

Modicon M580, M340 and X80 I/O Platforms

Standards and Certifications

Original instructions

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Safety Information

Important Information

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

Document Scope

This document presents the Standards and Certifications for the Modicon M580, M340, and X80 I/O ranges.

NOTE: The present document does not apply to the M580 safety-related range.

Validity Note

The characteristics that are described in the present document, as well as those described in the documents included in the Related Documents section below, can be found online. To access the information online, go to the Schneider Electric home page www.se.com/ww/en/download/

The characteristics that are described in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Related Documents

Title of documentation	Reference number
General Safety Instructions	EIO0000003905 (eng)
	EIO0000003906 (fre)
	EIO0000003907 (ger)
	EIO0000003908 (ita)
	EIO0000003909 (spa)
	EIO0000003910 (chs)
Electrical installation guide	EIGED306001EN (eng)

Platforms Conformity

The Modicon M580, M340, and X80 I/O platforms have been developed to comply with the principal national and international standards concerning electronic equipment for industrial automation systems.

Visit www.se.com for the latest Declarations of Conformity (DoC) and certifications.

Compliances for each product shall be verified in Declarations of Conformity (DoC) and certifications published on www.se.com.

The compliance and certification strategy of the Modicon M580, M340, and X80 I/O platforms is continuously adapted to the needs of the markets and domains listed below.

- Compliance with European Directives for CE marking
 - WEEE: *2012/19/EU*
 - Low Voltage: *2014/35/EU*
 - ElectroMagnetic Compatibility (EMC): *2014/30/EU*
 - ATEX: *2014/34/EU* (for ATEX modules)
- Requirements specific to programmable controllers relative to controller standard
 - *IEC/EN 61131-2*
 - Electrical safety standards *IEC/EN/UL/CSA 61010-2-201*
- Country specific passport:
 - UKCA
 - RCM
 - EAC

- Specific market:
 - Power generation: IEC/EN 61000-6-5 for interfaces type 1 and 2, IEC 61850-3 for locations G
 - Merchant navy requirements of the major international agencies unified in organization *IACS E10* rules: BV, DNV, ABS, LR, RINA, KRS, CCS
 - Railway applications:
 - Rolling stock: EN 45545-2, IEC 60332–2–24; EN 50155, IEC 60571; EN 50121-3-2, IEC 62236-3-2
 - Fire protection on railway vehicles: EN 45545-2
 - Signaling and telecommunication apparatus: EN 50121-4, IEC 62236-4
 - Fixed power supply installations and apparatus: EN 50121-5, IEC 62236-5

NOTE: To be compliant to railway market for rolling stock applications, a 24 Vdc process power supply compliant to EN 50155 has to be used.
Controllers must be installed in a metallic enclosure and are suitable for installation with body mounted profiles (category 1, class B).
 - Hazardous areas:
 - For USA and Canada: Hazardous location for use in class I, division 2, groups A, B,C, and D
 - For European Union: ATEX for atmosphere Zone 2 (gas) and Zone 22 (dust)
 - For United Kingdom: UKEX for atmosphere Zone 2 (gas) and Zone 22 (dust)
 - For other countries: IECEx for atmosphere Zone 2 (gas) and/or Zone 22 (dust)

NOTE: Refer to the supplied "ATEX IECEx instruction sheet" for important additional instructions concerning CE ATEX or IECEx equipment.

Certificates and Declarations

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

NOTE: Depending on the country and language selected, the menu names and paths may differ.

Step	Action
1	Go to the www.se.com global website.
2	Click PRODUCTS , and then select your country.
3	Select Industrial Automation and Control > PLC, PAC and Dedicated Controllers .
4	Click the product range for which certificates or declarations are needed (for example, Modicon M580 - ePac Controller , or Modicon X80 I/Os).
5	Click the Documents tab. Result: A new page with a menu on the left side appears.
6	On the left-side menu, under Document Category , click Conformity Assessments . Result: The page content is refreshed and presents the available documents for the product range. NOTE: If the type of document is not visible in the left side menu, under Document Category , click View more to display more document types.
7	Click the name of the document you want to download.

