# 8BVI0330HWSS.000-4

## 1 General information

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

# 2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Wall mounting** |  |
| 8BVI0330HWSS.000-4 | ACOPOSmulti3 SafeMOTION EnDat 2.2 Gen2 inverter module, 33 A, AS, wall mounting, optimized for applications with decentralized, computationally intensive open-loop and closed-loop control requirements | |
| | **Required accessories** | |
| | **Terminal block sets** | |
| 8BZVI0440SS.000-1A | Screw clamp terminal block set for ACOPOSmulti 8BVI0440HxSS and 8BVI0440HxSA modules: 1x 8TB2108.2010-00, 1x 8TB2104.203L-00, 1x 8TB4104.204G-10 | |
| | **Optional accessories** | |
| | **Accessory sets** | |
| 8BXB000.0000-00 | ACOPOSmulti accessory set for encoder buffering consisting of: 1x battery AA 3.6 V, 1x protective cover for battery holder | |
| | **Fan modules** | |
| 8BXF001.0000-00 | ACOPOSmulti fan module, replacement fan for ACOPOSmulti modules (8BxP/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/BiSS interface | |
| 8BAC0130.000-1 | ACOPOSmulti plug-in module, 2 digital outputs, 50 mA, max. 62.5 kHz, 2 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 plug-in module, 4 analog inputs ±10 V | |
| 8BAC0133.000-1 | ACOPOSmulti plug-in module, 3 RS422 outputs for ABR encoder emulation, 1 MHz | |
| | **POWERLINK/Ethernet cables** | |
| X20CA0E61.00020 | POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.2 m | |
| X20CA0E61.00025 | POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.25 m | |
| X20CA0E61.00030 | POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.3 m | |
| X20CA0E61.00035 | POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.35 m | |
| X20CA0E61.00050 | POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.5 m | |
| X20CA0E61.00100 | POWERLINK/Ethernet connection cable, RJ45 to RJ45, 1 m | |
| | **Shield component sets** | |
| 8SCS002.0000-00 | ACOPOSmulti shield component set: 1x clamping plate, 2x clamp D 4-13.5 mm, 2x 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 connection clamp SK20 | |
| | **Terminal blocks** | |
| 8TB2104.203L-00 | 4-pin screw clamp terminal block, 1-row, pitch: 5.08 mm, label 3: T- T+ B- B+, coding L: 1010 | |
| 8TB2108.2010-00 | 8-pin screw clamp terminal block, 1-row, pitch: 5.08 mm, label 1: Numbered consecutively | |
| 8TB4104.204G-10 | 4-pin screw clamp terminal block, 1-row, pitch: 10.16 mm, label 4: PE W V U, coding G: 0110 | |

Table 1: 8BVI0330HWSS.000-4 - Order data

# 3 Technical data

| Order number | 8BVI0330HWSS.000-4 |
|---|---|
| **General information** | |
| B&R ID code | 0x2FDA |
| System requirements | |
| Automation Studio | 4.6.1.x or later |
| mapp Technology Package | mapp Safety 5.24.0 or later |
| Cooling and mounting type | Wall mounting |
| Slots for plug-in modules | 2 [1] |
| Certifications | |
| CE | Yes |
| UKCA | Yes |
| Functional safety [2] | Yes (openSAFETY) |
| UL | cULus E225616<br>Power conversion equipment |
| KC | Yes |
| **DC bus connection** | |
| Voltage | |
| Nominal | 750 VDC |
| Continuous power consumption [3] | 24.4 kW |
| Power dissipation depending on switching frequency [4] | |
| 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 |
| Variant | ACOPOSmulti backplane |
| **24 VDC power supply** | |
| Input voltage | 25 VDC ±1.6% |
| Input capacitance | 32.9 µF |
| Max. power consumption | 31 W + $P_{SMC1}$ + $P_{SLOT2}$ + $P_{24\ V\ Out}$ + $P_{HoldingBrake}$ [5] |
| Variant | 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% |
| Fuse protection | 250 mA (slow-blow) electronic, automatic reset |
| **Motor connection [6]** | |
| Quantity | 1 |
| Continuous power per motor connection [3] | 24 kW |
| Continuous current per motor connection [3] | 33 $A_{eff}$ |
| Reduction of continuous current depending on switching frequency [7] | |
| Switching frequency 5 kHz | 1.57 A/K (starting at 40°C) [8] |
| Switching frequency 10 kHz | 0.5 A/K (starting at -10°C) [9] |
| Switching frequency 20 kHz | 0.36 A/K (starting at -77°C) [9] |
| Reduction of continuous current depending on 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 [10] | 5 / 10 / 20 kHz |
| Insulation stress of the connected motor per IEC TS 60034-25:2004 [11] | Limit value curve A [12] |
| Protective measures | |
| Overload protection | Yes |
| Short-circuit and ground fault protection | Yes |
| Max. output frequency | 598 Hz [13] |
| Variant | |
| U, V, W, PE | Connector |
| Shield connection | Yes |
| Terminal connection cross section | |
| Flexible and fine-stranded wires | |
| 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 shield connection | 23 to 35 mm |

