

# Product data sheet

Specifications



## Logic controller, Modicon M221, 24io tr.npn

TM221C24U

### Main

Range of product	Modicon M221
Product or component type	Logic controller
[Us] rated supply voltage	24 V DC
Discrete input number	14, 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	10 transistor 2 fast output
Discrete output voltage	24 V DC
Discrete output current	0.5 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	20.4...28.8 V
Inrush current	35 A
Maximum power consumption in W	13 W at 24 V (with max number of I/O expansion module) 4.1 W at 24 V (without I/O expansion module)
Power supply output current	0.52 A 5 V for expansion bus 0.2 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
Input impedance	3.4 kOhm for discrete input 100 kOhm for analog input 4.9 kOhm for fast input

<b>Response time</b>	35 µs turn-off, I2...I5 terminal(s) for input 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 5 µs turn-on, turn-off, Q0...Q1 terminal(s) for output 50 µs turn-on, turn-off, Q2...Q3 terminal(s) for output 300 µs turn-on, turn-off, other terminals terminal(s) for output
<b>Configurable filtering time</b>	0 ms for input 3 ms for input 12 ms for input
<b>Discrete output logic</b>	Negative logic (sink)
<b>Maximum current per output common</b>	5 A
<b>Output frequency</b>	100 kHz for fast output (PWM/PLS mode) at Q0...Q1 5 kHz for output at Q2...Q3 0.1 kHz for output at Q4...Q9
<b>Absolute accuracy error</b>	+/- 1 % of full scale for analog input
<b>Maximum leakage current</b>	0.1 mA for transistor output
<b>Maximum voltage drop</b>	<1 V
<b>Mechanical durability</b>	20000000 cycles for transistor output
<b>Maximum tungsten load</b>	<12 W for output and fast output
<b>Protection type</b>	Without protection
<b>Memory capacity</b>	256 kB for user application and data RAM with 10000 instructions 256 kB for internal variables RAM
<b>Data backed up</b>	256 kB built-in flash memory for backup of application and data
<b>Data storage equipment</b>	2 GB SD card (optional)
<b>Battery type</b>	BR2032 or CR2032X lithium non-rechargeable
<b>Backup time</b>	1 year at 25 °C (by interruption of power supply)
<b>Execution time for 1 KInstruction</b>	0.3 ms for event and periodic task
<b>Execution time per instruction</b>	0.2 µs Boolean
<b>Exct time for event task</b>	60 µs response time
<b>Maximum size of object areas</b>	512 %M memory bits 8000 %MW memory words 512 %KW constant words 255 %TM timers 255 %C counters
<b>Realtime clock</b>	With
<b>Clock drift</b>	<= 30 s/month at 25 °C
<b>Regulation loop</b>	Adjustable PID regulator up to 14 simultaneous loops
<b>Positioning functions</b>	Position PTO 2 axe(s)pulse/direction mode (100 kHz) Position PTO 1 axe(s)CW/CCW mode (100 kHz)
<b>Function available</b>	Frequency generator PLS PWM
<b>Counting input number</b>	4 fast input (HSC mode) at 100 kHz 32 bits
<b>counter function</b>	A/B Single phase Pulse/direction
<b>Integrated connection type</b>	USB port with mini B USB 2.0 connector Non isolated serial link serial 1 with RJ45 connector and RS485 interface Non isolated serial link serial 2 with RJ45 connector and RS232/RS485 interface
<b>Supply</b>	(serial)serial link supply: 5 V, <200 mA

<b>Transmission rate</b>	1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m for RS485 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m for RS232 480 Mbit/s for USB
<b>Communication port protocol</b>	USB port: USB - SoMachine-Network Non isolated serial link: Modbus master/slave - RTU/ASCII or SoMachine-Network
<b>Local signalling</b>	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 (green) for SL1 1 LED (green) for SL2 1 LED per channel (green) for I/O state
<b>Electrical connection</b>	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
<b>Maximum cable distance between devices</b>	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 Shielded cable: <3 m for fast output
<b>Insulation</b>	Between input and internal logic at 500 V AC Between fast input and internal logic at 500 V AC Non-insulated between inputs Between output and internal logic at 500 V AC Non-insulated between analogue input and internal logic Non-insulated between analogue outputs
<b>Marking</b>	CE
<b>Mounting support</b>	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
<b>Height</b>	90 mm
<b>Depth</b>	70 mm
<b>Width</b>	110 mm
<b>Net weight</b>	0.77 kg