Installation General Rules

M580, M340, and X80 I/O platforms are intended for use in a pollution degree 2 industrial environment, in over-voltage Category II applications (as defined in IEC 61010-2-201), at altitudes up to 2000 m (6562 ft) 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.

NOTE: Install, wire, and maintain the devices in accordance with the instructions in the *Electrical installation guide*.

Operating and Storage Conditions

Characteristics

Characteristics		Standard module	Ruggedized module	
			Coated module	Hardened module
Ambient temperature ⁽¹⁾	Operation	0...60 °C (32...140 °F)	depending on the module reference: <ul style="list-style-type: none"> 0...60 °C (32...140 °F) -25...60 °C (-13...140 °F) 	-25...70 °C (-13...158 °F)
	Storage	-40... 85 °C (-40...185 °F)	-40... 85 °C (-40...185 °F)	-40... 85 °C (-40...185 °F)
Relative humidity (without condensation)	Cyclical humidity	5...95% up to 55 °C (131 °F)	5...95% up to 55 °C (131 °F)	5...95% up to 55 °C (131 °F)
	Continuous humidity	5...93% up to 55 °C (131 °F)	5...93% up to 55 °C (131 °F)	5...93% up to 60 °C (140 °F)
Altitude	Operation	0...2000 m (0...6562 ft) For higher altitude, refer to section <i>Altitude</i> , page 11.		
<p>(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 (1.97 in) and not less than 25 mm (0.98 in) away from the equipment, on a horizontal plane located at the vertical mid-point below the equipment.</p>				

Altitude

These modules are designed to operate with full characteristics (current, power) at altitudes up to 2000 m (6562 ft).

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 section *Power Consumption Breakdown* (see Modicon X80, Racks and Power Supplies, Hardware Reference Manual).

An additional derating applies to modules that operate above 2000 m (6562 ft) 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 is due to the relatively lower air density, pressure, and temperature at higher altitudes.

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

- Maintain the output capabilities of the modules and reduce the maximum ambient temperature, or
- Reduce the output capabilities of the modules that allow them to maintain 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		
	Standard module	Ruggedized module	
		Coated module	Hardened module
0...2000 m (0...6562 ft)	60 °C (140 °F)	60 °C (140 °F)	70 °C (158 °F)
> 2000 m (6562 ft)	54 °C (129.2 °F)	54 °C (129.2 °F)	63 °C (145.4 °F)
> 3000 m (9843 ft)	48 °C (118.4 °F)	48 °C (118.4 °F)	56 °C (132.8 °F)
> 4000 m (13123 ft) to maximum 5000 m (16404 ft)	42 °C (107.6 °F)	42 °C (107.6 °F)	49 °C (120.2 °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 controllers, communication modules, and so on.

Conservation of Maximum Ambient Temperature

The modules can be installed at maximum ambient temperature of 60 °C / 70 °C (140 °F / 158 °F) if the usable output power and current are reduced:

Altitude	Usable output power	Usable output current
0...2000 m (0...6562 ft)	$P_{2000\text{ m (6562 ft)}}$	$I_{2000\text{ m (6562 ft)}}$
> 2000 m (6562 ft)	$P_{2000\text{ m (6562 ft)}} \times 0.9$	$I_{2000\text{ m (6562 ft)}} \times 0.95$
> 3000 m (9843 ft)	$P_{2000\text{ m (6562 ft)}} \times 0.8$	$I_{2000\text{ m (6562 ft)}} \times 0.89$

