

DATA SHEET

DC523

Digital input/output module



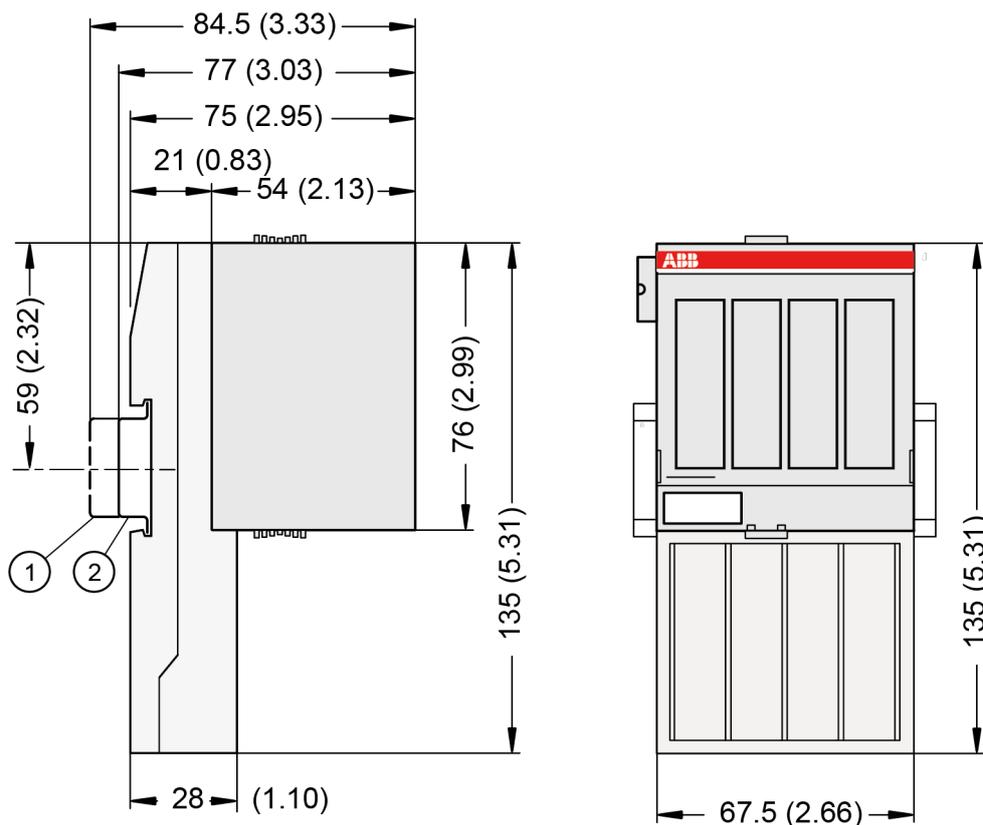
1 Ordering data

| Part no. | Description | Product life cycle phase *) |
|--------------------|---|-----------------------------|
| 1SAP 240 500 R0001 | DC523, digital input/output module, 24 DC, 24 V DC / 0.5 A, 1-wire | Active |
| 1SAP 440 500 R0001 | DC523-XC, digital input/output module, 24 DC, 24 V DC / 0.5 A, 1-wire, XC version | Active |



*) Modules in lifecycle Classic are available from stock but not recommended for planning and commissioning of new installations.

2 Dimensions



- 1 Din rail 15 mm
- 2 Din rail 7.5 mm



The dimensions are in mm and in brackets in inch.

3 Technical data

3.1 Technical data of the module

The system data of AC500 and S500 are applicable to the standard version ↗ *Chapter 4 “System data AC500” on page 6.*

The system data of AC500-XC are applicable to the XC version ↗ *Chapter 5 “System data AC500-XC” on page 10.*

Only additional details are therefore documented below.

The technical data are also applicable to the XC version.

| Parameter | Value |
|---------------------------|--|
| Process supply voltage UP | |
| Connections | Terminals 1.8, 2.8, 3.8 and 4.8 for +24 V (UP) as well as 1.9, 2.9, 3.9 and 4.9 for 0 V (ZP) |
| Rated value | 24 V DC |
| Max. ripple | 5 % |