## Environment

<b>Standards</b>	IEC 61131-2 UL 508 CAN/CSA C22.2 No. 213 IACS E10 ANSI/ISA 12-12-01
<b>Product certifications</b>	EAC DNV-GL LR ABS RCM cULus CE UKCA cULus HazLoc
<b>Environmental characteristic</b>	Ordinary and hazardous location
<b>Resistance to electrostatic discharge</b>	8 kV in air conforming to IEC 61000-4-2 4 kV on contact conforming to IEC 61000-4-2
<b>Resistance to electromagnetic fields</b>	10 V/m 80 MHz...1 GHz conforming to IEC 61000-4-3 3 V/m 1.4 GHz...2 GHz conforming to IEC 61000-4-3 1 V/m 2...2.7 GHz conforming to IEC 61000-4-3
<b>Resistance to magnetic fields</b>	30 A/m 50/60 Hz conforming to IEC 61000-4-8

<b>Resistance to fast transients</b>	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
<b>Surge withstand</b>	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
<b>Resistance to conducted disturbances</b>	10 V 0.15...80 MHz conforming to IEC 61000-4-6 3 V 0.1...80 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)
<b>Electromagnetic emission</b>	Conducted emissions - test level: 79 dB $\mu$ V/m QP/66 dB $\mu$ V/m AV ( power lines (AC)) at 0.15...0.5 MHz conforming to IEC 55011 Conducted emissions - test level: 73 dB $\mu$ V/m QP/60 dB $\mu$ V/m AV ( power lines (AC)) at 0.5...300 MHz conforming to IEC 55011 Conducted emissions - test level: 120...69 dB $\mu$ V/m QP ( power lines) at 10...150 kHz conforming to IEC 55011 Conducted emissions - test level: 63 dB $\mu$ V/m QP ( power lines) at 1.5...30 MHz conforming to IEC 55011 Radiated emissions - test level: 40 dB $\mu$ V/m QP class A ( 10 m) at 30...230 MHz conforming to IEC 55011 Conducted emissions - test level: 79...63 dB $\mu$ V/m QP ( power lines) at 150...1500 kHz conforming to IEC 55011 Radiated emissions - test level: 47 dB $\mu$ V/m QP class A ( 10 m) at 200...1000 MHz conforming to IEC 55011
<b>Immunity to microbreaks</b>	10 ms
<b>Ambient air temperature for operation</b>	-10...55 °C (horizontal installation) -10...35 °C (vertical installation)
<b>Ambient air temperature for storage</b>	-25...70 °C
<b>Relative humidity</b>	10...95 %, without condensation (in operation) 10...95 %, without condensation (in storage)
<b>IP degree of protection</b>	IP20 with protective cover in place
<b>Pollution degree</b>	<= 2
<b>Operating altitude</b>	0...2000 m
<b>Storage altitude</b>	0...3000 m
<b>Vibration resistance</b>	3.5 mm at 5...8.4 Hz on symmetrical rail 3.5 mm at 5...8.4 Hz on panel mounting 1 gn at 8.4...150 Hz on symmetrical rail 1 gn at 8.4...150 Hz on panel mounting
<b>Shock resistance</b>	147 m/s <sup>2</sup> for 11 ms

## Packing Units

<b>Unit Type of Package 1</b>	PCE
<b>Number of Units in Package 1</b>	1
<b>Package 1 Height</b>	11.2 cm
<b>Package 1 Width</b>	14.3 cm
<b>Package 1 Length</b>	15.5 cm
<b>Package 1 Weight</b>	576 g
<b>Unit Type of Package 2</b>	S04
<b>Number of Units in Package 2</b>	24

Package 2 Height	30 cm
Package 2 Width	40 cm
Package 2 Length	60 cm
Package 2 Weight	13.872 kg
Unit Type of Package 3	P12
Number of Units in Package 3	288
Package 3 Height	120.0 cm
Package 3 Width	105.0 cm
Package 3 Length	80.0 cm
Package 3 Weight	190.88 kg



## Environmental Data

Schneider Electric aims to achieve Net Zero status by 2050 through supply chain partnerships, lower impact materials, and circularity via our ongoing “Use Better, Use Longer, Use Again” campaign to extend product lifetimes and recyclability.