Altitude	Usable output power	Usable output current
> 4000 m (13123 ft) to maximum 5000 m (16404 ft)	$P_{2000\text{ m (6562 ft)}} \times 0.7$	$I_{2000\text{ m (6562 ft)}} \times 0.84$
<p>$P_{2000\text{ m (6562 ft)}}$: This is the maximum available power of a power supply on 3V3_BAC, 24V_BAC, or 24V_SENSORS at 2000 m (6562 ft).</p> <p>$I_{2000\text{ m (6562 ft)}}$: This is the output current.</p> <p>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, validate, in 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 (0...6562 ft)	$\text{Dielec}_{2000\text{ m (6562 ft)}} = \text{Values given in module characteristics}$
> 2000 m (6562 ft)	$\text{Dielec}_{2000\text{ m (6562 ft)}} - 150\text{ V}$
> 3000 m (9843 ft)	$\text{Dielec}_{2000\text{ m (6562 ft)}} - 300\text{ V}$
> 4000 m (13123 ft) to maximum 5000 m (16404 ft)	$\text{Dielec}_{2000\text{ m (6562 ft)}} - 450\text{ V}$
<p>NOTE: Values for intermediate altitudes may be derived by linear interpolation.</p>	

Select the double-isolation BMXCPS4002 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, page 14
- Immunity to high frequency interference, page 16
- Electromagnetic emissions, page 21
- Immunity to climatic variations (Power ON), page 22
- Withstand to climatic variations (Power OFF), page 22
- Immunity to mechanical constraints (Power ON), page 23
- Withstand to mechanical constraints (Power ON), page 23
- Equipment and personnel safety, page 24

Immunity to Low Frequency Interference Tests

Name of test	Standards	Levels
Voltage and frequency variation	Industry 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
	Merchant Navy IACS E10	0.80 Un...0.90 Fn; 1.20 Un...1.10 Fn; t = 1.5 s / 5 s
Direct voltage variation	Industry IEC/EN 61131-2; IEC 61000-4-29	0.85...1.2 Un + ripple: 5% peak; 2 steps t = 30 min
	Merchant Navy IACS E10 (controller connected to DC supply)	0.85...1.2 Un + ripple: 5% peak; 2 steps t = 30 min
	Merchant Navy IACS E10 (controller not connected to charging battery)	0.75...1.2 Un + ripple: 0%; 2 steps t = 15 min
Third harmonics	Industry IEC/EN 61131-2	H3 (10% Un), 0° / 180°; 2 steps t = 5 min

Name of test	Standards	Levels
Immunity to conducted low frequency	Merchant Navy IACS E10	For AC: H2...H15 (10% Un), H15...H100 (10%...1% Un), H100...H200 (1% Un) For DC: H100...H200 (10% Un)
Voltage interruptions and dips	Industry IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-11; IEC 61000-4-29	Short interruptions: 10 ms for AC or DC PS2 , 85% Un 1 ms for DC PS1, 85% Un
	Railway EN 50155; IEC 60571	Un to 0.6*Un ; t = 100 ms Supply dips and change over Class C1 Un to 0: Interruption of supply Class S1, S2, S3 and Supply change over Class C2 Class S1; [normal operation] Class S2; t = 10 ms; Class S3; t = 20 ms; Class C2; t = 30 ms
	Industry IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-11; IEC 61000-4-29	Longer interruptions: Check operating mode (no erratic behavior) up to 5 s , 85% Un for IACS, 3 times 30 s in 5 min, 85% Un
	Merchant Navy IACS E10	Longer interruptions: Check operating mode (no erratic behavior) up to 5 s , 85% Un for IACS, 3 times 30 s in 5 min, 85% Un
	Industry IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-11	Dips: For AC PS2 only 0% Un, t0: 1/2 period 40% Un, cycle: 10/12 70% Un, cycle: 25/30 0% Un, cycle: 250/300
Voltage shut-down and start-up	Industry IEC/EN 61131-2	Un...0...Un; t = Un / 60 s Umin...0...Umin; t = Umin / 5 s Umin...0.9 Udl...Umin; t = Umin / 60 s