| Parameter | Value |
|---|---|
| Protection against reversed voltage | Yes |
| Rated protection fuse on UP | 10 A fast |
| Galvanic isolation | Yes, per module |
| Current consumption | |
| From 24 V DC power supply at the terminals UP/L+ and ZP/M of the CPU/communication interface module | Ca. 2 mA |
| From UP at normal operation / with outputs | 0.1 A + max. 0.5 A per output |
| Inrush current from UP (at power up) | 0.008 A ² s |
| Max. power dissipation within the module | 6 W (outputs unloaded) |
| Sensor power supply | |
| Connections | Terminals 1.0 ... 1.3 = +24 V, 1.4 ... 1.7 = 0 V |
| Voltage | 24 V DC with short circuit and overload protection |
| Loadability | Terminals 1.0 ... 1.3, in total max. 0.5 A |
| Weight (without terminal unit) | Ca. 125 g |
| Mounting position | Horizontal Or vertical with derating (output load reduced to 50 % at +40 °C per group) |
| Cooling | The natural convection cooling must not be hindered by cable ducts or other parts in the control cabinet. |



NOTICE!

All I/O channels (digital and analog) are protected against reverse polarity, reverse supply, short circuit and temporary overvoltage up to 30 V DC.



Multiple overloads

No effects of multiple overloads on isolated multi-channel modules occur, as every channel is protected individually by an internal smart high-side switch.

3.2 Technical data of the configurable digital inputs/outputs

Each of the configurable I/O channels is defined as input or output by the user program. This is done by interrogating or allocating the corresponding channel.

| Parameter | Value |
|--|--------------------------------------|
| Number of channels per module | 24 inputs/outputs (with transistors) |
| Distribution of the channels into groups | 1 group of 24 channels |
| If the channels are used as inputs | |
| Channels C0 ... C7 | Terminals 2.0 ... 2.7 |

| Parameter | Value |
|--|---|
| Channels C8 ... C15 | Terminals 3.0 ... 3.7 |
| Channels C16 ... C23 | Terminals 4.0 ... 4.7 |
| If the channels are used as outputs | |
| Channels C0 ... C7 | Terminals 2.0 ... 2.7 |
| Channels C8 ... C15 | Terminals 3.0 ... 3.7 |
| Channels C16 ... C23 | Terminals 4.0 ... 4.7 |
| Indication of the input/output signals | 1 yellow LED per channel, the LED is ON when the input/output signal is high (signal 1) |
| Monitoring point of input/output indicator | LED is part of the input circuitry |
| Galvanic isolation | From the rest of the module |

3.2.1 Technical data of the digital inputs/outputs if used as inputs

| Parameter | Value |
|--|---|
| Number of channels per module | Max. 24 digital inputs |
| Reference potential for all inputs | Terminals 1.9, 2.9, 3.9 and 4.9 (negative pole of the process supply voltage, signal name ZP) |
| Galvanic isolation | From the rest of the module |
| Indication of the input signals | 1 yellow LED per channel, the LED is ON when the input signal is high (signal 1) |
| Monitoring point of input/output indicator | LED is part of the input circuitry |
| Input type acc. to EN 61131-2 | Type 1 |
| Input delay (0->1 or 1->0) | Typ. 8 ms, configurable from 0.1 to 32 ms |
| Input signal voltage | 24 V DC |
| Signal 0 | -3 V ... +5 V *) |
| Undefined signal | > +5 V ... < +15 V |
| Signal 1 | +15 V ... +30 V |
| Ripple with signal 0 | Within -3 V ... +5 V *) |
| Ripple with signal 1 | Within +15 V ... +30 V |
| Input current per channel | |
| Input voltage +24 V | Typ. 5 mA |
| Input voltage +5 V | > 1 mA |
| Input voltage +15 V | > 5 mA |
| Input voltage +30 V | < 8 mA |
| Max. cable length | |
| Shielded | 1000 m |
| Unshielded | 600 m |

*) Due to the direct connection to the output, the demagnetizing varistor is also effective at the input (see figure) above. This is why the difference between UPx and the input signal must not exceed the clamp voltage of the varistor. The varistor limits the clamp voltage to approx. 36 V. Consequently, the input voltage must range from -12 V ... +30 V when UPx = 24 V and from -6 V ... +30 V when UPx = 30 V.

