# 8BVI0330HWSA.000-1

## 1 General information

- Clearly structured, straightforward implementation via network-based safety technology
- Modular expandability through virtual wiring
- Immediate triggering of safety function thanks to short cycle times
- Easy implementation with transparent control and status information in the standard application as well
- Compact design

## 2 Order data

| Model number | Short description | Figure |
|---|---|---|
| | **Wall mounting** |  |
| 8BVI0330HWSA.000-1 | ACOPOSmulti inverter module, 33 A, HV, wall mounting, SafeMC SinCos | |
| | **Required accessories** | |
| | **Terminal block sets** | |
| 8BZVI0440SS.000-1A | Screw clamp set for ACOPOSmulti 8BVI0440HxSS and 8BVI0440HxSA modules: 1x 8TB2108.2010-00, 1x 8TB2104.203L-00, 1x 8TB4104.204G-10 | |
| | **Optional accessories** | |
| | **Fan modules** | |
| 8BXF001.0000-00 | ACOPOSmulti fan module, replacement fan for ACOPOSmulti modules (8BVP / 8B0C / 8BVI / 8BVE / 8B0K) | |
| | **Plug-in modules** | |
| 8BAC0120.000-1 | ACOPOSmulti plug-in module, EnDat 2.1 interface | |
| 8BAC0120.001-2 | ACOPOSmulti plug-in module, EnDat 2.2 interface | |
| 8BAC0121.000-1 | ACOPOSmulti plug-in module, HIPERFACE interface | |
| 8BAC0122.000-1 | ACOPOSmulti plug-in module, resolver interface 10 kHz | |
| 8BAC0123.000-1 | ACOPOSmulti plug-in module, incremental encoder and SSI absolute encoder interface for RS422 signals | |
| 8BAC0123.001-1 | ACOPOSmulti plug-in module, incremental encoder interface for 5 V single-ended and 5 V differential signals | |
| 8BAC0123.002-1 | ACOPOSmulti plug-in module, incremental encoder interface for 24 V single-ended and 24 V differential signals | |
| 8BAC0124.000-1 | ACOPOSmulti plug-in module, SinCos interface | |
| 8BAC0125.000-1 | ACOPOSmulti plug-in module, SinCos EnDat 2.1/SSI interface | |
| 8BAC0130.000-1 | ACOPOSmulti plug-in module, 2 digital outputs, 50 mA, max. 62,5 kHz, 4 digital outputs, 500 mA, max. 1,25 kHz, 2 digital inputs 24 VDC | |
| 8BAC0130.001-1 | ACOPOSmulti plug-in module, 2 digital outputs, 50 mA, max. 62.5 kHz, 4 digital outputs, 500 mA, max. 1.25 kHz | |
| 8BAC0132.000-1 | ACOPOSmulti input module, 4 analog inputs ±10 V | |
| 8BAC0133.000-1 | ACOPOSmulti plug-in module, 3 RS422 outputs for ABR encoder emulation, 1 Mhz | |
| | **POWERLINK cables** | |
| X20CA0E61.00020 | POWERLINK connection cable, RJ45 to RJ45, 0.2 m | |
| X20CA0E61.00025 | POWERLINK connection cable, RJ45 to RJ45, 0.25 m | |
| X20CA0E61.00030 | POWERLINK connection cable, RJ45 to RJ45, 0.3 m | |
| X20CA0E61.00035 | POWERLINK connection cable, RJ45 to RJ45, 0.35 m | |
| X20CA0E61.00050 | POWERLINK connection cable, RJ45 to RJ45, 0.5 m | |
| X20CA0E61.00100 | POWERLINK connection cable, RJ45 to RJ45, 1 m | |
| | **Shield component sets** | |
| 8SCS002.0000-00 | ACOPOSmulti shield component set: 1x clamping plate; 2x clamps D 4-13.5 mm; 4x screws | |
| 8SCS007.0000-00 | ACOPOSmulti shield component set: 1x shield mounting plate 2x 45°; 4x screws | |
| 8SCS008.0000-00 | ACOPOSmulti shield component set: 1x shield plate 2x type 0; 1x hose clamp, B 9 mm, D 23-35 mm | |
| 8SCS010.0000-00 | ACOPOSmulti shield component set: 1x ACOPOSmulti holding plate SK14-20; 1x shield terminal SK20 | |
| | **Terminal blocks** | |
| 8TB2104.203L-00 | Screw clamp 4-pin, single row, spacing: 5.08 mm, label 3: T- T + B- B+, L keying: 1010 | |