Name of test	Standards	Levels
Conducted common mode disturbances range 0 Hz...150 kHz	Industry IEC 61000-6-5; IEC 61850-3; IEC 61000-4-16	For remote systems: 50/60 Hz and DC, 300 V, t = 1 s 50/60 Hz and DC, 30 V, t = 1 min 5 Hz...150 kHz, sweep 3...30 V
<p>Where:</p> <p>PS1: applies to controller supplied by battery</p> <p>PS2: applies to controller energized from AC or DC supplies</p> <p>Un: nominal voltage</p> <p>Fn: nominal frequency</p> <p>Udl: detection level when powered</p>		

Immunity to High Frequency Interference Tests

Name of test	Standards	Levels
Electrostatic discharges	Industry IEC/EN 61131-2 (zone B and C); IEC/EN 61000-6-2; IEC 61000-4-2	4 kV contact; 8 kV air; 4 kV indirect contact
	Merchant Navy IACS E10	6 kV contact; 8 kV air; 6 kV indirect contact
	Power Station and Substation IEC 61000-6-5; IEC 61850-3; IEC 61000-4-2	6 kV contact; 8 kV air; 6 kV indirect contact
	Railway EN 50155; EN 50121-3-2; EN 50121-4; EN 50121-5; IEC 60571; IEC 62236-3-2; IEC 62236-4; IEC 62236-5	6 kV contact; 8 kV air; 6 kV indirect contact
Radio frequency electromagnetic field	Industry IEC/EN 61131-2 (zone B); IEC/EN 61000-6-2; IEC 61000-4-3	10 V/m, 80 MHz...1 GHz; 3 V/m, 1.4...6 GHz Sinus amplitude modulated 80%, 1 kHz + internal clock frequencies

Name of test	Standards	Levels
	Merchant Navy IACS E10	10 V/m, 80 MHz...6 GHz Sinus amplitude modulated 80%, 1 kHz + internal clock frequencies
	Power Station and Substation IEC 61000-6-5; IEC 61850-3; IEC 61000-4-2	10 V/m, 80 MHz...1 GHz; 3 V/m, 1...2.7 GHz; 1 V/m, 2.7...6 GHz Sinus amplitude modulated 80%, 1 kHz + internal clock frequencies
	Railway Rolling Stock EN 50155; EN 50121-3-2; IEC 60571; IEC 62236-3-2	20 V/m, 80 MHz...0.8 GHz; 20 V/m, 0.8...1 GHz; 10 V/m 1.4...2 GHz; 5 V/m, 2...2.7 GHz; 3 V/m, 5.1...6 GHz Sinus amplitude modulated 80%, 1 kHz
	Railway Stationary EN 50121-4; EN 50121-5; IEC 62236-3-2; IEC 62236-4; IEC 62236-5	10 V/m, 80 MHz...0.8 GHz; 20 V/m, 0.8...1 GHz; 10 V/m 1.4...2 GHz; 5 V/m, 2...2.7 GHz; 3 V/m, 5.1...6 GHz Sinus amplitude modulated 80%, 1 kHz
Electrical fast transient bursts	Industry IEC/EN 61131-2; IEC/EN 61000-6-2; IEC 61000-4-4	For AC and DC main supplies: 2 kV in common mode / 2 kV in differential mode For AC and DC auxiliary supplies, AC unshielded I/Os: 2 kV in common mode For unshielded analog and DC I/Os, communication and all shielded lines: 1 kV in common mode
	Merchant Navy IACS E10	For AC and DC main supplies: 2 kV in common mode / 2 kV in differential mode For AC and DC auxiliary supplies, AC unshielded I/Os: 2 kV in common mode For unshielded analog and DC I/Os, communication and all shielded lines: 1 kV in common mode
	Power Station and Substation IEC 61000-6-5; IEC 61850-3; IEC 61000-4-4	For AC and DC supplies: 2 kV in common mode / 2 kV in differential mode (type 2) 4 kV in common mode / 4 kV in differential mode (type 3) For unshielded/shielded AC, DC I/Os, communication:

