP slave device<br>Modbus TCP server<br>Ethernet/IP adapter |

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| 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 | Removable screw terminal block for inputs<br>Removable screw terminal block for outputs<br>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 |
| 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 | 95 Mm |
| Net weight | 0.346 Kg |

## Environment

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|---|---|
| Standards | IEC 61131-2<br>UL 508<br>CAN/CSA C22.2 No. 213<br>IACS E10<br>ANSI/ISA 12-12-01 |
| Product certifications | EAC[RETURN]DNV-GL[RETURN]RCM[RETURN]ABS[RETURN]cULus[RETURN]LR[RETURN |
| Environmental characteristic | Ordinary and hazardous location |
| Resistance to electrostatic discharge | 8 KV in air conforming to IEC 61000-4-2<br>4 KV on contact conforming to IEC 61000-4-2 |
| Resistance to electromagnetic fields | 10 V/M 80 MHz...1 GHz conforming to IEC 61000-4-3<br>3 V/M 1.4 GHz...2 GHz conforming to IEC 61000-4-3<br>1 V/M 2...2.7 GHz conforming to IEC 61000-4-3 |
| Resistance to magnetic fields | 30 A/M 50/60 Hz conforming to IEC 61000-4-8 |
| Resistance to fast transients | 2 KV (power lines) conforming to IEC 61000-4-4<br>2 KV (relay output) conforming to IEC 61000-4-4<br>1 KV (I/O) conforming to IEC 61000-4-4<br>1 KV (Ethernet line) conforming to IEC 61000-4-4<br>1 KV (serial link) conforming to IEC 61000-4-4 |
| Surge withstand | 2 KV power lines (AC) common mode conforming to IEC 61000-4-5<br>2 KV relay output common mode conforming to IEC 61000-4-5<br>1 KV I/O common mode conforming to IEC 61000-4-5<br>1 KV shielded cable common mode conforming to IEC 61000-4-5<br>0.5 KV power lines (DC) differential mode conforming to IEC 61000-4-5<br>1 KV power lines (AC) differential mode conforming to IEC 61000-4-5<br>1 KV relay output differential mode conforming to IEC 61000-4-5<br>0.5 KV power lines (DC) common mode conforming to IEC 61000-4-5 |
| Resistance to conducted disturbances | 10 V 0.15...80 MHz conforming to 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 spec |
| Electromagnetic emission | Conducted emissions - test level: 79 dBµV/m QP/66 dBµV/m AV ( power lines (AC)) at 0.15…0<br>Conducted emissions - test level: 73 dBµV/m QP/60 dBµV/m AV ( power lines (AC)) at 0.5…30<br>Conducted emissions - test level: 120...69 dBµV/m QP ( power lines) at 10…150 kHz conformi<br>Conducted emissions - test level: 63 dBµV/m QP ( power lines) at 1.5…30 MHz conforming to<br>Radiated emissions - test level: 40 dBµV/m QP class A ( 10 m) at 30…230 MHz conforming to<br>Conducted emissions - test level: 79...63 dBµV/m QP ( power lines) at 150…1500 kHz conform<br>Radiated emissions - test level: 47 dBµV/m QP class A ( 10 m) at 200…1000 MHz conforming |

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| Immunity to microbreaks | 10 Ms |
| Ambient air temperature for operation | -10…55 °C (horizontal installation)<br>-10…35 °C (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 at 5…8.4 Hz on symmetrical rail<br>3.5 mm at 5…8.4 Hz on panel mounting<br>1 gn at 8.4…150 Hz on symmetrical rail<br>1 gn at 8.4…150 Hz on panel mounting |
| Shock resistance | 147 m/s² for 11 ms |

## Packing Units

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|---|---|
| Unit Type of Package 1 | PCE |
| Number of Units in Package 1 | 1 |
| Package 1 Height | 10.6 Cm |
| Package 1 Width | 14.0 Cm |
| Package 1 Length | 13.9 Cm |
| Package 1 Weight | 300.0 G |
| Unit Type of Package 2 | S04 |
| Number of Units in Package 2 | 20 |
| Package 2 Height | 30 Cm |
| Package 2 Width | 40 Cm |
| Package 2 Length | 60 Cm |
| Package 2 Weight | 6.983 Kg |
| Unit Type of Package 3 | P12 |
| Number of Units in Package 3 | 240 |
| Package 3 Height | 105.0 Cm |
| Package 3 Width | 120.0 Cm |
| Package 3 Length | 80.0 Cm |
| Package 3 Weight | 156 Kg |

## Offer Sustainability

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| Recyclability potential, in % | 0 |
| Total lifecycle Carbon footprint | 107 kg CO2 eq. |
| Carbon footprint of the manufacturing phase [A1 to A3] | 11.102144169944033 |
| Carbon footprint of the manufacturing phase [A1 to A3] | 11 kg CO2 eq. |
| Carbon footprint of the distribution phase [A4] | 0.6869216485302384 |
| Carbon footprint of the distribution phase [A4] | 0.7 kg CO2 eq. |
| Carbon footprint of the installation phase [A5] | 0.005100009556700557 |
| Carbon footprint of the installation phase [A5] | 0 kg CO2 eq. |
| Carbon footprint of the use phase [B2, B3, B4, B6] | 94.4714868646892 |
| Carbon footprint of the use phase [B2, B3, B4, B6] | 94 kg CO2 eq. |
| Mercury free | Yes |
| Sustainable packaging | No |
| Carbon footprint of the end-of-life phase [C1 to C4] | 0.6535249198975186 |
| Carbon footprint of the end-of-life phase [C1 to C4] | 0.7 kg CO2 eq. |
| Environmental Disclosure | Product Environmental Profile |
| Total lifecycle Carbon footprint | 107 |
| Packaging made with recycled cardboard | Yes |
| Packaging without single use plastic | No |
| SCIP Number | C9e48184-76ce-4d1a-abc2-18108c652781 |

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| REACh Regulation | Reference contains Substances of Very High Concern above the threshold |
| EU RoHS Directive | Compliant By Exemption |
| California proposition 65 | WARNING: This product can expose you to chemicals including: Lead and lead compounds, w |
| PVC free | Yes |
| End of life manual availability | End Of Life Information |
| Take-back | No |
| WEEE Label | The product must be disposed on European Union markets following specific waste collection a |

## Contractual warranty

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| Warranty (in months) | 18 |

Product Life Status : Commercialised