

Modicon M580 Safety Standards and Certifications

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This document presents the Standards and Certifications for the M580 Safety range.

For any information related to functional safety refer to the *Modicon M580, Safety Manual*, and *Modicon M580, Safety System Planning Guide*.

Validity Note

This document is valid for EcoStruxure™ Control Expert 14.0 or later.

Related Documents

Title of Documentation	Reference Number
Modicon M580, Safety Manual	QGH46982 (English), QGH46983 (French), QGH46984 (German), QGH46985 (Italian), QGH46986 (Spanish), QGH46987 (Chinese)
Modicon M580, Safety System Planning Guide	QGH60283 (English), QGH60284 (French), QGH60285 (German), QGH60286 (Spanish), QGH60287 (Italian), QGH60288 (Chinese)
Modicon X80 Racks and Power Supplies, Hardware, Reference Manual	EIO0000002626 (English), EIO0000002627 (French), EIO0000002628 (German), EIO0000002630 (Italian), EIO0000002629 (Spanish), EIO0000002631 (Chinese)
Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual	33002439 (English), 33002440 (French), 33002441 (German), 33003702 (Italian), 33002442 (Spanish), 33003703 (Chinese)

You can download these technical publications and other technical information from our website at <https://www.schneider-electric.com/en/download>

Product Related Information

WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise are allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Platforms Conformity

The Modicon M580 Safety platform has been developed to comply with the principal national and international standards concerning electronic equipment for industrial automation systems.

- Compliance with European Directives for **CE** marking
 - Machinery: 2006/42/EC
 - Electromagnetic Compatibility: 2014/30/EU
- Requirements specific to programmable controllers relative to PLC standard IEC/EN 61131-2 and electrical safety standards IEC/EN/UL/CSA 61010-2-201
- Requirements specific to power utility automation systems: IEC/EN 61000-6-5, IEC/EN 61850-3
- Merchant navy requirements of the major international agencies unified in organization (International Association of Classification Societies) IACS E10 rules: BV, DNV-GL, ABS, LR, RINA, KRS, CCS
- Ex areas:
 - For USA and Canada: Hazardous location class I, division 2, groups A,B,C, and D
 - For other countries: CE ATEX (2014/34/EU) or IECEx in Zone 2 (gases) and Zone 22 (dust)
- Country specific passport:
 - RMC, EAC, KC

Certificates and Declarations

Product certificates and declarations are available for download on Schneider Electric website:

Step	Action
1	Connect to www.schneider-electric.com global website.
2	Click PRODUCTS → PLC, PAC and Dedicated Controllers .
3	Click the product range for which certificates or declarations are needed (for example Modicon M580 - ePac Controller , or Modicon X80 I/Os ...).
4	In the Documents & Downloads tab, click See More Documents . A new page with a menu on the left side appears.
5	In the left side menu, under Document Type Group category, click the type of document you are looking for (Certificate, Marine certificate, Declaration of conformity, ...). The page content is refreshed and presents the available documents for the product range. If the type of document is not visible in the left side menu, under Document Type Group category, click the + button at the right side of More options... to display more document types.
6	Select the document for download

NOTE: In case of Schneider Electric website evolution, the menu names and paths may slightly differ.

Installation General Rules

The Modicon M580 Safety platform is intended for use in a pollution degree 2 industrial environment, in over-voltage Category II applications (as defined in IEC 60664-1), at altitude up to 2000 m without derating and in low-voltage installations, where the main power branch is protected on both wires by devices such as fuses or circuit breakers limiting the current to 15 A for North America and 16 A for the rest of the world.

Modicon platforms are open-type equipment as defined in IEC 61010-2-201. Mount these modules in an enclosure that is appropriate for the specific environmental conditions. Design the installation to prevent personal injury from exposure to live parts. Use an enclosure with flame-retardant properties to prevent or minimize the spread of fire.

You can install these modules without enclosure in controlled-access offices and labs that do not exceed pollution degree 2 (control rooms with no dust-producing machines or activity). Pollution degree 2 does not account for more severe environmental conditions, like air pollution by dust, smoke, corrosive or radioactive particles, vapors or salts, attack by fungi, insects, and so on.

