# **Product datasheet**





# logic controller, Modicon M221, 24 IO, relay, Ethernet

TM221CE24R

#### Main

Range of product	Modicon M221	
product or component type	Logic controller	
[Us] rated supply voltage	100240 V AC	
Discrete input number	14, discrete input conforming to IEC 61131-2 Type 1	
Analogue input number	2 at 010 V	
Discrete output type	Relay normally open	
Discrete output number	10 relay	
Discrete output voltage	5125 V DC 5250 V AC	
Discrete output current	2 A	

## Complementary

Discrete I/O number	24
Maximum number of I/O expansion module	7 (local I/O-Architecture) 14 (remote I/O-Architecture)
Supply voltage limits	85264 V
Network frequency	50/60 Hz
Inrush current	40 A
Maximum power consumption in VA	58 VA at 100240 V with max number of I/O expansion module 35 VA at 100240 V without I/O expansion module
Power supply output current	0.52 A 5 V for expansion bus 0.16 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 +/- 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 5 mA for fast input

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Input impedance	3.4 kOhm for discrete input
	100 kOhm for analog input
	4.9 kOhm for fast input
Response time	35 μs turn-off, I2I5 terminal(s) for input
	10 ms turn-on for output
	10 ms turn-off for output 5 µs turn-on, I0, I1, I6, I7 terminal(s) for fast input
	35 µs turn-on, other terminals terminal(s) for input
	5 µs turn-off, I0, I1, I6, I7 terminal(s) for fast input
	100 μs turn-off, other terminals terminal(s) for input
Configurable filtering time	0 ms for input
	3 ms for input
	12 ms for input
Output voltage limits	125 V DC
	277 V AC
Maximum current per output	4 A at COM 2
common	7 A at COM 0
	7 A at COM 1
Absolute accuracy error	+/- 1 % of full scale for analog input
Electrical durability	100000 cycles AC-12, 120 V, 240 VA, resistive
	100000 cycles AC-12, 240 V, 480 VA, resistive
	300000 cycles AC-12, 120 V, 80 VA, resistive
	300000 cycles AC-12, 240 V, 160 VA, resistive 100000 cycles AC-15, cos phi = 0.35, 120 V, 60 VA, inductive
	100000 cycles AC-15, cos prii = 0.35, 120 V, 60 VA, inductive 100000 cycles AC-15, cos phi = 0.35, 240 V, 120 VA, inductive
	300000 cycles AC-15, cos phi = 0.35, 120 V, 18 VA, inductive
	300000 cycles AC-15, cos phi = 0.35, 240 V, 36 VA, inductive
	100000 cycles AC-14, cos phi = 0.7, 120 V, 120 VA, inductive
	100000 cycles AC-14, cos phi = 0.7, 240 V, 240 VA, inductive
	300000 cycles AC-14, cos phi = 0.7, 120 V, 36 VA, inductive
	300000 cycles AC-14, cos phi = 0.7, 240 V, 72 VA, inductive
	100000 cycles DC-12, 24 V, 48 W, resistive 300000 cycles DC-12, 24 V, 16 W, resistive
	100000 cycles DC-13, 24 V, 24 W, inductive (L/R = 7 ms)
	300000 cycles DC-13, 24 V, 7.2 W, inductive (L/R = 7 ms)
Switching frequency	20 switching operations/minute with maximum load
Mechanical durability	20000000 cycles for relay output
Minimum load	1 mA at 5 V DC for relay output
Protection type	Without protection at 5 A
Reset time	· · · · · · · · · · · · · · · · · · ·
	1s
Memory capacity	256 kB for user application and data RAM with 10000 instructions 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	255 %TM timers
-	512 %M memory bits
	8000 %MW memory words
	255 %C counters 512 %KW constant words
	512 /JINY CONSTANT WORLS
Realtime clock	With
Clock drift	<= 30 s/month at 25 °C

