

3 Guidelines and standards

Overview

An updated overview of the most important conformities per module (ABS, BV, CCC, CE, cUL, DNV, KR, LR, NK, RINA, RoHS, UL) can be downloaded as a document at the following link:

www.bachmann.info/de/service/download-center/zertifikate

Certificate / EU declaration of conformity

The certificates and the EU declaration of conformity for the M1 control system are provided on the Bachmann homepage:

www.bachmann.info/de/service/download-center/zertifikate

Product standard

The M1 control system has been developed in accordance with **EN 61131-2:2007 and IEC 61131-2:2017 Programmable controllers – Part 2: Equipment requirements and tests**.

Low Voltage Directive (LVD)

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

The requirements specified in this directive must be complied with for installation of the M1 control system.

General conditions for use

The components of the M1 controller system are designed for stationary use in places protected against weather influences in industrial environments. The assemblies of the grid measurement modules (GSP274, GMP232/x) are designed solely for stationary use where the entire system has a power rating that exceeds 20 kVA.

- **Standard components**

Environmental conditions according to IEC 60721-3-3:2019:

- Climatic class 3K22
- Mechanical class 3M12

- **ColdClimate components**

Environmental conditions according to IEC 60721-3-3:2019:

- Climatic class 3K24
- Mechanical class 3M12

Mechanical environmental conditions

Standard	Description
IEC 60068-2-6:2007 and EN 60068-2-6:2008	Sinusoidal vibrations 2 to 9 Hz with ± 3.5 mm amplitude 9 to 500 Hz with ≤ 1 g acceleration
IEC 60068-2-27:2008 and EN 60068-2-27:2009	Shock Occasional peaks ≤ 15 g over 11 ms, half sine wave in each of the 3 vertically superimposed axes.

Tab. 1: Mechanical environmental conditions

Climatic ambient conditions

Value	Description	
	Default	ColdClimate
Temperature	Temperature ranges that must be maintained see Ambient conditions of the individual hardware modules.	
Relative humidity	5 to 95 % continuously, non-condensing	5 to 95 % continuously, short-term condensing (100 % ≤ 60 min)
Pollution degree ¹⁾	Pollution degree II Usually nonconductive contamination without condensation	Pollution degree II Usually nonconductive contamination. Occasionally, however, conductivity due to condensation can be expected.
Air pressure	106 to 58 kPa (0 to 4,500 m) For modules with supply voltages above 60 V, a derating of the maximum voltage for values below 80 kPa (≥ 2,000 m above sea level) can be defined in the environmental conditions of the module description.	
Temperature derating	2,000 m to 4,500 m above sea level: 0.5 Kelvin (K) per 100 m elevation	
¹⁾ Individual modules may have divergent specifications, e. g. DOR206/230, GSP274, GMP232/x, GM260		

Tab. 2: Climatic ambient conditions

Directive on EMC (Electromagnetic compatibility)

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE
COUNCIL

The following table shows the specifications for interference emission and interference resistance for the European Union.

Emitted interference	EN 61000-6-4:2007 + AMD1:2011 and IEC 61000-6-4:2018 Industrial radio-frequency disturbance characteristics
CISPR 32:2015 + AMD1:2019 and EN 55032:2015	Conducted Emission – Wired Network Port <ul style="list-style-type: none"> • 150 to 500 kHz, Q-Peak limit 53 dB (µA) – 43 dB (µA), Average limit 40 dB (µA) – 30 dB (µA) • 500 to 30 MHz, Q-Peak limit 43 dB (µA), Average limit 30 dB (µA)
CISPR 16-2-3:2016 + AMD1:2019 and EN 55016-2-3:2017	Radiated Emission Measurement distance 3 m, FAR <ul style="list-style-type: none"> • 30 to 230 MHz, Q-Peak limit 52 dB (µV/m) to 45 dB (µV/m) • 230 MHz to 1 GHz, Q-Peak limit 52 dB (µV/m) or: Measurement distance 10 m, SAC <ul style="list-style-type: none"> • 30 to 230 MHz, Q-Peak limit 40 dB (µV/m) • 230 to 1000 MHz, quasi-peak 47 dB (µV/m) Measurement distance 3 m, FAR <ul style="list-style-type: none"> • 1 to 3 GHz, Average limit 56 dB (µV/m), Peak limit 76 dB (µV/m) • 3 to 6 GHz, Average limit 60 dB (µV/m), Peak limit 80 dB (µV/m)
CISPR 16-2-1:2014 + AMD1:2017 and EN 55016-2-1:2015	Conducted Emission <ul style="list-style-type: none"> • 150 to 500 kHz, Q-Peak limit 79 dB (µV), Average limit 66 dB (µV) • 500 kHz to 30 MHz, Q-Peak limit 73 dB (µV), Average limit 60 dB (µV)
Interference immunity	Generic standard EN 61000-6-2:2005 and IEC 61000-6-2:2016
EN 61000-4-2:2009 and IEC 61000-4-2:2008	Discharge of electrostatic energy: <ul style="list-style-type: none"> • ±4 kV, ±2 kV contact discharge, 10 discharges per polarity and test point • ±8 kV, ±4 kV, ±2 kV air discharge, 10 discharges per polarity and test point
EN 61000-4-3:2020 and IEC 61000-4-3:2020	Electromagnetic HF field, amplitude-modulated: <ul style="list-style-type: none"> • 80 MHz to 1 GHz: 10 V/m, 1.4 GHz to 6 GHz: 3 V/m • Modulation: 80 % AM, Modulation frequency: 1 kHz
EN 61000-4-4:2012 and IEC 61000-4-4:2012	Fast transient electric disturbances/burst: <ul style="list-style-type: none"> • Signal and control lines > 3 m: ±1 kV, 5 ns/50 ns, 5 & 100 kHz • AC/DC mains inputs and outputs: ±2 kV, 5 ns/50 ns, 5 & 100 kHz