3.2.2 Technical data of the digital inputs/outputs if used as outputs

| Parameter | Value |
|---|--|
| Number of channels per module | Max. 24 transistor outputs |
| Reference potential for all outputs | Terminals 1.9, 2.9, 3.9 and 4.9 (negative pole of the process supply voltage, signal name ZP) |
| Common power supply voltage | For all outputs: terminals 1.8, 2.8, 3.8 and 4.8 (positive pole of the process supply voltage, signal name UP) |
| Output voltage for signal 1 | UP (-0.8 V) |
| Output delay (0->1 or 1->0) | On request |
| Output current | |
| Rated value, per channel | 500 mA at UP = 24 V |
| Maximum value (all channels together) | 8 A |
| Leakage current with signal 0 | < 0.5 mA |
| Rated protection fuse on UP | 10 A fast |
| Demagnetization when inductive loads are switched off | With varistors integrated in the module (see figure below) |
| Switching frequency | |
| With resistive load | On request |
| With inductive loads | Max. 0.5 Hz |
| With lamp loads | Max. 11 Hz with max. 5 W |
| Short-circuit-proof / overload-proof | Yes |
| Overload message (I > 0.7 A) | Yes, after ca. 100 ms |
| Output current limitation | Yes, automatic reactivation after short circuit/overload |
| Resistance to feedback against 24 V signals | Yes |
| Max. cable length | |
| Shielded | 1000 m |
| Unshielded | 600 m |

The following drawing shows the circuitry of a digital input/output with the varistors for demagnetization when inductive loads are switched off.

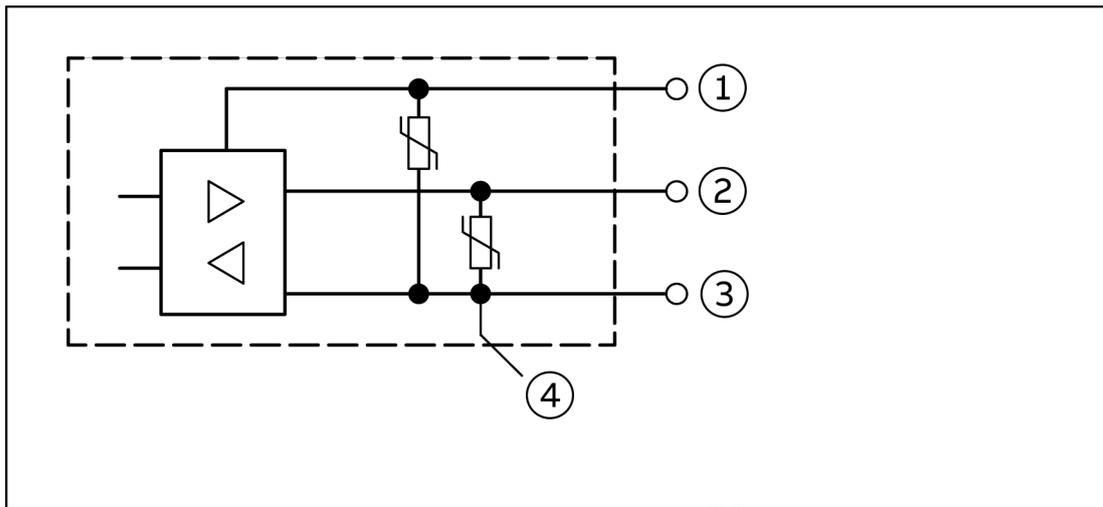


Fig. 1: Digital input/output (circuit diagram)

- 1 UPx (+ 24 V)
- 2 Digital input/output
- 3 ZPx (0 V)
- 4 For demagnization when inductive loads are switched off

3.3 Technical data of the fast counter



The fast counter of the module does not work if the module is connected to a

- FBP interface module
- CS31 bus module
- CANopen communication interface module

| Parameter | Value |
|--------------------|-------------|
| Used inputs | C16 / C17 |
| Used outputs | C18 |
| Counting frequency | Max. 50 kHz |

How to prepare a device as fast counter and how to connect it to the PLC is described in an [application example](#).

4 System data AC500

4.1 Environmental conditions

Table 1: Process and supply voltages

| Parameter | Value |
|---------------------------------------|---------------------|
| 24 V DC | |
| Voltage | 24 V (-15 %, +20 %) |
| Protection against reverse polarity | Yes |
| 100 V AC...240 V AC wide-range supply | |

| Parameter | | Value |
|--|-----------|--|
| | Voltage | 100 V ... 240 V (-15 %, +10 %) |
| | Frequency | 50/60 Hz (-6 %, +4 %) |
| Allowed interruptions of power supply, according to EN 61131-2 | | |
| | DC supply | Interruption < 10 ms, time between 2 interruptions > 1 s, PS2 |
| | AC supply | Interruption < 0.5 periods, time between 2 interruptions > 1 s |

**NOTICE!****Risk of damaging the PLC due to improper voltage levels!**

- Never exceed the maximum tolerance values for process and supply voltages.
- Never fall below the minimum tolerance values for process and supply voltages. Observe the **system data**  *Chapter 4 "System data AC500" on page 6* and the **technical data** of the module used.