[Environmental Data explained >](#)

[How we assess product sustainability >](#)

### Environmental footprint

Total lifecycle Carbon footprint	112
Environmental Disclosure	<a href="#">Product Environmental Profile</a>

## Use Better

### Materials and Substances

Packaging made with recycled cardboard	Yes
Packaging without single use plastic	Yes
<a href="#">EU RoHS Directive</a>	Pro-active compliance (Product out of EU RoHS legal scope)
REACH Regulation	<a href="#">REACH Declaration</a>
California proposition 65	<b>WARNING:</b> This product can expose you to chemicals including: Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to <a href="#">www.P65Warnings.ca.gov</a>
PVC free	Yes

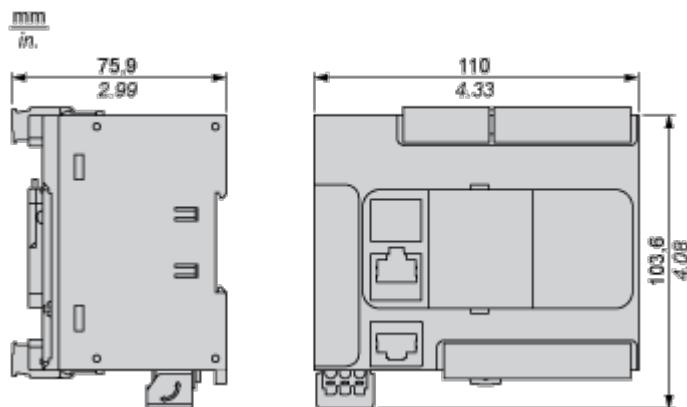
## Use Again

### Repack and remanufacture

End of life manual availability	<a href="#">End of Life Information</a>
Take-back	No
WEEE Label	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins

## Dimensions Drawings

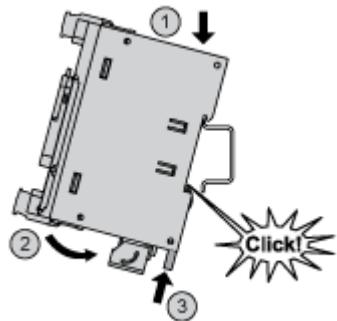
## Dimensions

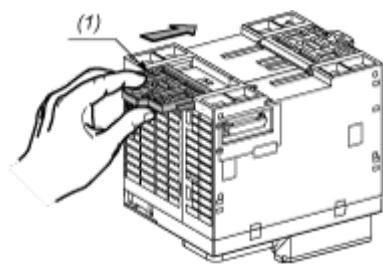


Mounting and Clearance

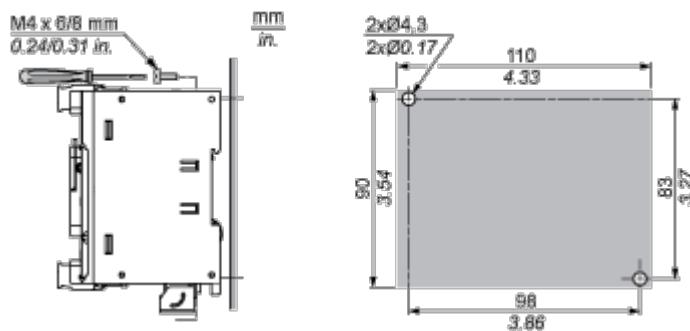
Mounting on a Rail

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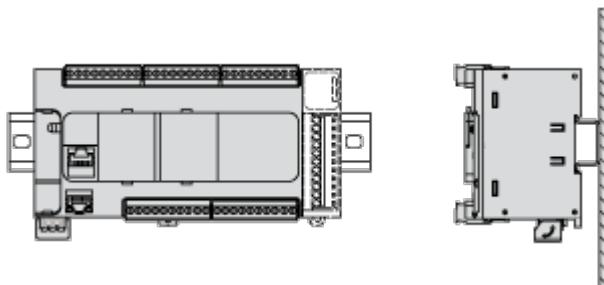
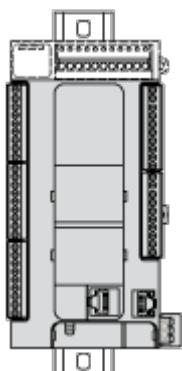
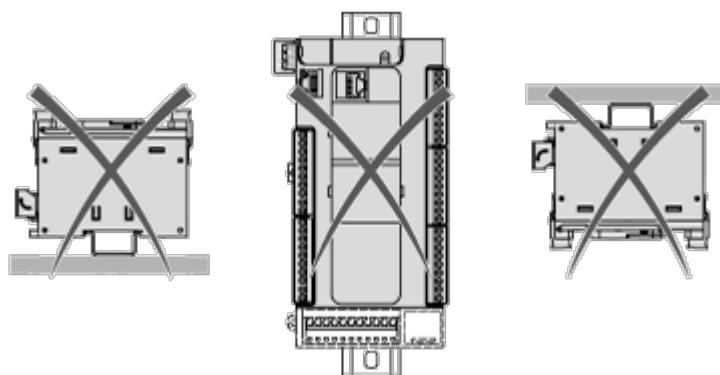


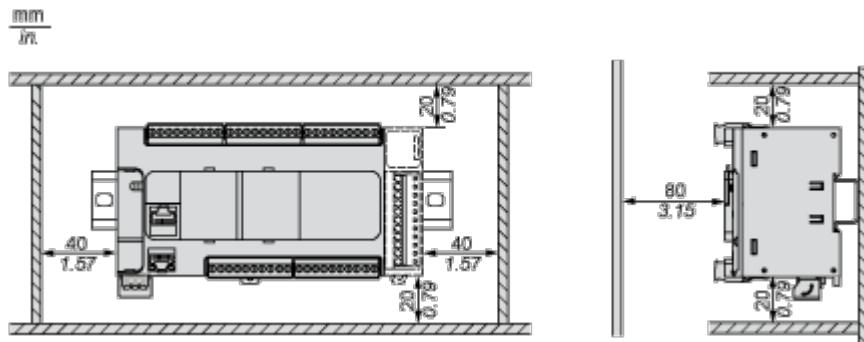
Direct Mounting on a Panel Surface

(1) Install a mounting strip

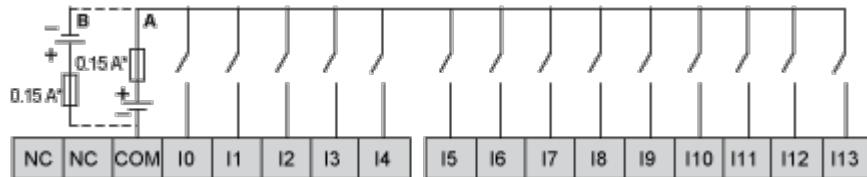
**Mounting Hole Layout**

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**Mounting****Correct Mounting Position****Acceptable Mounting Position****Incorrect Mounting Position**

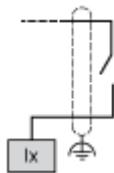
Clearance

## Connections and Schema

Digital Inputs

- (\*) Type T fuse
- (A) Sink wiring (positive logic).
- (B) Source wiring (negative logic).