Operating and Storage Conditions

Characteristics

Characteristics		Modicon M580 Safety Platform
Ambient temperature ⁽¹⁾	Operation	-25...+60 °C (-13...+140 °F)
	Storage	-40...+ 85 °C (-40...+185 °F)
Relative humidity (without condensation)	Cyclical humidity	+5...+95% up to 55 °C (+131 °F)
	Continuous humidity	+5...+93% up to 55 °C (+131 °F)
Altitude	Operation	0...2000 m For greater altitude, refer to chapter <i>Altitude</i> (<i>see page 10</i>).
(1) For non-vented equipment that is mounted in a cabinet and cooled by natural air convection, the ambient temperature is the air temperature at a point not more than 50 mm and not less than 25 mm away from the equipment, on a horizontal plane located at the vertical mid-point below the equipment.		

Altitude

These modules are designed to operate with full characteristics (current, power) at altitudes up to 2000 m.

The Control Expert software defines the maximum number of modules that you can use with a single power supply at those altitudes. For more detailed information, refer to chapter *Power Consumption Breakdown* (see *Modicon X80, Racks and Power Supplies, Hardware Reference Manual*).

An additional derating applies to modules that operate above 2000 m altitude:

- On the maximum ambient temperature or on the maximum power consumption
- On the dielectric strength

These deratings compensate for the reduced capacity of heat transfer that owes to the relatively lower air density, pressure, and temperature at higher altitudes.

Depending on the maximum operating ambient temperature of the equipment, you can decide:

- Either to maintain the output capabilities of the modules and reduce the maximum ambient temperature or;
- Reduce the output capabilities of the modules that allows to keep the maximum ambient temperature.

Conservation of Outputs Capabilities

The module characteristics such as current and power remain unchanged if the maximum ambient temperature does not exceed these values:

Altitude	Maximum operating ambient temperature
0...2000 m	+60 °C (+140 °F)
3000 m	+54 °C (+129.2 °F)
4000 m	+48 °C (+118.4 °F)
5000 m	+42 °C (+107.6 °F)
NOTE: Values for intermediate altitudes may be derived by linear interpolation.	

NOTE: This solution is suitable for power supplies, and modules that have only internal dissipation such as CPUs, communication modules, and so on.

Conservation of Maximum Ambient Temperature

The modules can be installed at maximum ambient temperature +60 °C (140 °F) if the usable output power and current are reduced:

Altitude	Usable output power	Usable output current
0...2000 m	P_{2000m}	I_{2000m}
<p>P_{2000m}: This is the maximum available power of a power supply on 3V3_BAC, 24V_BAC, or 24V_SENSORS at 2000 m.</p> <p>I_{2000m}: This is the output current.</p> <p>NOTE: Values for intermediate altitudes may be derived by linear interpolation.</p>		

Altitude	Usable output power	Usable output current
3000 m	$P_{2000m} \times 0.9$	$I_{2000m} \times 0.95$
4000 m	$P_{2000m} \times 0.8$	$I_{2000m} \times 0.89$
5000 m	$P_{2000m} \times 0.7$	$I_{2000m} \times 0.84$
<p>P_{2000m}: This is the maximum available power of a power supply on 3V3_BAC, 24V_BAC, or 24V_SENSORS at 2000 m. I_{2000m}: This is the output current. NOTE: Values for intermediate altitudes may be derived by linear interpolation.</p>		

After determining the maximum usable current delivered by the power supply with the above deratings, check with Control Expert that the consumption of the modules into the rack is compatible with the new calculated values.

NOTE: For digital output modules, apply the calculated derating to the output current capabilities and adapt the corresponding loads.

Reduced Dielectric Strength

An increase in altitude reduces the dielectric strength characteristics. This table shows the degradation of isolation at specific altitudes:

Altitude	Dielectric strength loss
0...2000 m	$Dielec_{2000m} =$ Values given in module characteristics
3000 m	$Dielec_{2000m} - 150$ V
4000 m	$Dielec_{2000m} - 300$ V
5000 m	$Dielec_{2000m} - 450$ V
NOTE : Values for intermediate altitudes may be derived by linear interpolation.	

We highly recommend that you select the double-isolation BMXCPS4002S module as the main power supply 230 Vac.

Environment Test Compliance Levels

Overview

Standards and levels are provided for these tests:

- Immunity to low frequency interference (*see page 13*) (CE)
- Immunity to high frequency interference (*see page 14*) (CE)
- Electromagnetic emissions (*see page 15*) (CE)
- Immunity to climatic variations (Power ON) (*see page 16*)
- Withstand to climatic variations (Power OFF) (*see page 17*)

- Immunity to mechanical constraints (Power ON) (*see page 17*)
- Withstand to mechanical constraints (Power ON) (*see page 18*)
- Equipment and personnel safety (*see page 18*) (CE)

NOTE: The tests with (CE) marking are required by European directives and based on IEC/EN 61131-2 standards.