Name of test	Standards	Levels
		1 kV in common mode (type 2) 2 kV in common mode (type 3)
	Railway Rolling Stock EN 50155; EN 50121-3-2; IEC 60571; IEC 62236-3-2	For I/Os and communication lines: 2 kV in common mode For AC and DC power supplies: 2 kV in common mode for power ports
	Railway Stationary (signaling and telecommunication) EN 50121-4; IEC 62236-4	For I/Os and communication lines: 2 kV in common mode For AC and DC power supplies: 2 kV in common mode for power ports 1 kV in common mode for earth ports
	Railway (fixed installation power supply) EN 50121-5; IEC 62236-5	For ports for process, measurement and control lines and long bus 2 kV in common mode For AC and DC power supplies: 4 kV in common mode for power ports 1 kV in common mode for earth ports
Surge	Industry IEC/EN 61131-2 (zone B); IEC/EN 61000-6-2; IEC 61000-4-5	For AC main and AC auxiliary supplies: 2 kV in common mode / 1 kV in differential mode For DC main and DC auxiliary supplies: 1 kV in common mode / 1 kV in differential mode For analog, digital unshielded I/Os: 1 kV in common mode (I/O < 48V) 2 kV in common mode / 1 kV in differential mode For communication and all shielded lines: 1 kV in common mode
	Merchant Navy IACS E10	For AC or DC main supplies 1 kV in common mode / 0.5 kV in differential mode
	Power Station and Substation IEC 61000-6-5; IEC 61850-3;	For AC or DC main and AC or DC auxiliary supplies 2 kV in common mode / 1 kV in differential mode

Name of test	Standards	Levels
	IEC 61000-4-5	For analog, digital unshielded I/Os: 1 kV (I/O < 48 V); 2 kV (I/O > 48 V) in common mode For communication and all shielded lines: 2 kV in common mode
	Railway EN 50155; EN 50121-3-2; EN 50121-4; IEC 60571; IEC 62236-3-2; IEC 62236-4	For I/Os and communication lines, DC and AC power supplies: 2 kV in common mode / 1 kV in differential mode
	Railway (fixed installation power supply) EN 50121-5; IEC 62236-5	For ports for process, measurement and control lines and long bus and DC power supplies 2 kV in common mode / 1 kV in differential mode For AC power supplies: 4 kV in common mode / 2 kV in differential mode
Conducted disturbances induced by radio-frequency electromagnetic fields	Industry IEC/EN 61131-2 (zone B and C); IEC/EN 61000-6-2; IEC 61000-4-6	10 V, 0.15...80 MHz Sinus amplitude modulated 80%, 1 kHz + spot frequencies
	Merchant Navy IACS E10	3 V, 0.15...80 MHz Sinus amplitude modulated 80%, 1 kHz + spot frequencies
	Power Station and Substation IEC 61000-6-5; IEC 61850-3; IEC 61000-4-6	10 V, 0.15...80 MHz Sinus amplitude modulated 80%, 1 kHz + spot frequencies
	Railway EN 50155; EN 50121-3-2; EN 50121-4; EN 50121-5; IEC 60571; IEC 62236-3-2; IEC 62236-4; IEC 62236-5	10 V, 0.15...80 MHz Sinus amplitude modulated 80%, 1 kHz + spot frequencies
Damped oscillatory wave	Industry IEC/EN 61131-2 (zone C); IEC 61000-4-18	For AC and DC main supplies and AC auxiliary supplies, AC unshielded I/Os: 2.5 kV in common mode / 1 kV in differential mode only at 1 MHz