Counting input number	4 fast input (HSC mode) at 100 kHz 32 bits
counter function	A/B Single phase Pulse/direction
Integrated connection type	USB port with mini B USB 2.0 connector  Non isolated serial link serial 1 with RJ45 connector and RS232/RS485 interface  Ethernet with RJ45 connector
Supply	(serial)serial link supply: 5 V, <200 mA
Transmission rate	1.2115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m for RS485 1.2115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m for RS232 480 Mbit/s for USB
Communication port protocol	USB port: USB - SoMachine-Network Non isolated serial link: Modbus master/slave - RTU/ASCII or SoMachine-Network Ethernet
Port Ethernet	10BASE-T/100BASE-TX 1 port with 100 m copper cable
communication service	Modbus TCP server Modbus TCP slave device DHCP client Modbus TCP client Ethernet/IP adapter
Local signalling	1 LED (green) for PWR 1 LED (green) for RUN 1 LED (red) for module error (ERR) 1 LED (green) for SD card access (SD) 1 LED (red) for BAT 1 LED per channel (green) for I/O state 1 LED (green) for SL Ethernet network activity (green) for ACT Ethernet network link (yellow) for Link (Link Status)
Electrical connection	removable screw terminal block for inputs removable screw terminal block for outputs terminal block, 3 terminal(s) for connecting the 24 V DC power supply connector, 4 terminal(s) for analogue inputs Mini B USB 2.0 connector for a programming terminal
Maximum cable distance between devices	Shielded cable: <10 m for fast input Unshielded cable: <30 m for output Unshielded cable: <30 m for digital input Unshielded cable: <1 m for analog input
Insulation	Between input and internal logic at 500 V AC  Non-insulated between analogue input and internal logic  Non-insulated between analogue inputs  Between supply and ground at 1500 V AC  Between sensor power supply and ground at 500 V AC  Between input and ground at 500 V AC  Between output and ground at 1500 V AC  Between supply and internal logic at 2300 V AC  Between sensor power supply and internal logic at 500 V AC  Between output and internal logic at 2300 V AC  Between Ethernet terminal and internal logic at 500 V AC  Between supply and sensor power supply at 2300 V AC
marking	CE
Sensor power supply	24 V DC at 250 mA supplied by the controller
Mounting support	Top hat type TH35-15 rail conforming to IEC 60715 Top hat type TH35-7.5 rail conforming to IEC 60715 plate or panel with fixing kit
Height	90 mm
Depth	70 mm
Width	110 mm
net weight	0.395 kg

## **Environment**

Standards	IEC 61131-2 UL 508	
	CAN/CSA C22.2 No. 213 IACS E10 ANSI/ISA 12-12-01	
Product certifications	LR cULus	
	ABS DNV-GL	
	EAC RCM	
	CE	
	UKCA cULus HazLoc	
Environmental characteristic	Ordinary and hazardous location	
Resistance to electrostatic discharge	8 kV in air conforming to IEC 61000-4-2 4 kV on contact conforming to IEC 61000-4-2	
Resistance to electromagnetic	10 V/m 80 MHz1 GHz conforming to IEC 61000-4-3	
fields	3 V/m 1.4 GHz2 GHz conforming to IEC 61000-4-3 1 V/m 22.7 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	
	2 kV (relay output) conforming to IEC 61000-4-4	
	1 kV (I/O) conforming to IEC 61000-4-4 1 kV (Ethernet line) conforming to IEC 61000-4-4	
	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	
	2 kV relay output common mode conforming to IEC 61000-4-5 1 kV I/O common mode conforming to IEC 61000-4-5	
	1 kV shielded cable common mode conforming to IEC 61000-4-5	
	0.5 kV power lines (DC) differential mode conforming to IEC 61000-4-5  1 kV power lines (AC) differential mode conforming to IEC 61000-4-5	
	1 kV relay output differential mode conforming to IEC 61000-4-5	
	0.5 kV power lines (DC) common mode conforming to IEC 61000-4-5	
Resistance to conducted	10 V 0.1580 MHz conforming to IEC 61000-4-6	
disturbances	3 V 0.180 MHz conforming to Marine specification (LR, ABS, DNV, GL) 10 V spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz) conforming to Marine specification (LR, ABS, DNV, GL)	
Electromagnetic emission	Conducted emissions - test level: 79 dBµV/m QP/66 dBµV/m AV ( power lines (AC))	
	at 0.150.5 MHz conforming to IEC 55011  Conducted emissions - test level: 73 dBμV/m QP/60 dBμV/m AV ( power lines (AC))	
	at 0.5300 MHz conforming to IEC 55011  Conducted emissions - test level: 12069 dBµV/m QP ( power lines) at 10150 kHz	
	conforming to IEC 55011	
	Conducted emissions - test level: 63 dBµV/m QP ( power lines) at 1.530 MHz conforming to IEC 55011	
	Radiated emissions - test level: 40 dBμV/m QP class A ( 10 m) at 30230 MHz	
	conforming to IEC 55011  Conducted emissions - test level: 7963 dBµV/m QP ( power lines) at 1501500	
	kHz conforming to IEC 55011	
	Radiated emissions - test level: 47 dB $\mu$ V/m QP class A ( 10 m) at 2001000 MHz conforming to IEC 55011	
Immunity to microbreaks	10 ms	
Ambient air temperature for operation	-1055 °C (horizontal installation) -1035 °C (vertical installation)	
Ambient air temperature for storage	-2570 °C	
Relative humidity	1095 %, without condensation (in operation) 1095 %, without condensation (in storage)	
IP degree of protection	IP20 with protective cover in place	
Pollution degree	<= 2	
Operating altitude	02000 m	
Storage altitude	03000 m	