Immunity to Low Frequency Interference (CE) Tests

NOTE: Install, wire, and maintain the devices in accordance with the instructions in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Voltage and frequency variations	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-11	0.85...1.10 Un –0.94...1.04 Fn; 4 steps t = 30 min
	IACS E10; IEC 61000-4-11	0.80 Un...0.90 Fn; 1.20 Un...1.10 Fn; t = 1.5 s/5 s
Direct voltage variations	IEC/EN 61131-2; IEC 61000-4-29; IACS E10 (PLC not connected to charging battery)	0.85...1.2 Un + ripple: 5% peak; 2 steps t = 30 min
Third harmonic	IEC/EN 61131-2	H3 (10% Un), 0°/180°; 2 steps t = 5 min
Immunity to conducted low frequency (only IACS)	IACS E10	For AC: <ul style="list-style-type: none"> ● H2...H15 (10% Un), ● H15...H100 (10%...1% Un), ● H100...H200 (1% Un) For DC: <ul style="list-style-type: none"> ● H100...H200 (1% Un)
Voltage interruptions	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-11; IEC 61000-4-29; IACS E10 For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	Power supply immunity: <ul style="list-style-type: none"> ● 10 ms for AC and DC PS2 (20 ms DS criteria) ● Check operating mode for longer interruptions up to 5 s, 85% Un For IACS, 3 times 30 s in 5 mn, 85% Un
	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-11	For AC PS2: <ul style="list-style-type: none"> ● 20% Un, t0: ½ period ● 40% Un, cycle: 10/12 ● 70% Un, cycle: 25/30 ● 0% Un, cycle: 250/300
Where: PS1 applies to PLC supplied by battery PS2 applies to PLC energized from AC or DC supplies Un nominal voltage Fn nominal frequency Udl detection level when powered		

Name of test	Standards	Levels
Voltage shut-down and start-up	IEC/EN 61131-2	<ul style="list-style-type: none"> • $U_n \dots 0 \dots U_n$; $t = U_n/60$ s • $U_{min} \dots 0 \dots U_{min}$; $t = U_{min}/5$ s • $U_{min} \dots 0.9 U_{dl} \dots U_{min}$; $t = U_{min}/60$ s
Magnetic field	IEC/EN 61131-2; IEC 61000-4-8 (for MV power stations: IEC 61000-6-5; IEC 61850-3) For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	Power frequency: 50/60 Hz, 100 A/m continuous...1000 A/m; $t = 3$ s; 3 axes
	IEC 61000-4-10	Oscillatory: 100 kHz...1 MHz, 100 A/m; $t = 9$ s; 3 axes
Conducted common mode disturbances range 0 Hz...150 kHz	IEC 61000-4-16 (for MV power stations: IEC 61000-6-5; IEC 61850-3) For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	For AC: 10 V For DC: 10 V cont. or 100 V, $t = 1$ s
<p>Where:</p> <p>PS1 applies to PLC supplied by battery</p> <p>PS2 applies to PLC energized from AC or DC supplies</p> <p>U_n nominal voltage</p> <p>F_n nominal frequency</p> <p>U_{dl} detection level when powered</p>		

Immunity to High Frequency Interference (CE) Tests

NOTE: These tests are performed without an enclosure and with devices fixed on a metal grid and wired as per the recommendations in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Electrostatic discharges	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-2; IACS E10 For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	6 kV contact; 8 kV air; 6 kV indirect contact
Radiated radio frequency electromagnetic field	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-3; IACS E10 For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	80 MHz...1 GHz: 10/15 V/m (20 V/m DS criteria) 1.4 GHz...2 GHz: 3 V/m (10 V/m DS criteria) 2 GHz...6 GHz: 3 V/m Sinus amplitude modulated 80%, 1 kHz + internal clock frequencies