Table 1: 8BVI0330HWSA.000-1 - Order data

| Model number | Short description | Figure |
|---|---|---|
| 8TB2108.2010-00 | Screw clamp 8-pin, single row, spacing: 5.08 mm, label 1: numbered serially | |
| 8TB4104.204G-10 | Screw clamp 4-pin, single row, spacing: 10.16 mm, label 4: PE W V U, G keying: 0110 | |

Table 1: 8BVI0330HWSA.000-1 - Order data

# 3 Technical data

| Product ID | 8BVI0330HWSA.000-1 |
|---|---|
| **General information** | |
| B&R ID code | 0xE0B7 |
| Cooling and mounting method | Wall mounting |
| Slots for plug-in modules | 1 [1] |
| Certification | |
| CE | Yes |
| cULus | Yes |
| FSC | Yes |
| **DC bus connection** | |
| Voltage | |
| Nominal | 750 VDC |
| Continuous power consumption [2] | 24.4 kW |
| Power loss depending on the switching frequency [3] | |
| Switching frequency 5 kHz | $[0.07*I_M^2+7.3*I_M+40]$ W |
| Switching frequency 10 kHz | $[0.2*I_M^2+11.1*I_M+130]$ W |
| Switching frequency 20 kHz | $[1.85*I_M^2+3.8*I_M+300]$ W |
| DC bus capacitance | 990 µF |
| Design | ACOPOSmulti backplane |
| **24 VDC supply** | |
| Input voltage | 25 VDC ±1.6% |
| Input capacitance | 329 µF |
| Max. power consumption | In preparation |
| Design | ACOPOSmulti backplane |
| **24 VDC output** | |
| Quantity | 2 |
| Output voltage | |
| DC bus voltage ($U_{DC}$): 260 to 315 VDC | 25 VDC * ($U_{DC}$/315) |
| DC bus voltage ($U_{DC}$): 315 to 800 VDC | 24 VDC ±6% |
| protection | 250 mA (slow-blow) electronic, automatic reset |
| **Motor connection [4]** | |
| Quantity | 1 |
| Continuous power per motor connection [2] | 24 kW |
| Continuous current per motor connection [2] | 33 $A_{eff}$ |
| Reduction of continuous current depending on the switching frequency [5] | |
| Switching frequency 5 kHz | 1.57 A/K (from 40°C) [6] |
| Switching frequency 10 kHz | 0.5 A/K (from -10°C) [7] |
| Switching frequency 20 kHz | 0.36 A/K (from -77°C) [7] |
| Reduction of continuous current depending on the installation elevation | |
| Starting at 500 m above sea level | 3.3 $A_{eff}$ per 1000 m |
| Peak current | 83 $A_{eff}$ |
| Nominal switching frequency | 5 kHz |
| Possible switching frequencies [8] | 5/10/20 kHz |
| Electrical stress of the connected motor in accordance with IEC TS 60034-25 [9] | Limit value curve A |
| Protective measures | |
| Overload protection | Yes |
| Short circuit and ground fault protection | Yes |
| Max. output frequency | 600 Hz [10] |
| Design | |
| U, V, W, PE | Male connector |
| Shield connection | Yes |
| Terminal connection cross section | |
| Flexible and fine wire lines | |
| With wire end sleeves | 0.5 to 16 mm² |
| Approbation data | |
| UL/C-UL-US | 20 to 6 |
| CSA | 20 to 6 |
| Terminal cable cross section dimension of the shield connection | 23 to 35 mm |