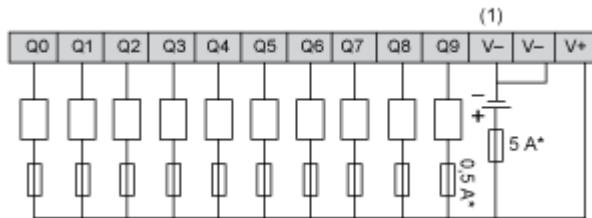
## Connection of the Fast Inputs



I0, I1, I6, I7

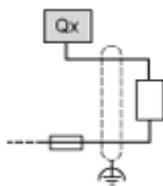
**Transistor Outputs**

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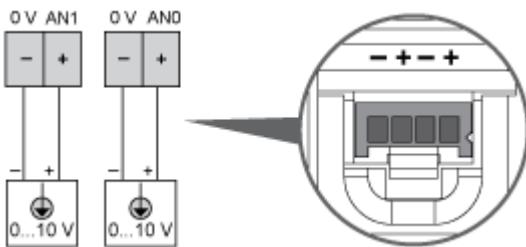
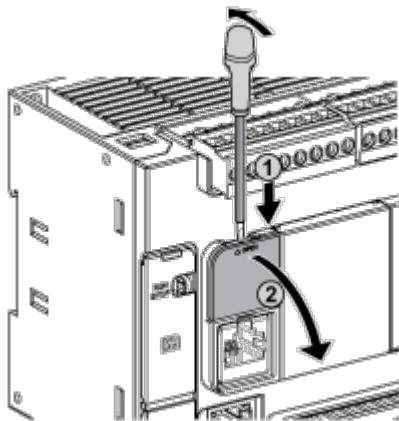


(\*) Type T fuse

(1) The V- terminals are connected internally.

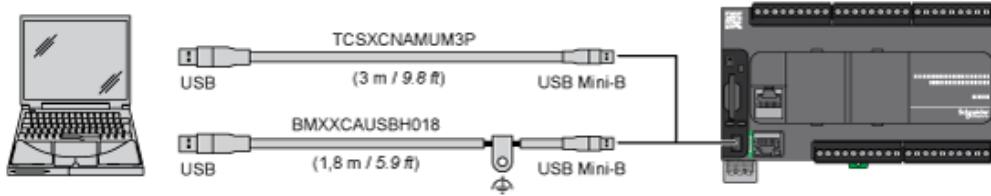
**Connection of the Fast Outputs**

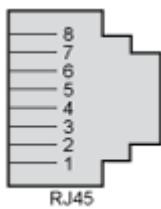
Q0, Q1

Analog Inputs

The (-) poles are connected internally.

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

USB Mini-B Connection

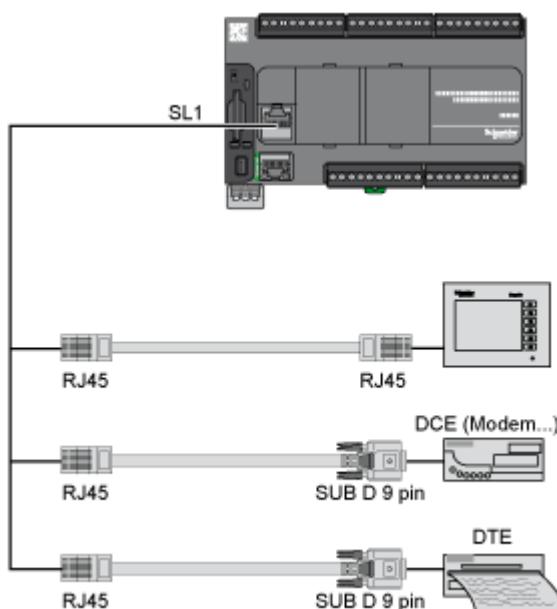
**SL1 Connection**

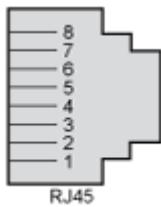
SL1

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

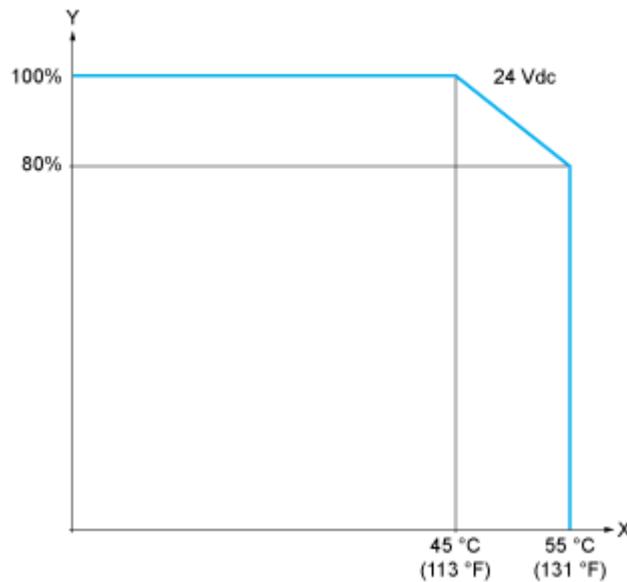
N °	RS 485
1	N.C.
2	N.C.
3	N.C.
4	D1
5	D0
6	N.C.
7	N.C.
8	Common