Table 2: 8BVI0330HWSS.000-4 - Technical data

| Order number | 8BVI0330HWSS.000-4 |
|---|---|
| Max. motor line length depending on 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 [14] | 24 VDC +5.8% / -0.5% [15] |
| Continuous current per connection | 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-circuit monitoring | Yes |
| Undervoltage monitoring | Yes |
| Response threshold for open-circuit monitoring | Approx. 0.5 A |
| Response threshold for undervoltage monitoring | 24 VDC -2% / -4% |
| **Encoder interfaces [16]** | |
| Quantity | 1 |
| Type | EnDat 2.2 [17] |
| Connections | 9-pin female DSUB connector |
| Status indicators | UP/DN LEDs |
| Electrical isolation | |
| Encoder - ACOPOSmulti | No |
| Encoder monitoring | Yes |
| Max. encoder cable length | 100 m<br>Depends on the cross section of the power supply wires in the encoder cable [18] |
| Encoder power supply | |
| Output voltage | Typ. 12.5 V |
| Load capacity | 350 mA |
| Protective measures | |
| Short-circuit proof | Yes |
| Overload-proof | Yes |
| Synchronous serial interface | |
| Signal transmission | RS485 |
| Data transfer rate | 6.25 Mbit/s |
| Max. power consumption per encoder interface | $P_{SMC}$[W] = 19 V * $I_{Encoder}$[A] [19] |
| **Trigger inputs** | |
| Quantity | 2 |
| Circuit | 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 |
| Switching delay | |
| Rising edge | 52 µs ±0.5 µs (digitally filtered) |
| Falling edge | 53 µs ±0.5 µs (digitally filtered) |
| Modulation compared to ground potential | Max. ±38 V |
| **Temperature sensor connection** | |
| Quantity | 1 |
| Resistance range | 500 Ω to 5 kΩ |
| **Support** | |
| Motion system | |
| mapp Motion | 5.24.1 and higher |
| ACP10/ARNC0 | 5.24.1 and higher |
| **Electrical properties** | |
| Discharge capacitance | 0.22 µF |
| **Operating conditions** | |
| Permissible mounting orientations | |
| Hanging vertically | Yes |
| Horizontal, face up | Yes |
| Standing horizontally | No |
| Installation elevation above sea level | |
| Nominal | 0 to 500 m |
| Maximum [20] | 4000 m |

Table 2: 8BVI0330HWSS.000-4 - Technical data

| Order number | 8BVI0330HWSS.000-4 |
|---|---|
| Pollution degree per EN 61800-5-1 | 2 (non-conductive pollution) |
| Overvoltage category per EN 61800-5-1 | III |
| Degree of protection per EN 60529 | IP20 [21] |
| **Ambient conditions** | |
| Temperature | |
| Operation | |
| Nominal | 5 to 40°C |
| Maximum | 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 properties** | |
| Dimensions [22] | |
| Width | 106.5 mm |
| Height | 317 mm |
| Depth | |
| Wall mounting | 263 mm |
| Weight | Approx. 5.4 kg |
| Module width | 2 |