Table 2: 8BVI0330HWSA.000-1 - Technical data

| Product ID | 8BVI0330HWSA.000-1 |
|---|---|
| Max. motor line length depending on the switching frequency | |
| Switching frequency 5 kHz | 25 m |
| Switching frequency 10 kHz | 25 m |
| Switching frequency 20 kHz | 25 m |
| **Motor holding brake connection** | |
| Quantity | 1 |
| Output voltage [11] | 24 VDC +5.8% / -0.5% [12] |
| Continuous current | 4.2 A |
| Max. internal resistance | 0.15 Ω |
| Extinction potential | Approx. 30 V |
| Max. extinction energy per switching operation | 3 Ws |
| Max. switching frequency | 0.5 Hz |
| Protective measures | |
| Overload and short circuit protection | Yes |
| Open line monitoring | Yes |
| Undervoltage monitoring | Yes |
| Response threshold for open line monitoring | Approx. 0.5 A |
| Response threshold for undervoltage monitoring | 24 VDC -2% / -4% |
| **Encoder interfaces [13]** | |
| Quantity | 1 |
| Type | SinCos |
| Connections | 15-pin female DSUB connector |
| Status indicators | UP/DN LEDs |
| Electrical isolation | |
| Encoder - ACOPOSmulti | No |
| Encoder monitoring | Yes |
| Max. encoder cable length | 50 m [14] |
| Encoder supply | |
| Output voltage | 5 V ±5% [15] |
| Load capability | 300 mA [16] |
| Sense lines | 2, compensation of max. 2 x 0.7 V |
| Protective measures | |
| Short circuit protection | Yes |
| Overload protection | Yes |
| Synchronous serial interface | |
| Signal transmission | RS485 |
| Data transfer rate | 781.25 kbit/s |
| Sine/Cosine inputs | |
| Signal transmission | Differential signals, symmetrical |
| Differential voltage | |
| In motion | 0.5 to 1.35 V [17] |
| At a standstill | 0.8 to 1.35 V [18] |
| Differential voltage deviation per signal period | ±10% [19] |
| Common-mode voltage | Max. ±7 V |
| Terminating resistors | 120 Ω |
| Max. input frequency | 200 kHz |
| Signal frequency (-5 dB) | <300 kHz |
| Signal frequency (-3 dB) | DC up to 200 kHz |
| ADC resolution | 12-bit |
| Reference input | |
| Signal transmission | Differential signal, symmetrical |
| Differential voltage for low | ≤ -0.2 V |
| Differential voltage for high | ≥ 0.2 V |
| Common-mode voltage | Max. -5 V to +9 V |
| Terminating resistors | 120 Ω |
| Position | |
| Resolution @ 1 $V_{SS}$ [20] | Number of encoder lines * 5700 |
| Precision [21] | --- |
| Noise [21] | --- |
| Max. power consumption per encoder interface | In preparation |
| **Trigger inputs** | |
| Quantity | 2 |
| Wiring | Sink |
| Electrical isolation | |
| Input - Inverter module | Yes |
| Input - Input | Yes |
| Input voltage | |
| Nominal | 24 VDC |
| Maximum | 30 VDC |
| Switching threshold | |
| Low | <5 V |
| High | >15 V |
| Input current at nominal voltage | Approx. 10 mA |