Vibration resistance	3.5 mm at 58.4 Hz on symmetrical rail 3.5 mm at 58.4 Hz on panel mounting 1 gn at 8.4150 Hz on symmetrical rail 1 gn at 8.4150 Hz on panel mounting	
Shock resistance	98 m/s² for 11 ms	

## **Packing Units**

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Height	11.156 cm
Package 1 Width	14.152 cm
Package 1 Length	15.681 cm
Package 1 Weight	650.0 g
Unit Type of Package 2	CAR
Number of Units in Package 2	20
Package 2 Height	29.9 cm
Package 2 Width	39.4 cm
Package 2 Length	57.5 cm
Package 2 Weight	14.171 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	182 kg



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Transparency RoHS/REACh

### Well-being performance

	Mercury Free	
<b>②</b>	Rohs Exemption Information	Yes
	Pvc Free	

#### **Certifications & Standards**

Reach Regulation	REACh Declaration	
Eu Rohs Directive	Pro-active compliance (Product out of EU RoHS legal scope)	
China Rohs Regulation	China RoHS declaration	
Environmental Disclosure	Product Environmental Profile	
Weee	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins	
Circularity Profile	End of Life Information	

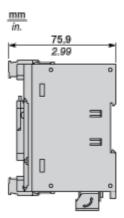
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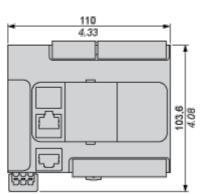
## **Product datasheet**

## **TM221CE24R**

**Dimensions Drawings** 

#### **Dimensions**



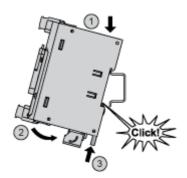


## **Product datasheet**

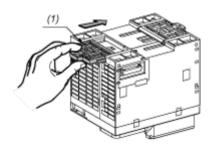
## **TM221CE24R**

Mounting and Clearance

Mounting on a Rail

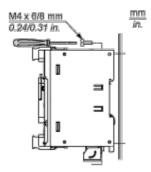


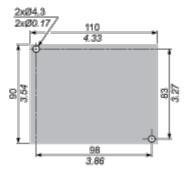
#### **Direct Mounting on a Panel Surface**