Name of test	Standards	Levels
		<p>For DC auxiliary supplies, analog, DC unshielded I/Os: 1 kV in common mode / 0.5 kV in differential mode</p> <p>For communication and all shielded lines: 0.5 kV in common mode</p> <p>For ports for process, measurement, control lines and long bus: 2.5 kV in common mode / 1 kV in differential mode</p>
	<p>Power Station and Substation IEC 61000-6-5; IEC 61850-3; IEC 61000-4-18</p>	<p>For AC and DC main supplies and AC auxiliary supplies, AC unshielded I/Os, communication and all shielded lines: 2.5 kV in common mode / 1 kV in differential mode only at 1 MHz</p>
	<p>Railway (fixed installation power supply) EN 50121-5; IEC 62236-5</p>	<p>For AC and DC main supplies and AC auxiliary supplies, AC unshielded I/Os, communication and all shielded lines: 2.5 kV in common mode / 1 kV in differential mode only at 1 MHz</p>
Magnetic field	<p>Power Station and Substation IEC 61000-6-5; IEC 61850-3; IEC 61000-4-6</p>	<p>Power frequency: 50/60 Hz, 100 A/m continuous 1000 A/m; t = 3 s; 3 axes</p> <p>Oscillatory: 100 kHz 1 MHz, 100 A/m; t = 9 s; 3 axes</p>

Electromagnetic Emissions Tests

Name of test	Standards	Levels
Conducted emission	IEC/EN 61131-2; IEC/EN 61000-6-4; CISPR 11 and 22, Class A, Group 1	150...500 kHz: quasi-peak 79 dB ($\mu\text{V/m}$); average 66 dB ($\mu\text{V/m}$) 500 kHz...30 MHz: quasi-peak 73 dB ($\mu\text{V/m}$); average 60 dB ($\mu\text{V/m}$)
	IACS E10	For AC or DC power (general power distribution zone): 10...150 kHz: quasi-peak 120...69 dB ($\mu\text{V/m}$) 150...500 kHz: quasi-peak 79 dB ($\mu\text{V/m}$) 500 kHz...30 MHz: quasi-peak 73 dB ($\mu\text{V/m}$) For AC or DC power (bridge and deck zone for evaluation): 10...150 kHz: quasi-peak 96...50 dB ($\mu\text{V/m}$) 150 kHz...350 kHz: quasi-peak 60...50 dB ($\mu\text{V/m}$) 350 kHz...30 MHz: quasi-peak 50 dB ($\mu\text{V/m}$)
Radiated emission	IEC/EN 61131-2; IEC/EN 61000-6-4; CISPR 11 and 22, Class A, Group 1	30...230 MHz: quasi-peak 40 dB ($\mu\text{V/m}$) (at 10 m) 230 MHz...1 GHz: quasi-peak 47 dB ($\mu\text{V/m}$) (at 10 m) 1...3 GHz: quasi-peak 76 dB ($\mu\text{V/m}$) (at 3 m) 3...6 GHz: quasi-peak 80 dB ($\mu\text{V/m}$) (at 3 m)
	IACS E10	For general power distribution zone: 150 kHz...30 MHz: quasi-peak 80...50 dB ($\mu\text{V/m}$) (at 3 m) 30...100 MHz: quasi-peak 60...54 dB ($\mu\text{V/m}$) (at 3 m) 100 MHz...2 GHz: quasi-peak 54 dB ($\mu\text{V/m}$) (at 3 m) 156...165 MHz: quasi-peak 24 dB ($\mu\text{V/m}$) (at 3 m)

Immunity to Climatic Variations (Power ON) Tests

Name of test	Standards	Levels
Dry heat	IEC 60068-2-2 (Bb and Bd)	60 °C (140 °F), t = 16 hrs (for ruggedized range: 70 °C (158 °F), t = 16 hrs) ⁽¹⁾
	IACS E10	70 °C (158 °F), t = 16 hrs
Cold	IEC 60068-2-1 (Ab and Ad); IACS E10	-25...0 °C (-13...32 °F), t = 16 hrs + power on at 0 °C (32 °F) (for ruggedized range: power on at -25 °C (-13 °F)) ⁽¹⁾
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)) ⁽¹⁾
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 (-13...158 °F)) ⁽¹⁾
(1) Refer also to the section <i>Installation in More Severe Environments</i> .		