Table 2: 8BVI0330HWSA.000-1 - Technical data

| Product ID | 8BVI0330HWSA.000-1 |
|---|---|
| Switching delay | |
| Positive edge | 52 µs ± 0.5 µs (digitally filtered) |
| Negative edge | 53 µs ± 0.5 µs (digitally filtered) |
| Modulation compared to ground potential | Max. ±38 V |
| **Electrical characteristics** | |
| Discharge capacitance | 022 µF |
| **Operating conditions** | |
| Permitted mounting orientations | |
| Hanging vertically | Yes |
| Lying horizontally | Yes |
| Standing horizontally | No |
| Installation at elevations above sea level | |
| Nominal | 0 to 500 m |
| Maximum [22)] | 4000 m |
| Degree of pollution in accordance with EN 60664-1 | 2 (non-conductive pollution) |
| Overvoltage category in accordance with IEC 60364-4-443:1999 | III |
| EN 60529 protection | IP20 [23)] |
| **Environmental conditions** | |
| Temperature | |
| Operation | |
| Nominal | 5 to 40°C |
| Maximum [24)] | 55°C |
| Storage | -25 to 55°C |
| Transport | -25 to 70°C |
| Relative humidity | |
| Operation | 5 to 85% |
| Storage | 5 to 95% |
| Transport | Max. 95% at 40°C |
| **Mechanical characteristics** | |
| Dimensions [25)] | |
| Width | 1065 mm |
| Height | 317 mm |
| Depth | |
| Wall mounting | 263 mm |
| Weight | Approx. 5.4 kg |
| Module width | 2 |

Table 2: 8BVI0330HWSA.000-1 - Technical data

1) SLOT 2 is not occupied. SLOT 1 of the ACOPOSmulti module is occupied by the SafeMC module.
2) Valid in the following conditions: 750 VDC DC bus voltage, 5 kHz switching frequency, 40°C ambient temperature, installation altitude <500 m above sea level, no derating due to cooling type.
3) $I_M$ ... Current on the motor connection [A].
4) Only 8BCM motor cables from B&R may be used to connect the motor interfaces.
5) Valid in the following conditions: 750 VDC DC bus voltage. The temperature specifications refer to the ambient temperature.
6) Value for the nominal switching frequency.
7) The module cannot supply the full continuous current at this switching frequency. This unusual value for the ambient temperature, at which a derating of the continuous current must be accounted for, ensures that the derating of the continuous current can be determined in the same manner as at other switching frequencies.
8) B&R recommends operating the module at its nominal switching frequency. Operating the module at a higher switching frequency for application-specific reasons reduces the continuous current and increases the CPU load.
9) If necessary, the stress of the motor isolation system be reduced by an additional externally-wired dU/dt choke. For example, the RWK 305 three-phase du/dt choke from Schaffner (www.schaffner.com) can be used. IMPORTANT: Even when using a dU/dt choke, it is necessary to ensure that an EMC-compatible, low inductance shield connection is used!
10) The module's electrical output frequency (SCTRL_SPEED_ACT * MOTOR_POLEPAIRS) is monitored to protect against dual use in accordance with EC 428/2009 | 3A225. If the electrical output frequency of the module exceeds the limit value of 600 Hz uninterrupted for more than 0.5 s, then the current movement is aborted and error 6060 is output (Power element: Limit speed exceeded).
11) During project development, it is necessary to check if the minimum voltage can be maintained on the holding brake with the specified wiring. The operating voltage range of the holding brake can be found in the user's manual for the respective motor.
12) The specified values is only valid under the following conditions:
- The 24 VDC supply for the module is provided by an 8B0C auxiliary supply module installed on the same mounting plate.
If the 24 VDC supply for the module is applied to the mounting plate using an 8BVE expansion module, then the output voltage is reduced because of voltage drops on the expansion cable. In this case, undervoltage monitoring must be disabled.
13) Only shielded cables are permitted to be used.
The stranded wire for the analog interface (Sin, nSin, Cos, nCos, Ref, nRef) and the digital interface (T, nT, D, nD) must be twisted pair with a wave impedance of 120 Ω ±10%.
Additional shielding of the analog interface is recommended.
14) The maximum allowed cable length is 50 m.
15) During the power-on procedure for the encoder supply voltage (2 seconds), the monitoring limit for the supply voltage is increased from 5.25 V to 6 V. In this phase, overvoltages up to 6 V are not detected.
A short-term overvoltage of maximum 6 V should not damage the encoder electronics in any way.
An undervoltage on the encoder supply will result in a sine or cosine signal outside the specification.
16) An actual reserve of 12 mA exists for the terminating resistor.
17) The sine-cosine output signals from the measuring equipment are checked by the evaluation circuit using pointer length monitoring.
The pointer length $z = 2 \sqrt{((Sin - nSin)^2 + (Cos - nCos)^2)}$ is monitored according to the specified limits.
18) The sine-cosine output signals from the measuring equipment are checked by the evaluation circuit using pointer length monitoring.
The pointer length $z = 2 \sqrt{((Sin - nSin)^2 + (Cos - nCos)^2)}$ is also monitored according to the specified limits from the time the evaluation circuit is switched on until a signal period has passed.