<p>EN 61000-4-5:2014+ AMD1:2017 and IEC 61000-4-5:2014 + AMD1:2017</p>	<p>Surges:</p> <ul style="list-style-type: none"> • Signal and control lines > 30 m: Line(s) to Ground: ± 0.5 kV, ± 1 kV • DC mains input: Line to Line: ± 0.5 kV; Line(s) to Ground: ± 0.5 kV, ± 1 kV • AC mains input: Line to Line: ± 0.5 kV, ± 1 kV; Line(s) to Ground: ± 0.5 kV, ± 1 kV, ± 2 kV • Angle (AC): 0°, 90°, 180°, 270°
<p>EN 61000-4-6:2014 and IEC 61000-4-6:2013 + COR1:2015</p>	<p>Conducted disturbance, induced by high-frequency fields:</p> <ul style="list-style-type: none"> • Frequency range: 150 kHz to 80 MHz, 10 V • Modulation: 80 % AM, 1 kHz
<p>EN 61000-4-8:2010 and IEC 61000-4-8:2009</p>	<p>Power frequency magnetic field immunity test:</p> <ul style="list-style-type: none"> • Frequency: 50 Hz and 60 Hz, 30 A/m • Field direction: X, Y, Z
<p>EN 61000-4-9:2016 and IEC 61000-4-9:2016</p>	<p>Pulsed magnetic fields:</p> <ul style="list-style-type: none"> • Frequency: 50 Hz, 1000 A/m, Field direction: X, Y, Z
<p>EN 61000-4-12:2017 and IEC 61000-4-12:2017</p>	<p>Attenuated sine oscillations</p> <ul style="list-style-type: none"> • Signal and control lines shielded: Line(s) to Ground: ± 0.5 kV • Signal and control lines shielded: Line to Line: ± 0.5 kV; Line(s) to Ground: ± 1 kV • AC mains input: Line to Line: ± 1 kV; Line(s) to Ground: ± 2.5 kV • Test pulse: 12 Ohm; Angle (AC): 0°, 90°, 180°, 270°

Tab. 3: Electromagnetic compatibility – Specifications for interference emission and interference resistance for the European Union

Additional specifications

EN 61000-3-2:2019 and IEC 61000-3-2:2018 + AMD1:2020	<p>Harmonics Current Emission</p> <ul style="list-style-type: none"> • Even: 2nd max 1.08 A, 4th max 0.43 A, 6th max 0.30 A, 8th ≤ n ≤ 40th max 0.23 A * 8/n • Odd: 3rd max 2.30 A, 5th max 1.14 A, 7th max 0.77 A, 9th max 0.40 A, 11th max 0.33 A, 13th max 0.21 A, 15th ≤ n ≤ 39th max 0.15 A * 15/n
EN 61000-3-3:2013 and IEC 61000-3-3:2013 + AMD1:2017 + AMD2:2021	<p>Limitation of voltage changes and voltage fluctuations</p> <ul style="list-style-type: none"> • Flicker impedance: Z_{Ref} (IEC EN 60725) • Observation time for P_{ST}: 10 min
EN 61000-4-11:2020 and IEC 61000-4-11:2020	<p>Voltage dips immunity tests</p> <ul style="list-style-type: none"> • Count: ≥ 3 per angle, Repetition: 10 s, Angle: 0°, 180° <p>Voltage dips and interruptions immunity</p> <ul style="list-style-type: none"> • 0 % residual voltage, 1 period starting at zero-crossing • 40 % residual voltage, 10/12 cycles at 50 Hz/60 Hz • 70 % residual voltage, 25/30 cycles at 50 Hz/60 Hz • 0 % residual voltage, 250/300 cycles at 50 Hz/60 Hz
EN 61000-4-29:2000 and IEC 61000-4-29:2000	<p>Voltage dips on d.c. input power port immunity tests</p> <ul style="list-style-type: none"> • 0 % residual voltage, d.c. supply interruption ≥ 10 ms