Withstand to Climatic Variations (Power OFF) Tests

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	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

Name of test	Standards	Levels
Sinusoidal vibrations	IEC/EN 61131-2; IEC 60068-2-6 (Fc)	Basic IEC/EN 61131-2: 5...150 Hz, ±3.5 mm amplitude (5...8.4 Hz), 1 g (8.4...150 Hz) Specific profile: 5...150 Hz, ±10.4 mm amplitude (5...8.4 Hz), 3 g (8.4...150 Hz) Endurance (basic and specific): 10 sweep cycles for each axis
	IEC 60870-2-2; IEC 60068-2-6 (Class Cm)	2...500 Hz, 7 mm amplitude (2...9 Hz), 2 g (9...200 Hz), 1.5 g (200...500 Hz) 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	Seismic 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)	30 g, 11 ms; 3 shocks/direction/axis ⁽¹⁾ 25 g, 6 ms; 100 bumps/direction/axis (bumps) ⁽²⁾
Free fall during operation	IEC/EN 61131-2; IEC 60068-2-32 (Ed Method 1)	1 m (3.28 ft), 2 falls
<p>(1) When using fast actuators (response time ≤ 5 ms) driven by relay outputs: 15 g, 11 ms; 3 shocks/direction/axis.</p> <p>(2) When using fast actuators (response time ≤15 ms) driven by relay outputs: 15 g, 6 ms; 100 bumps/direction/axis.</p>		

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

Name of test	Standards	Levels
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	Operations (for modules and connectors): 50 for permanent connections, 500 for non-permanent connections

Equipment and Personnel Safety Tests

Name of test	Standards	Levels
Dielectric strength and insulation resistance	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	Dielectric: 2 Un + 1000 V; t = 1 min Insulation: Un ≤50 V: 10 MΩ, 50 V ≤Un ≤250 V: 100 MΩ
Ground continuity	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	30 A, R ≤0.1 Ω; t = 2 min
Leakage current	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	<0.5 mA in normal condition <3.5 mA in single fault condition
Protection offered by enclosures	IEC/EN 61131-2; IEC61010-2-201;	IP20 and protection against standardized pins
Impact withstand	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	Sphere of 500 g, fall from 1.30 m (4.27 ft) (energy 6.8 J minimum)
Overload	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	50 cycles, Un, 1.5 In; t = 1 s ON + 9 s OFF
Endurance	IEC/EN 61131-2; IEC 61010-2-201; UL; CSA	In, Un; 6000 cycles, 1 s ON + 9 s OFF
Temperature rise	IEC/EN 61131-2; UL; CSA; ATEX; IECEx	Ambient temperature 60 °C (140 °F) (for ruggedized range: 70 °C (158 °F))

Specific Environment Tests

Name of test	Standards	Levels
Corrosion areas - gas, salt, dust	ISA S71.4	Flowing mixed gas; class Gx, 25 °C (77 °F), 75% relative humidity, t = 14 days
	IEC/EN 60721-3-3 IEC 60068-2-60	Flowing mixed gas; class 3C3, 25 °C (77 °F), 75% relative humidity, t = 14 days
	IEC/EN 60721-3-3 IEC 60068-2-60	Flowing mixed gas; class 3C4, 25 °C (77 °F), 75% relative humidity, t = 7 days
	IEC 60068-2-52	Salt spray: test Kb, severity 2
	IEC/EN 60721-3-3 IEC 60068-2-68	Dust and sand, Arizona dust, class 3S4, 20 cycles
	IEC/EN 60721-3-3 IEC 60068-2-10	Mold growth, fungal spore, class 3B2, t = 28 days

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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