19) The sine-cosine output signals from the measuring equipment are checked by the evaluation circuit using pointer length monitoring.
The pointer length $z = 2 \sqrt{((Sin - nSin)^2 + (Cos - nCos)^2)}$ is only permitted to vary by maximum ±10% per signal period.
20) This value does not correspond to the encoder resolution that must be configured in Automation Studio (16384 * number of encoder lines).
21) Limited by the encoder in practice.
22) Continuous operation at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the specified continuous current reductions into consideration).
23) This value only applies in its delivered state (SLOT2 of the module is sealed by a slot cover / shield plate). If SLOT2 on the module is not sealed, then the protection level is reduced to IP10. It is important to note that a 8SCS005.0000-00 shield set (slot cover / shield plate) or plug-in module must always be inserted!
24) Continuous operation at ambient temperatures ranging from 40°C to max. 55°C is possible (taking the specified continuous current reductions into consideration), but this will result in a shorter service life.
25) These dimensions refer to the actual device dimensions including the respective mounting plate. Make sure to leave additional space above and below the devices for mounting, connections and air circulation.

# 4 Dimension diagram and installation dimensions

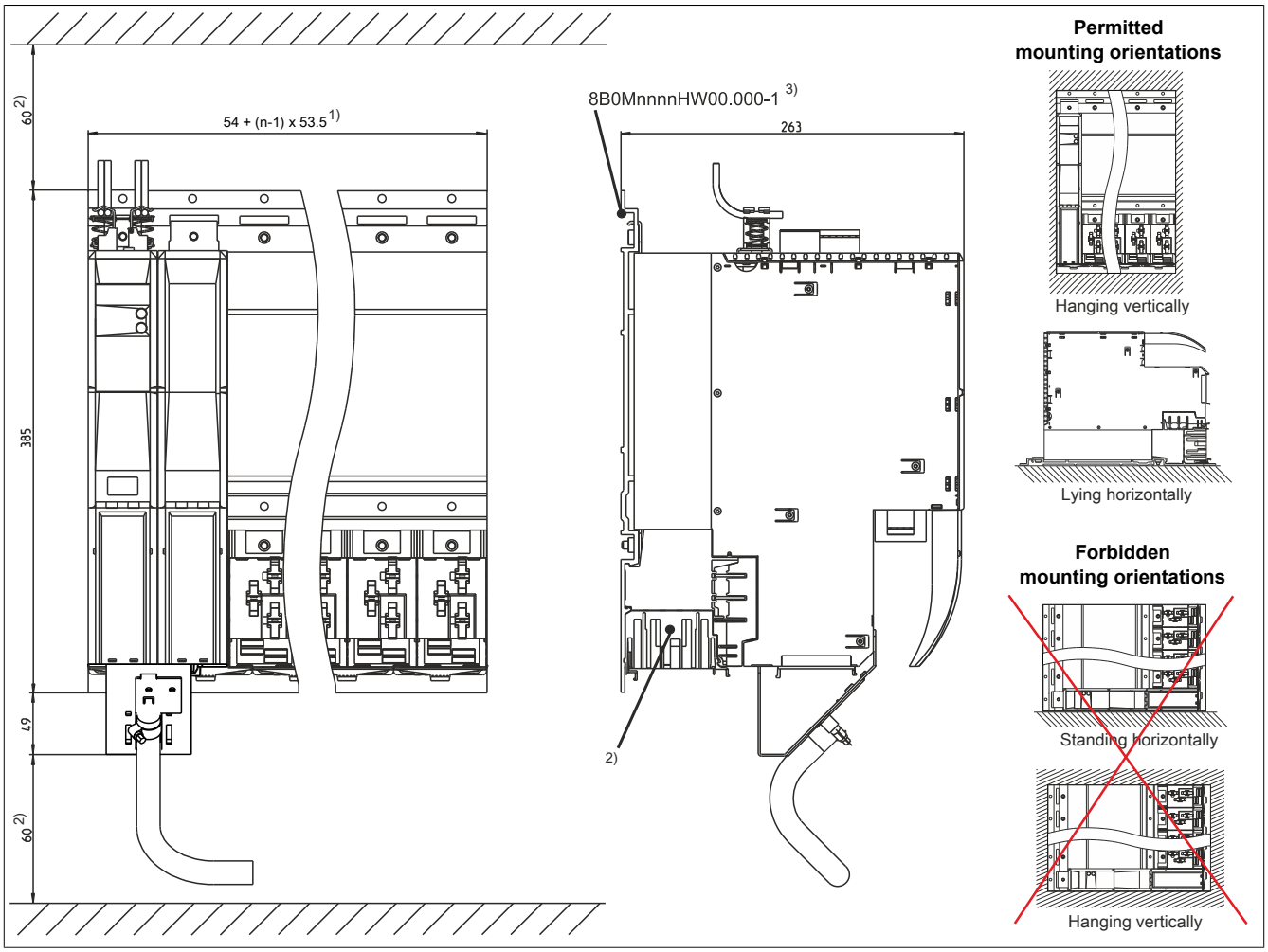



Figure 1: Dimension diagram and installation dimensions

1) n... Necessary width (slots) of the mounting plate.
2) For proper air circulation, at least 60 mm clearance must be available above and below the module.
**To ensure that the fan modules in the mounting plate can be replaced easily, at least 250 mm clearance must be available below the module.**
3) nnnn indicates the number of slots (e.g. 0160 refers to 16 slots).