Tab. 4: Additional specifications for grid measurement modules

Marine Classification (only for products with marine approval)

Vibration	Generic standard IACS E10:2018, IEC 60945:2002/COR1:2008
IEC 60068-2-6:2007 and EN 60068-2-6:2008 test Fc	<ul style="list-style-type: none"> • 2.0 to 25 Hz – amplitude ± 1.6 mm • 25 to 100 Hz – acceleration 4.0 g <p>Observe the following:</p> <ul style="list-style-type: none"> • Duration in case of no resonance condition 90 minutes at 30 Hz • Duration of each resonance frequency at which $Q \geq 2$ is recorded 90 minutes • During the vibration test, functional tests are to be carried out • Tests to be carried out in three mutually perpendicular planes • It is recommended as guidance that Q does not exceed 5 • Transfer point from the shaker to the UUT is a massive DIN rail • Shaker control regulates this transfer point

Tab. 5: Marine classification – vibration

Emitted interference	Generic standard IACS E10:2018, IEC 60945:2002/COR1:2008
<p>CISPR 16-2-3:2016 + AMD1:2019 and EN 55016-2-3:2017 Radiated emission</p>	<p>General power distribution zone</p> <p>Measurement distance 3 m:</p> <ul style="list-style-type: none"> • 0.15 to 30 MHz, Q-Peak limit 80 to 50 dB (µV/m) • 30 to 100 MHz, Q-Peak limit 60 to 54 dB (µV/m) • 100 to 156 MHz, Q-Peak limit 54 dB (µV/m) • 156 to 165 MHz, Peak limit) 30 dB (µV/m), Q-Peak limit 24 dB (µV/m) • 165 to 1000 MHz, Q-Peak limit 54 dB (µV/m) • 1 to 6 GHz, Average limit 54 dB (µV/m) <p>Bridge and open deck zone</p> <p>Measurement with 2 x 1.8 mH EMC-Filter, Measurement distance 3 m:</p> <ul style="list-style-type: none"> • 150 to 300 kHz, Q-Peak limit 80 to 52 dB (µV/m) • 0.3 to 30 MHz, Q-Peak limit 52 to 34 dB (µV/m) • 30 to 156 MHz, Q-Peak limit 54 dB (µV/m) • 156 to 165 MHz, Peak limit) 30 dB (µV/m), Q-Peak limit 24 dB (µV/m) • 165 to 1000 MHz, Q-Peak limit 54 dB (µV/m) • 1 to 6 GHz, Average limit 54 dB (µV/m)
<p>CISPR 16-2-1:2014 + AMD1:2017 and EN 55016-2-1:2014 Line-borne emitted interference</p>	<p>General power distribution zone</p> <p>Measurement:</p> <ul style="list-style-type: none"> • 10 to 150 kHz, Q-Peak limit 120 to 69 dB (µV) • 150 to 500 kHz, Q-Peak limit 79 dB (µV) • 0.5 to 30 MHz, Q-Peak limit 73 dB (µV) <p>Bridge and open deck zone</p> <p>Measurement with 2 x 1.8 mH EMC-Filter:</p> <ul style="list-style-type: none"> • 10 to 150 kHz, Q-Peak limit 96 to 50 dB (µV) • 150 to 350 kHz, Q-Peak limit 60 to 50 dB (µV) • 0.35 to 30 MHz, Q-Peak limit 50 dB (µV)
Interference immunity	Generic standard IACS E10:2018
<p>EN 61000-4-2:2009 and IEC 61000-4-2:2008</p>	<p>Discharge of electrostatic energy:</p> <ul style="list-style-type: none"> • ±6 kV, ±4 kV, ±2 kV contact discharge, 10 discharges per polarity and test point • ±8 kV, ±4 kV, ±2 kV air discharge, 10 discharges per polarity and test point