Name of test	Standards	Levels
Electrical fast transient bursts	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-4; IACS E10 For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	For AC or DC main supplies: <ul style="list-style-type: none"> ● 2 kV in common mode/2 kV in wire mode For AC or DC auxiliary supplies, AC unshielded I/O: <ul style="list-style-type: none"> ● 2 kV in common mode For analog, DC unshielded I/O, communication and shielded lines: <ul style="list-style-type: none"> ● 1 kV in common mode
Surge	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-5; IACS E10 For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	For AC or DC main and auxiliary supplies, AC unshielded I/O: <ul style="list-style-type: none"> ● 2 kV in common mode/1 kV in differential mode (4 kV DS criteria with external protection) For analog, DC unshielded I/O: <ul style="list-style-type: none"> ● 2 kV in common mode/2 kV in differential mode For communication and shielded lines: <ul style="list-style-type: none"> ● 1 kV in common mode (3 kV DS criteria)
Conducted disturbances induced by radiated electromagnetic fields	IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-6; IACS E10 For functional safety (DS criteria): IEC 61000-6-7; IEC 61326-3-1	10 V; 0.15 MHz...80 MHz (20 V DS criteria) Sinus amplitude 80%, 1 kHz + spot frequencies
Damped oscillatory wave	IEC/EN 61131-2; IEC 61000-4-18; IACS E10	For AC or DC main supplies and AC auxiliary supplies, AC unshielded I/O: <ul style="list-style-type: none"> ● 2.5 kV in common mode/1 kV in differential mode For DC auxiliary supplies, analog, DC unshielded I/O: <ul style="list-style-type: none"> ● 1 kV in common mode/0.5 kV in differential mode For communication and shielded lines: <ul style="list-style-type: none"> ● 0.5 kV in common mode

Electromagnetic Emissions (CE) Tests

NOTE: Install, wire, and maintain the devices in accordance with the instructions in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Conducted emission	IEC/EN 61131-2; IEC/EN 61000-6-4; CISPR 11 and 22, Class A, Group 1 (FCC part 15 compliance)	150...500 kHz: quasi-peak 79 dB (μV/m); average 66 dB (μV/m) 500 kHz...30 MHz: quasi-peak 73 dB (μV/m); average 60 dB (μV/m)
	IACS E10	<ul style="list-style-type: none"> AC or DC power (general power distribution zone): 10 kHz...150 kHz: quasi-peak 120...69 dB (μV/m); 150 kHz...0.5 MHz: quasi-peak 79 dB (μV/m) 0.5...30 MHz: quasi-peak 73 dB (μV/m) AC or DC power (bridge and deck zone for evaluation): 10 kHz...150 kHz: quasi-peak 96...50 dB (μV/m) 150 kHz...0.35 MHz: quasi-peak 60...50 dB (μV/m) 0.35...30 MHz: quasi-peak 50 dB (μV/m)
Radiated emission	IEC/EN 61131-2; IEC/EN 61000-6-4; CISPR 11 and 22, Class A, Group 1 (FCC part 15 compliance)	30 MHz...230 MHz: quasi-peak 40 dB (μV/m) (at 10 m); 230 MHz...1 GHz: quasi-peak 47 dB (μV/m) (at 10 m); 1...3 GHz: quasi-peak 76 dB (μV/m) (at 3 m); 3...6 GHz: quasi-peak 80 dB (μV/m) (at 3 m);
	IACS E10	For general power distribution zone: <ul style="list-style-type: none"> 0.15 MHz ... 30 MHz: quasi-peak 80...50 dB (μV/m) (at 3 m) 30...100 MHz: quasi-peak 60...54 dB (μV/m) (at 3 m) 100 MHz...2 GHz: quasi-peak 54 dB (μV/m) (at 3 m) 156...165 MHz: quasi-peak 24 dB (μV/m) (at 3 m)

Immunity to Climatic Variations (Power ON) Tests

NOTE: Install, wire, and maintain the devices in accordance with the instructions in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Dry heat	IEC 60068-2-2 (Bb and Bd)	60 °C (+140 °F), t = 16 hrs
	IACS E10	60 °C (+140 °F), t = 16 hrs +70 °C (+158 °F), t = 2 hrs

Name of test	Standards	Levels
Cold	IEC 60068-2-1 (Ab and Ad); IACS E10	-25...0 °C (-13...32 °F), t = 16 hrs + power on at -25 °C
Damp heat, steady state (continuous humidity)	IEC 60068-2-78 (Cab); IACS E10	55 °C (+131 °F), 93% relative humidity, t = 96 hrs (for ruggedized range: 60 °C (+140 °F))
Damp heat, cyclic (cyclical humidity)	IEC 60068-2-30 (Db); IACS E10	25...55 °C (77...131 °F), 93...95% relative humidity, 2 cycles t = 12 hrs + 12 hrs
Change of temperature	IEC 60068-2-14 (Nb)	0 ...60 °C (32...140 °F), 5 cycles t = 6 hrs + 6 hrs (for ruggedized range: -25...70 °C (77...158 °F))