# 5 Wiring: Safe double-width inverter modules (single-axis modules)

## 5.1 Pinout overview

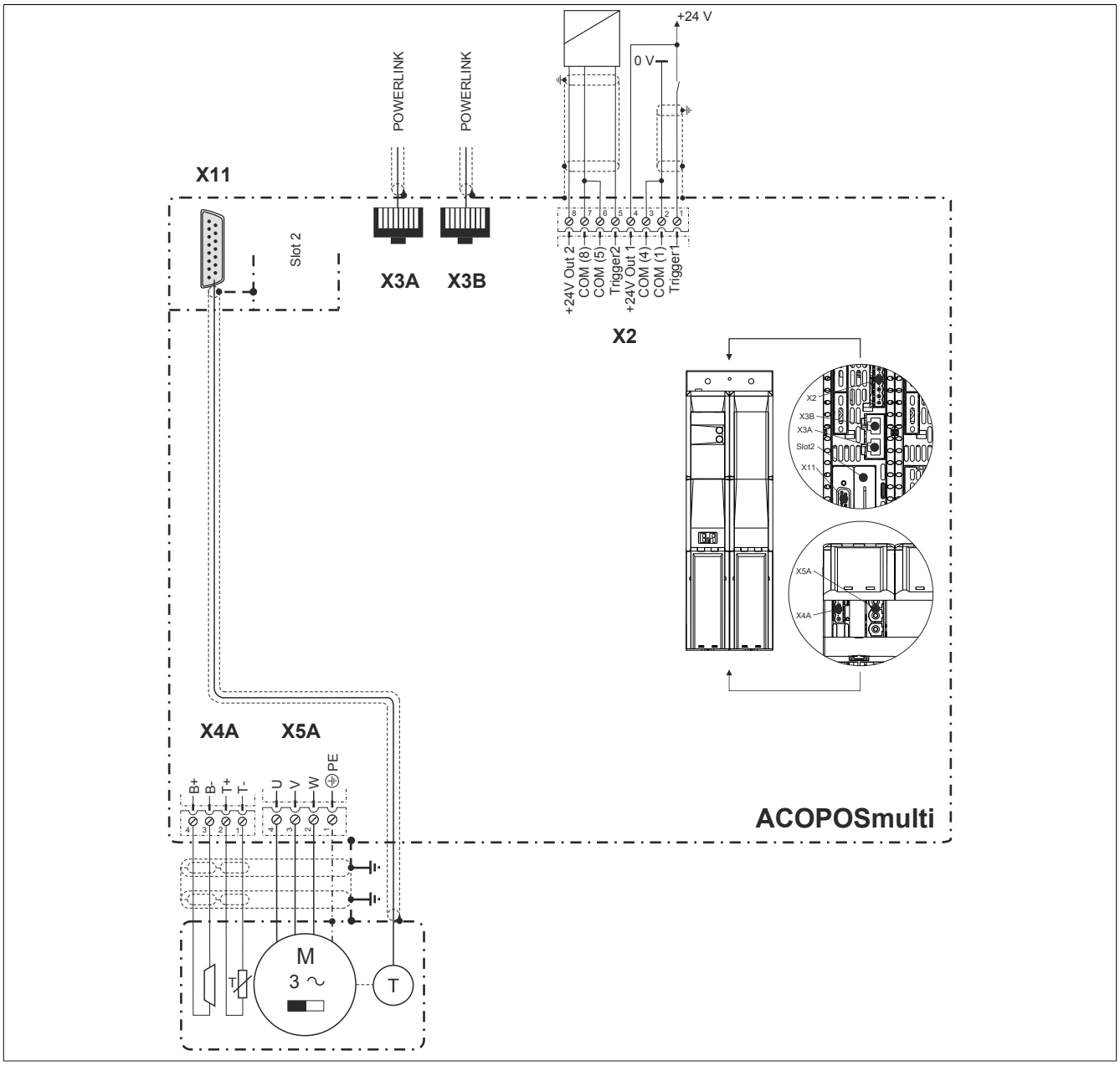



Figure 2: Pinout overview

## 5.2 X2 connector - Pinout

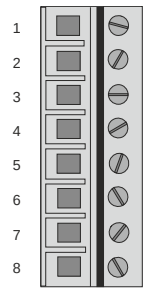
| X2 | Pin | Name | Function |
|---|---|---|---|
|  | 1 | Trigger 1 | Trigger 1 |
| | 2 | COM (1) | Trigger 1 0 V |
| | 3 | COM (2) | +24 V output 1 0 V |
| | 4 | +24V Out 1 | +24 V output 1 |
| | 5 | Trigger 2 | Trigger 2 |
| | 6 | COM (5) | Trigger 2 0 V |
| | 7 | COM (8) | +24 V output 2 0 V |
| | 8 | +24V Out 2 | +24 V output 2 |



Table 3: X2 connector - Pinout

## 5.3 X3A, X3B connectors - Pinout

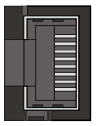
| X3A, X3B | Pin | Name | Function |
|---|---|---|---|
|   | 1 | RXD | Receive signal |
| | 2 | RXD\ | Receive signal inverted |
| | 3 | TXD | Transmit signal |
| | 4 | Shield | Shield |
| | 5 | Shield | Shield |
| | 6 | TXD\ | Transmit signal inverted |
| | 7 | Shield | Shield |
| | 8 | Shield | Shield |

Table 4: X3A, X3B connectors - Pinout

## 5.4 X4A connector - Pinout

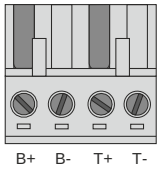
| X4A | Name | Function |
|---|---|---|
|   | T- | Axis 1: Temperature sensor - |
| | T+ | Axis 1: Temperature sensor + |
| | B- 1) | Axis 1: Brake - |
| | B+ 1) | Axis 1: Brake + |

Table 5: X4A connector - Pinout

1) Wiring is not permitted to exceed a total length of 3 m.