(1) Install a mounting strip

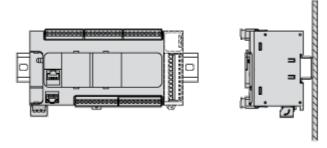
#### **Mounting Hole Layout**



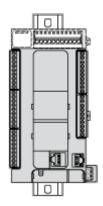


#### **Mounting**

#### **Correct Mounting Position**

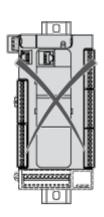


#### **Acceptable Mounting Position**



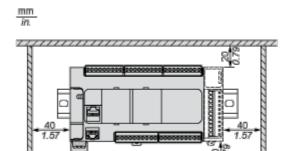
#### **Incorrect Mounting Position**

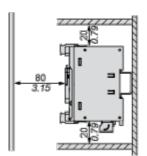






#### Clearance

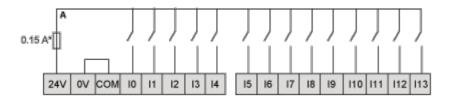




#### Connections and Schema

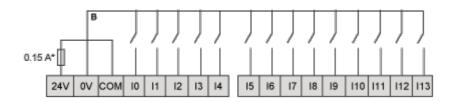
#### **Digital Inputs**

#### Wiring Diagram (Positive Logic)



(\*) Type T fuse

#### Wiring Diagram (Negative Logic)



(\*) Type T fuse

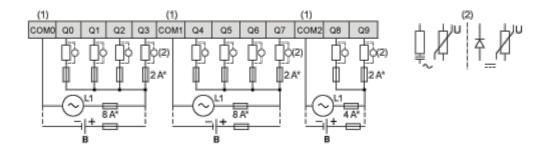
#### **Connection of the Fast Inputs**



10, 11, 16, 17

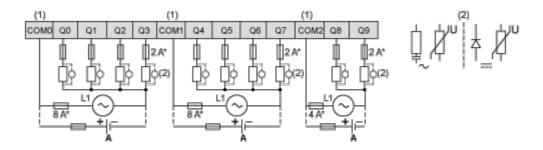
#### **Relay Outputs**

#### Negative Logic (Sink)



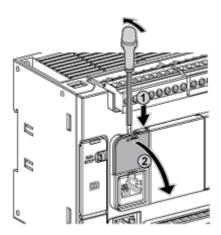
- (\*) Type T fuse
- (1) The COM0, COM1 and COM2 terminals are not connected internally.
- (2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load
- B Sink wiring (negative logic)

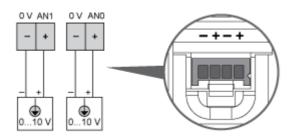
#### Positive Logic (Source)



- (\*) Type T fuse
- (1) The COM0, 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**





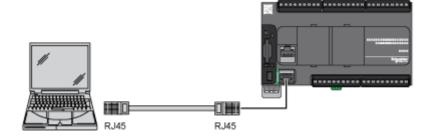
The (-) poles are connected internally.

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

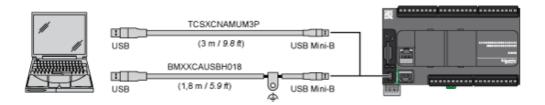
#### **Ethernet Connection**



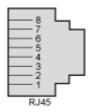
Pin N°	Signal
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-



#### **USB Mini-B Connection**



#### **SL1 Connection**

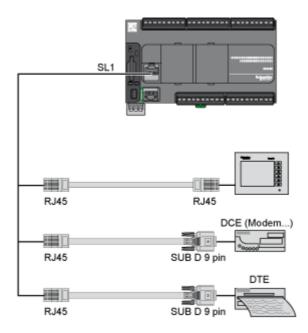


SL1

Ν°	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	стѕ	N.C.
7	N.C*.	5 Vdc
8	Common	Common

N.C.: not connected

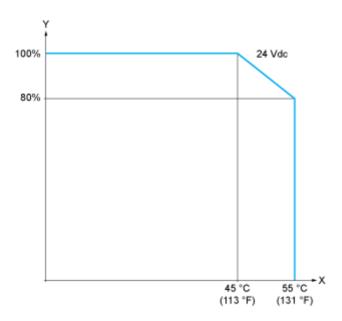
<sup>\*: 5</sup> Vdc delivered by the controller. Do not connect.



#### Performance Curves

#### **Derating Curves**

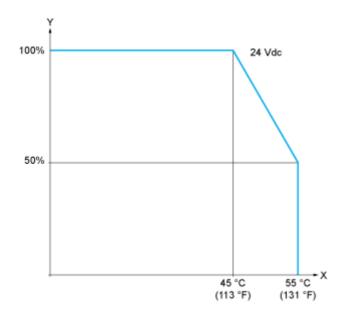
#### **Embedded Digital Inputs (No Cartridge)**



X: Ambient temperature

Y: Input simultaneous ON ratio

### **Embedded Digital Inputs (with Cartridge)**



X: Ambient temperature

Y: Input simultaneous ON ratio