**NOTICE!**

Improper voltage level or frequency range which cause damage of AC inputs:

- AC voltage above 264 V
- Frequency below 47 Hz or above 62.4 Hz

**NOTICE!**

Improper connection leads cause overtemperature on terminals.

PLC modules may be destroyed by using wrong cable type, wire size and cable temperature classification.

| Parameter | | Value |
|--------------|-----------|--|
| Temperature | | |
| | Operating | 0 °C ... +60 °C: Horizontal mounting of modules. 0 °C ... +40 °C: Vertical mounting of modules. Output load reduced to 50 % per group. |
| | Storage | -40 °C ... +70 °C |
| | Transport | -40 °C ... +70 °C |
| Humidity | | Max. 95 %, without condensation |
| Air pressure | | |
| | Operating | > 800 hPa / < 2000 m |
| | Storage | > 660 hPa / < 3500 m |

4.2 Creepage distances and clearances

The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.

4.3 Power supply units

 **AC500 and AC500-eCo PLC devices are Class II/Class III devices and do not require a Protective Earth (PE) connection.**

For proper EMC performance, all metal parts, DIN rails, mounting screws, and cable shield connection terminals are connected to a common ground and provide Functional Earth (FE). This is typically connected to a common reference potential, such as equipotential bonding rails.

Signal Grounds (SGND or GND) are used for signal reference and must not be connected to cable shields, FE or other signals unless otherwise specified in the specific device description.

For the supply of the modules, power supply units according to SELV or PELV specifications must be used.

 **Safety Extra Low Voltage (SELV) and Protective Extra Low Voltage (PELV)**

To ensure electrical safety of AC500/AC500-eCo extra low voltage circuits, 24 V DC supply, communication interfaces, I/O circuits, and all connected devices must be powered from sources meeting requirements of SELV, PELV, class 2, limited voltage or limited power according to applicable standards.

 **WARNING!**

Improper installation can lead to death by touching hazardous voltages!

To avoid personal injury, safe separation, double or reinforced insulation and separation of the primary and secondary circuit must be observed and implemented during installation.

- Only use power converters for safety extra-low voltages (SELV) with safe galvanic separation of the primary and secondary circuit.
- Safe separation means that the primary circuit of mains transformers must be separated from the secondary circuit by double or reinforced insulation. The protective extra-low voltage (PELV) offers protection against electric shock.

4.4 Electromagnetic compatibility

Table 2: Electromagnetic compatibility

| Parameter | Value |
|---|--|
| Device suitable only as <i>Control Equipment for Industrial Applications</i> , including marine applications. IEC 61131-2, zone B  Chapter 4.6 “Approvals and certifications” on page 10 | |
| Radiated emission according to IEC 61000-6-4 CISPR11, class A | Yes |
| Conducted emission according to IEC 61000-6-4 CISPR11, class A | Yes |
| Electrostatic discharge (ESD) according to IEC 61000-4-2, criterion B | Air discharge: 8 kV Contact discharge: 6 kV |

| Parameter | Value |
|---|--|
| Fast transient interference voltages (burst) according to IEC 61000-4-4, criterion B | Power supply (DC): 2 kV Digital inputs/outputs (24 V DC): 1 kV Digital inputs/outputs (240 V AC): 2 kV Analog inputs/outputs: 1 kV Communication lines shielded: 1 kV |
| High energy transient interference voltages (surge) according to IEC 61000-4-5, criterion B | Power supply (DC): - Line to ground: 1 kV - Line to line: 0,5 kV Digital inputs/outputs/relay: (24 V DC): - Line to ground: 1 kV (AC): - Line to ground: 2 kV - Line to line: 1 kV Analog inputs/outputs: - Line to ground: 1 kV Communication lines: - Line to ground: 1 kV |
| Influence of radiated disturbances IEC 61000-4-3, criterion A | Test field strength: 10 V/m |
| Influence of line-conducted interferences IEC 61000-4-6, criterion A | Test voltage: 10 V |
| Power frequency magnetic fields IEC 61000-4-8, criterion A | 30 A/m 50 Hz 30 A/m 60 Hz |