## Danger!

**The functional fail safe state is enabled if the SBC output B+ is shorted to 24V (i.e. safe pulse disabling is activated). However, the brake always remains on/released because of the short circuit to 24 V!**
**This can lead to dangerous situations because the motor holding brake (and in the case of hanging loads, the unrestrained reduction) cannot be halted/prevented!**
**Appropriate wiring measures must be implemented to ensure that the SBC output B+ is not shorted to 24V!**

## Danger!

**The SBC output**

- **may not be wired to multiple modules!**
- **may not be wired as open emitter!**
- **may not be wired as open collector!**

## Danger!

**Only one output voltage of ≤5 V can be ensured for the safe motor holding brake output when shut off. When selecting a motor holding brake, the user has to make sure that the required braking torque is reached at a current voltage of 5 V.**

## Information:

**The transistors of the SBC output stage are tested cyclically. When the output channels are active, this test emits low pulses on the output with a maximum length of 600 µs.**

**This must be taken into consideration when choosing the motor holding brake!**

## Danger!

**The connections for the motor temperature sensors and the motor holding brake are safely isolated circuits. These connections are therefore only permitted to be connected to devices or components that have sufficient isolation in accordance with IEC 60364-4-41 or EN 61800-5-1.**

## Caution!

**If B+ and B- are swapped when connecting the permanent magnet holding brakes, then the brakes cannot be opened! ACOPOSmulti inverter modules cannot determine if a holding brake is connected with reverse polarity!**

## Warning!

**Temperature sensors are only permitted to be connected to the X4A/T+ and X4A/T- connectors on an ACOPOSmulti module under the following conditions:**

- **There is no ACOPOSmulti plug-in module in SLOT1 on the ACOPOSmulti module with a temperature sensor connected to T+ and T-.**

**Otherwise, the temperature monitoring functions on the ACOPOSmulti module may become ineffective, which in extreme cases can cause the hardware (e.g. motors) connected to the ACOPOSmulti module to be destroyed!**

### 5.5 X5A connector - Pinout

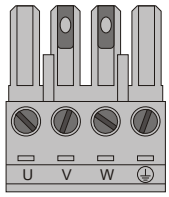
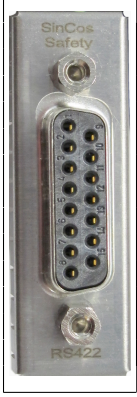
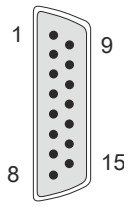
| X5A | Name | Function |
|---|---|---|
|  | ⏚ | Axis 1: Protective ground conductor |
| | W | Axis 1: Motor connection W |
| | V | Axis 1: Motor connection V |
| | U | Axis 1: Motor connection U |

Table 6: X5A connector - Pinout

## Information:

**Only 8BCM motor cables from B&R may be used to connect the motor interfaces.**

### 5.6 Pinout - SafeMC module

| Figure | X11 (X12) | Pin | Name | Function |
|---|---|---|---|---|
|  |  | 1 | A | Channel A/Sin |
| | | 2 | COM | Ground |
| | | 3 | B | Channel B/COS |
| | | 4 | +5 V | Encoder supply + |
| | | 5 | D | Data |
| | | 6 | --- | --- |
| | | 7 | R\ | Reference pulse inverted/nREF |
| | | 8 | T | Clock cycle |
| | | 9 | A\ | Channel A inverted/nSIN |
| | | 10 | Sense COM | Sense ground |
| | | 11 | B\ | Channel B inverted/nCOS |
| | | 12 | Sense +5V | Sense input +5 V |
| | | 13 | D\ | Data inverted |
| | | 14 | R | Reference pulse/REF |
| | | 15 | T\ | Clock cycle inverted |

## Information:

**The SafeMC modules cannot be replaced! SafeMC modules and the corresponding inverter module form a single unit. In the event of an error, the entire inverter module must be replaced.**