EN 61000-4-3:2020 and IEC 61000-4-3:2020	Electromagnetic HF field, amplitude-modulated: <ul style="list-style-type: none"> 80 MHz to 6 GHz: 10 V/m Modulation: 80 % AM, Modulation frequency: 1 kHz
EN 61000-4-4:2012 and IEC 61000-4-4:2012	Fast transient electric disturbances/burst: <ul style="list-style-type: none"> Signal and control lines > 3 m: ±1 kV, 5 ns/50 ns, 5 & 100 kHz AC/DC mains inputs and outputs: ±2 kV, 5 ns/50 ns, 5 & 100 kHz
EN 61000-4-5:2014+ AMD1:2017 and IEC 61000-4-5:2014 + AMD1:2017	Surges: <ul style="list-style-type: none"> Signal and control lines > 30 m: Line(s) to Ground: ±0.5 kV, ±1 kV DC mains input: Line to Line: ±0.5 kV; Line(s) to Ground: ±0.5 kV, ±1 kV AC mains input: Line to Line: ±0.5 kV, ±1 kV; Line(s) to Ground: ±0.5 kV, ±1 kV, ±2 kV Angle (AC): 0°, 90°, 180°, 270°
EN 61000-4-6:2014 and IEC 61000-4-6:2013 + COR1:2015	Conducted disturbance, induced by high-frequency fields: <ul style="list-style-type: none"> HF field, AM modulated; 150 kHz to 80 MHz; 3V Modulation: 80 % AM Modulation frequency: 1 kHz
IEC 61000-4-16:2015 and EN 61000-4-16:2016	Line-borne disturbance, induced by low-frequency: <ul style="list-style-type: none"> Signal level 2.4 V_{RMS}; maximum 2 W; 50 Hz to 10 kHz

Tab. 6: Marine classification – Specifications for interference emission and interference resistance

For applications on bridges or open decks, use one of the following EMC filters (recommended):

Manufacturer	Model	Current strength	Inductance
Phoenix Contact	NEF 1- 3 - 2794110	3	2 * 2.7 mH
Phoenix Contact	NEF 1- 6 - 2783082	6	
Phoenix Contact	NEF 1- 10 - 2788977	10	2 * 1.8 mH
Roxburgh	DRF01	3	2 * 3.2 mH

Tab. 7: Marine Classification – Recommended EMC filter for applications on bridges / open decks

FCC classification

Emitted interference	FCC Title 47 Chapter 1 Subchapter A §15 Radio Frequency Devices
§15.109 Radiated emission limits	Radiated Emission Measurement distance 3 m, FAR <ul style="list-style-type: none"> • 30 to 88 MHz, Q-Peak limit 49.53 dB (µV/m) • 88 to 216 MHz, Q-Peak limit 53.97 dB (µV/m) • 216 to 960 MHz, Q-Peak limit 56.89 dB (µV/m) • Above 960 MHz, Average limits 59.99 dB (µV/m) • Above 960 MHz, Peak 79.99 dB (µV/m)
§15.107 Conducted limits	Conducted Emission <ul style="list-style-type: none"> • 150 to 500 kHz, Q-Peak limit 79 dB (µV), Average limit 66 dB (µV) • 500 kHz to 30 MHz, Q-Peak limit 73 dB (µV), Average limit 60 dB (µV)

Tab. 8: FCC classification – Specifications for interference emission

Isolation test, galvanic isolation

Insulation quality has been verified with various testing voltages according to EN 61131-2:2007 and IEC 61131-2:2017.

For the technical specification 500 V applies in accordance with IEC 60255-27:2013 and EN 60255-27:2014:

- Standard interfaces and supply voltage
Power-frequency withstand voltage: 500 V_{RMS}; 50 Hz; 1 min

Protection class

Protection class	Description
Protection class I	Protective ground Modules: BS2xx/S, DOR2xx
Protection class II	Protective isolation (doubled isolation) Modules: GM2xx, GMP232/xx, GSP2xx
Protection class III	Supply voltage SELV/PELV Remaining M1-components

Tab. 9: Protection class

Degree of protection

- IP 20 according to IEC 60529:1989 + AMD1:1999 + AMD2:2013 and EN 60529:1991 + AMD1:2000 + AMD2:2013 (protected against touching with standard finger)
- Open device according to EN 61131-2:2007 and IEC 61131-2:2017
- **Open Device:**
For GM2xx, GMP232/x and GSP274: according to UL 508:2021
For remaining M1 components: UL 61010-1:2012 + AMD1:2018 and UL 61010-2-201:2018

Overvoltage category

Overvoltage category	Description
Overvoltage category II	M1 Series
Overvoltage category III	Modules: GM2xx, GMP232/xx, GSP2xx, DOR206/230
For details see product description	

Tab. 10: Overvoltage category

UL Standards

The supply of the M1 controller has to be in compliance with Class 2 so that compliance with the UL 61010-1:2012 + AMD1:2018 and the UL 61010-2-201:2018 **for use in class 2 circuits only** is ensured.