4.5 Mechanical data

| Parameter | Value |
|---|---|
| Mounting | Horizontal/Vertical |
| Wiring method | Spring/screw terminals |
| Degree of protection | PLC system: IP 20 <ul style="list-style-type: none"> ● with all modules or option boards plugged in ● with all terminals plugged in ● with all covers closed |
| Housing | Classification V-2 according to UL 94 |
| Vibration resistance (sinusoidal) acc. to IEC 60068-2-6 | All three axes 2 Hz ... 8.4 Hz, 3.5 mm peak, 8.4 Hz ... 150 Hz, 1 g |
| Shock test acc. to IEC 60068-2-27 | All three axes 15 g, 11 ms, half-sinusoidal |
| Mounting of the modules: | |

| Parameter | Value |
|--|------------------------------|
| Mounting Rail Top Hat according to IEC 60715 | 35 mm, depth 7.5 mm or 15 mm |
| Mounting with screws | M4 |
| Fastening torque | 1.2 Nm |

4.6 Approvals and certifications

The PLC Automation catalog contains an [overview of the available approvals and certifications](#).

5 System data AC500-XC

5.1 Environmental conditions

Table 3: Process and supply voltages

| Parameter | Value |
|--|--|
| 24 V DC | |
| Voltage | 24 V (-15 %, +20 %) |
| Protection against reverse polarity | Yes |
| 100 V AC...240 V AC wide-range supply | |
| Voltage | 100 V ... 240 V (-15 %, +10 %) |
| Frequency | 50/60 Hz (-6 %, +4 %) |
| Allowed interruptions of power supply, according to EN 61131-2 | |
| DC supply | Interruption < 10 ms, time between 2 interruptions > 1 s, PS2 |
| AC supply | Interruption < 0.5 periods, time between 2 interruptions > 1 s |



NOTICE!

Risk of damaging the PLC due to improper voltage levels!

- Never exceed the maximum tolerance values for process and supply voltages.
- Never fall below the minimum tolerance values for process and supply voltages. Observe the **system data** [↗ Chapter 4 “System data AC500” on page 6](#) and the **technical data** of the module used.



NOTICE!

Improper voltage level or frequency range which cause damage of AC inputs:

- AC voltage above 264 V
- Frequency below 47 Hz or above 62.4 Hz



NOTICE!

Improper connection leads cause overtemperature on terminals.

PLC modules may be destroyed by using wrong cable type, wire size and cable temperature classification.

| Parameter | Value |
|-----------------------------|--|
| Temperature | |
| Operating | <p>-40 °C ... +70 °C</p> <p>-40 °C ... 0 °C: Due to the LCD technology, the display might respond very slowly.</p> <p>-40 °C ... +40 °C: Vertical mounting of modules possible, output load limited to 50 % per group</p> <p>+60 °C ... +70 °C with the following deratings:</p> <ul style="list-style-type: none"> • System is limited to max. 2 communication modules per terminal base • Digital inputs: maximum number of simultaneously switched on input channels limited to 75 % per group (e.g. 8 channels => 6 channels) • Digital outputs: output current maximum value (all channels together) limited to 75 % per group (e.g. 8 A => 6 A) • Analog outputs only if configured as voltage output: maximum total output current per group is limited to 75 % (e.g. 40 mA => 30 mA) • Analog outputs only if configured as current output: maximum number of simultaneously used output channels limited to 75 % per group (e.g. 4 channels => 3 channels) |
| Storage / Transport | -40 °C ... +85 °C |
| Humidity | Operating / Storage: 100 % r. H. with condensation |
| Air pressure | <p>Operating:</p> <p>-1000 m 5000 m (1080 hPa ... 620 hPa)</p> <p>> 2000 m (< 795 hPa):</p> <ul style="list-style-type: none"> • Max. operating temperature must be reduced by 10 K for each 1000 m exceeding 2000 m • I/O module relay contacts must be operated with 24 V nominal only |
| Immunity to corrosive gases | <p>Yes, according to:</p> <p>ISA S71.04.1985 Harsh group A, G3/GX IEC60068-2-60</p> <p>Method 4 with following concentrations:</p> <ul style="list-style-type: none"> • H2S 100 ± 10ppb • NO2 1250 ± 20ppb • CL2 100 ± 10ppb • SO2 300 ± 20ppb |
| Immunity to salt mist | Yes, horizontal mounting only, according to IEC 60068-2-52 severity level: 1 |



NOTICE!

Risk of corrosion!

Unused connectors and slots may corrode if XC devices are used in salt-mist environments.

Protect unused connectors and slots with TA535 protective caps for XC devices.



NOTICE!

Risk of malfunctions!

Unused slots for communication modules are not protected against accidental physical contact.