N.C.: not connected

## Performance Curves

Derating Curves

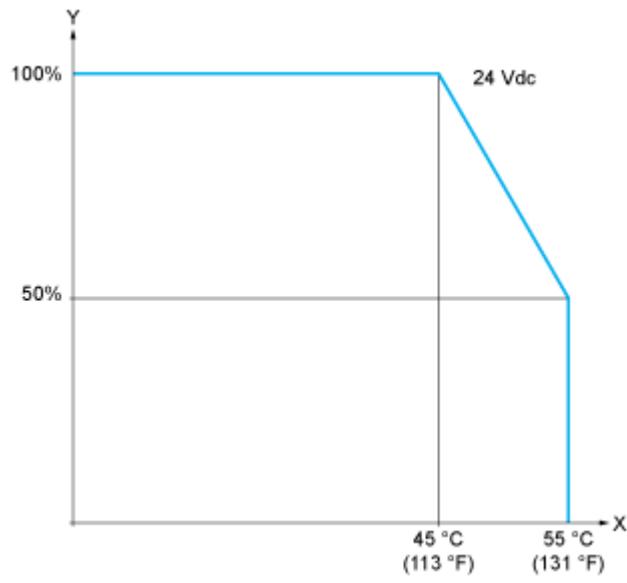
## Embedded Digital Inputs (No Cartridge)



X : Ambient temperature

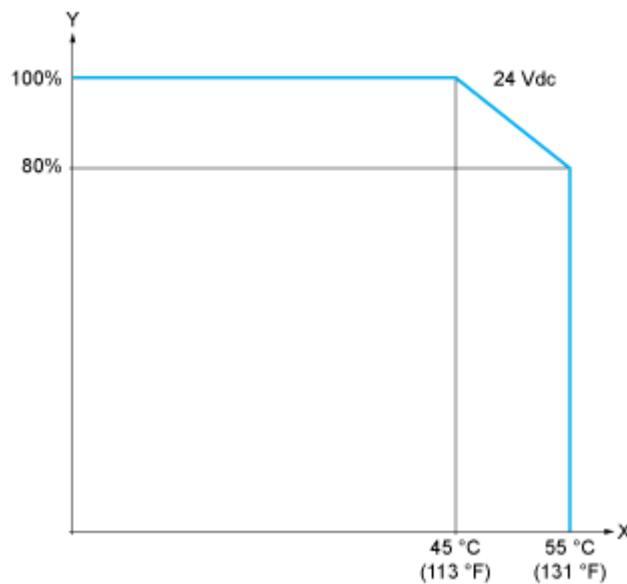
Y : Input simultaneous ON ratio

## Embedded Digital Inputs (with Cartridge)



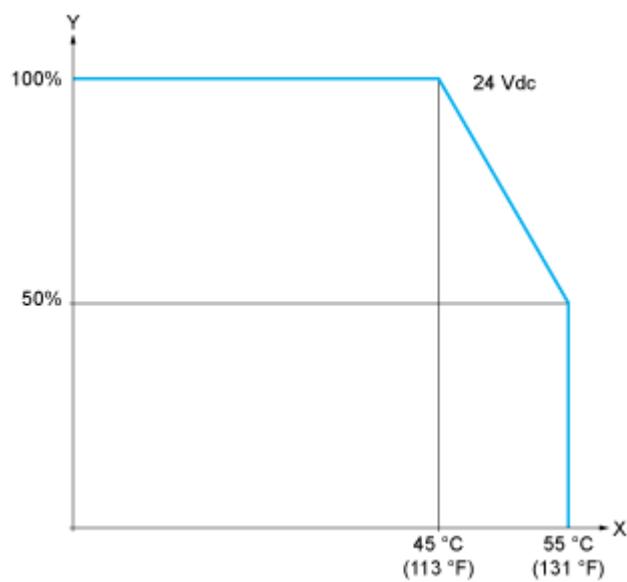
X : Ambient temperature

Y : Input simultaneous ON ratio

**Derating Curves****Embedded Digital Outputs (No Cartridge)**

X : Ambient temperature

Y : Output simultaneous ON ratio

**Embedded Digital Outputs (with Cartridge)**

X : Ambient temperature

Y : Output simultaneous ON ratio