Withstand to Climatic Variations (Power OFF) Tests

NOTE: The devices must be installed, wired and maintained in accordance with the instructions provided in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Dry heat	IEC/EN 61131-2; IEC 60068-2-2 (Bb and Bd); IEC/EN 60945	85 °C (185 °F), t = 96 hrs
Cold	IEC/EN 61131-2; IEC 60068-2-1 (Ab and Ad); IACS E10	-40 °C (-40 °F), t = 96 hrs
Damp heat, cyclic (cyclical humidity)	IEC/EN 61131-2; IEC 60068-2-30 (Db)	25...55 °C (77...131 °F), 93...95% relative humidity, 2 cycles t = 12 hrs + 12 hrs
Change of temperature (thermal shocks)	IEC/EN 61131-2; IEC 60068-2-14 (Na)	-40...85 °C (-40...185 °F), 5 cycles t = 3 hrs + 3 hrs

Immunity to Mechanical Constraints (Power ON) Tests

NOTE: Install, wire, and maintain the devices in accordance with the instructions in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Sinusoidal vibrations	IEC/EN 61131-2; IEC 60068-2-6 (Fc)	Basic IEC/EN 61131-2: <ul style="list-style-type: none"> 5...150 Hz, ± 3.5 mm amplitude (5...8.4 Hz), 1 g (8.4...150 Hz) Enhanced profile: <ul style="list-style-type: none"> 5...150 Hz, ± 10.4 mm amplitude (5...8.4 Hz), 3 g (8.4...150 Hz) For basic and specific: endurance: <ul style="list-style-type: none"> 10 sweep cycles for each axis
	IEC 60870-2-2; IEC 60068-2-6 (Class Cm) (for telecontrol equipment and system)	3...8.4 Hz, 7 mm amplitude, 8.4...500 Hz, 2 g Endurance: 10 sweep cycles for each axis
	IACS E10	3...100 Hz, 1 mm amplitude (3...13.2 Hz), 0.7 g (13.2 ...100 Hz) Endurance at each resonance frequency: 90 min for each axis, amplification coefficient < 10
	IEC 60068-2-6	Sismic analysis: 3...35 Hz, 22.5 mm amplitude (3...8.1 Hz), 6 g (8.1...35 Hz)
Shocks	IEC/EN 61131-2; IEC 60068-2-27 (Ea)	15 g, 11 ms; 3 shocks/direction/axis
Free fall during operation	IEC/EN 61131-2; IEC 60068-2-32 (Ed Method 1)	1 m (3.28 ft), 2 falls

Withstand to Mechanical Constraints (Power OFF) Tests

Name of test	Standards	Levels
Random free fall with packaging	IEC/EN 61131-2; IEC 60068-2-32 (Method 1)	1 m (3.28 ft), 5 falls
Flat free fall	IEC/EN 61131-2; IEC 60068-2-32 (Ed Method 1)	10 cm (0.33 ft), 2 falls
Controlled free fall	IEC/EN 61131-2; IEC 60068-2-31 (Ec)	30° or 10 cm (0.33 ft), 2 falls
Plugging/Unplugging	IEC/EN 61131-2	For modules and connectors: Operations: 50 for permanent connections, 500 for non-permanent connections

Equipment and Personnel Safety Tests

NOTE: Install, wire, and maintain the devices in accordance with the instructions in the *Grounding and Electromagnetic Compatibility of PLC Systems, Basic Principles and Measures, User Manual*.

Name of test	Standards	Levels
Dielectric strength and insulation resistance	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	Dielectric: Min. $2 U_n + 1000 \text{ Vac}$ (see details in <i>Modicon M580, Safety System Planning Guide</i>); $t = 1 \text{ min}$ Insulation: $U_n \leq 50 \text{ V}$: $10 \text{ M}\Omega$, $50 \text{ V} \leq U_n \leq 250 \text{ V}$: $100 \text{ M}\Omega$
Continuity of earth	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	30 A , $R \leq 0,1 \Omega$; $t = 2 \text{ min}$
Leakage current	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	$< 0.5 \text{ mA}$ in normal condition $< 3.5 \text{ mA}$ in single fault condition
Protection offered by enclosures	IEC/EN 61131-2; IEC61010-2-201;	IP20 and protection against standardized pins
Overload	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	50 cycles, U_n , $1.5 I_n$; $t = 1 \text{ s ON} + 9 \text{ s OFF}$
Endurance	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	I_n , U_n ; 6000 cycles, $1 \text{ s ON} + 9 \text{ s OFF}$
Temperature rise	IEC/EN 61131-2; UL; CSA; ATEX; IECEx	Ambient temperature $60 \text{ }^\circ\text{C}$ ($140 \text{ }^\circ\text{F}$)