- Unused slots for communication modules must be covered with dummy communication modules to achieve IP20 rating.
- I/O bus connectors must not be touched during operation.

5.2 Creepage distances and clearances

The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.

5.3 Power supply units



AC500 and AC500-eCo PLC devices are Class II/Class III devices and do not require a Protective Earth (PE) connection.

For proper EMC performance, all metal parts, DIN rails, mounting screws, and cable shield connection terminals are connected to a common ground and provide Functional Earth (FE). This is typically connected to a common reference potential, such as equipotential bonding rails.

Signal Grounds (SGND or GND) are used for signal reference and must not be connected to cable shields, FE or other signals unless otherwise specified in the specific device description.



Safety Extra Low Voltage (SELV) and Protective Extra Low Voltage (PELV)

To ensure electrical safety of AC500/AC500-eCo extra low voltage circuits, 24 V DC supply, communication interfaces, I/O circuits, and all connected devices must be powered from sources meeting requirements of SELV, PELV, class 2, limited voltage or limited power according to applicable standards.

**WARNING!****Improper installation can lead to death by touching hazardous voltages!**

To avoid personal injury, safe separation, double or reinforced insulation and separation of the primary and secondary circuit must be observed and implemented during installation.

- Only use power converters for safety extra-low voltages (SELV) with safe galvanic separation of the primary and secondary circuit.
- Safe separation means that the primary circuit of mains transformers must be separated from the secondary circuit by double or reinforced insulation. The protective extra-low voltage (PELV) offers protection against electric shock.

5.4 Electromagnetic compatibility

Table 4: Electromagnetic compatibility

| Parameter | Value |
|---|--|
| Device suitable only as <i>Control Equipment for Industrial Applications</i> , including marine applications. IEC 61131-2, zone B  Chapter 5.6 "Approvals and certifications" on page 14 | |
| Radiated emission according to IEC 61000-6-4 CISPR11, class A | Yes |
| Conducted emission according to IEC 61000-6-4 CISPR11, class A | Yes |
| Electrostatic discharge (ESD) according to IEC 61000-4-2, criterion B | Air discharge: 8 kV Contact discharge: 6 kV |
| Fast transient interference voltages (burst) according to IEC 61000-4-4, criterion B | Power supply (DC): 4 kV Digital inputs/outputs (24 V DC): 2 kV Digital inputs/outputs (240 V AC): 4 kV Analog inputs/outputs: 2 kV Communication lines shielded: 2 kV |
| High energy transient interference voltages (surge) according to IEC 61000-4-5, criterion B | Power supply (DC): - Line to ground: 1 kV - Line to line: 0,5 kV Digital inputs/outputs/relay: (24 V DC): - Line to ground: 1 kV (AC): - Line to ground: 2 kV - Line to line: 1 kV Analog inputs/outputs: - Line to ground: 1 kV Communication lines: - Line to ground: 1 kV |

| Parameter | Value |
|---|------------------------------|
| Influence of radiated disturbances IEC 61000-4-3, criterion A | Test field strength: 10 V/m |
| Influence of line-conducted interferences IEC 61000-4-6, criterion A | Test voltage: 10 V |
| Power frequency magnetic fields IEC 61000-4-8, criterion A | 30 A/m 50 Hz 30 A/m 60 Hz |

5.5 Mechanical data

| Parameter | Value |
|--|---|
| Mounting | Horizontal/vertical (no application in salt mist environment) |
| Wiring method | Spring terminals |
| Degree of protection | PLC system: IP 20 <ul style="list-style-type: none"> • with all modules or option boards plugged in • with all terminals plugged in • with all covers closed |
| Housing | Classification V-2 according to UL 94 |
| Vibration resistance (sinusoidal) acc. to IEC 60068-2-6 | 2 Hz ... 8.4 Hz, 3.5 mm peak, 8.4 Hz ... 500 Hz, 2 g |
| Vibration resistance (broadband random) acc. to IEC 60068-2-64 | 5 Hz ... 500 Hz, 1,9 g rms (operational) 5 Hz ... 500 Hz, 4 g rms (non operational) |
| Shock resistance | All three axes 15 g, 11 ms, half-sinusoidal |
| Mounting of the modules: | |
| Mounting Rail Top Hat according to IEC 60715 | 35 mm, depth 7.5 mm or 15 mm |
| Mounting with screws | M4 |
| Fastening torque | 1.2 Nm |

5.6 Approvals and certifications

The PLC Automation catalog contains an [*overview of the available approvals and certifications*](#).