Only copper wires may be connected to the M1-controller. The torque on the input lines must have the following values:

Screw-type terminal	Position	Torque
SS35/xx	Sidewise	22 to 25 Ncm (2 to 3 lbs)
SV35/xx	Front	
SS51/xx	Sidewise	50 to 60 Ncm (5 to 7 lbs)
SV51/xx	Front	50 to 60 Ncm (5 to 7 lbs)
SS76/xx	Sidewise	70 to 80 Ncm (8 to 9 lbs)

Tab. 11: UL-Standards – torque on the input lines (copper wires)

Default	Description
UL 508:2018	UL Standard for Safety for Industrial Control Equipment
UL 61010-1:2012 + AMD1:2018	UL Standard for Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
UL 61010-2-201:2018	UL Standard for Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-201: Particular requirements for control equipment

Tab. 12: UL Standards



The Bachmann electronic GmbH has the following cULus files:

- For USA: **NRAQ.E214207**
- For Canada: **NRAQ7.E214207**

With this number the listed modules can be queried via the following link:

<https://iq.ulprospector.com/>

Alternative at <http://www.ul.com> via Visit UL Product iQ today (as of May 2021).

Supplemental standards and directives

Standard / directive	Description
IEEE C37.90:2005	IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus (IEEE Power and Energy Society) Modules: GMP232/1, GMP232/2, GMP232/3, GMP232/4, GSP274
IEEE C37.90.1:2012	IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus (IEEE Power and Engineering Society) Modules: GMP232/1, GMP232/2, GMP232/3, GMP232/4, GSP274
IEEE C37.90.2:2004	IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers (IEEE Power and Engineering Society) Modules: GMP232/1, GMP232/2, GMP232/3, GMP232/4, GSP274
IEEE C37.90.3:2001	IEEE Standard Electrostatic Discharge Tests for Protective Relays Modules: GMP232/1, GMP232/2, GMP232/3, GMP232/4, GSP274
ENA G99/1-6:2020	Engineering Recommendation G99 Issue 1 March 2020: Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019 Modules: GMP232/1, GMP232/2, GMP232/3, GMP232/4, GSP274
VDE-AR-N 4105:2018	Power generation systems connected to the low-voltage distribution network – Technical minimum requirements for the connection to and parallel operation with low-voltage distribution networks Modules: GSP274
VDE-AR-N 4110:2018	Technical rules for the connection of customer systems to the medium-voltage network and their operation Modules: GMP232/1, GMP232/2, GMP232/3, GMP232/4, GSP274

Tab. 13: Supplemental standards and directives

© 2021 Bachmann electronic GmbH

All rights reserved.

All operating instructions, manuals, technical descriptions and software supplied by Bachmann electronic GmbH ("Bachmann") are copyright protected. The copying, distributing and/or other processing (e.g. through photocopying, microfilming, translating in machine readable form or transferring to any electronic medium) are not permitted. Any, even partial, use of the before-mentioned material which is in contradiction to this condition will be criminally prosecuted, unless Bachmann prior written consent has been obtained. All further rights and obligations in Bachmann software are specified in the "End-User Licence Agreement" (EULA).

Where a reference is made to products and/or services from third parties in this manual, this is done only for the purpose of example or is a mere recommendation from Bachmann. Bachmann makes no guarantee in regard to the selection, specification and/or usability of these goods and services. The naming and/or representation of trademarks which are not owned by Bachmann are for information purposes only and all rights remain with the respective owner of the trademark.

The OPC Foundation Certified for Compliance logo indicates that this product has been tested by an independent certification lab and certified to be compliant with the OPC Specifications DA2.05a/DA3.00. The OPC Foundation Certified for Compliance logo is a trademark and as such the property of The OPC Foundation and is used under licence.

Disclaimer:

We have carefully checked the contents of this document for consistency with the technical features and specifications of the relevant hard- and software. Despite this check, some deviations cannot be entirely excluded, which is why we cannot guarantee full consistency. However, the information in this document is regularly reviewed and corrections will be included in subsequent editions. Suggestions for corrections and improvements are very welcome. Bachmann reserves the right to change the technical specification of the hard- and/or software or the documentation without advance notice.

Contact:

Bachmann electronic GmbH
Kreuzäckerweg 33
6800 Feldkirch
Austria
P +43 5522 3497-0
F +43 5522 3497-1102
E-Mail: service@bachmann.info
www.bachmann.info