Table 2: 8BVI0330HWSS.000-4 - Technical data

1) SLOT 2 is available. SLOT 1 of the ACOPOSmulti module is occupied by the SafeMOTION module.
2) Achievable safety classifications (safety integrity level, safety category, performance level) are documented in the user's manual (section "Safety technology").
3) Valid under the following conditions: 750 VDC DC bus voltage, 5 kHz switching frequency, 40°C ambient temperature, installation elevation <500 m above sea level, no derating due to cooling type.
4) $I_M$ ... Current on motor connection X5A [$A_{eff}$]
5) $P_{SMC1}$ ... Max. power consumption $P_{SMC}$ [W] of the SafeMOTION module in SLOT1 (see section "Encoder interfaces").
   $P_{SLOT2}$ ... Max. power consumption $P_{8BAC}$ [W] of the plug-in module in SLOT2 (see the technical data for the respective plug-in module).
   $P_{24\ V\ Out}$ ... Power [W] that is output to connections X2/+24 V Out 1 and X2/+24 V Out 2 on the module (max. 10 W).
6) Only B&R 8BCM motor cables are permitted to be used for wiring the motor connections!
7) Valid under the following conditions: 750 VDC DC bus voltage. The temperature specifications refer to the ambient temperature.
8) Value for the nominal switching frequency.
9) The module cannot supply the full continuous current at this switching frequency. This unusual value for the ambient temperature, at which derating of the continuous current must be taken into account, ensures that the derating of the continuous current can be determined in the same manner as at other switching frequencies.
10) 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 CPU utilization.
11) If necessary, the stress of the motor isolation system can be reduced by an additional externally wired dv/dt choke. For example, the RWK 305 three-phase dv/dt choke from Schaffner (www.schaffner.com) can be used. IMPORTANT: Even when using a dv/dt choke, it is necessary to ensure that an EMC-compatible, low inductance shield connection is used!
12) Only applies when using B&R motor cables and B&R motors.
13) The module's electrical output frequency (SCTRL_SPEED_ACT * MOTOR_POLEPAIRS) is monitored to protect against dual use in accordance with Regulation (EC) 428/2009 | 3A225. If the electrical output frequency of the module exceeds the limit value of 598 Hz uninterrupted for more than 0.5 s, then the current movement is aborted and error 6060 is output ("Power unit: Limit speed exceeded").
14) During configuration, it is necessary to check if the minimum voltage can be maintained on the holding brake with the intended wiring. For the operating voltage range of the holding brake, see the user documentation for the motor being used.
15) The specified value is only valid under the following conditions:
   - The 24 VDC power supply for the module is provided by an 8B0C auxiliary supply module located on the same mounting plate.
   If the 24 VDC power 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.
16) Only B&R 8BCF EnDat 2.2 cables are permitted to be used for wiring the encoder interfaces.
17) An EnDat 2.2 functional safety encoder is required when using ACOPOSmulti SafeMOTION inverter modules! With standard EnDat 2.2 encoders, only the STO, SBC and time-monitored SS1 safety functions are available!
18) Maximum encoder cable length $l_{max}$ can be calculated as follows (the maximum permissible encoder cable length of 100 m is not permitted to be exceeded):

   $l_{max} = 7.9 / I_G * A * 1/(2*\rho)$

   $I_G$ ... Max. current consumption of the encoder [A].
   A ... Cross section of the power supply wires [mm²]
   ρ ... Specific resistance [Ω mm²/m] (e.g. for copper: ρ = 0.0178)
19) $I_{Encoder}$ ... Max. current consumption of the connected encoder [A].
20) Continuous operation at an installation elevation of 500 m to 4,000 m above sea level is possible taking the specified reduction of continuous current into account.
21) 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 level of protection 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!
22) These dimensions refer to the actual device dimensions including the respective mounting plate. Additional spacing above and below the devices must be taken into account for mounting, connections and air circulation.

# 4 Overload characteristics

The continuous current for the module is permitted to be exceeded for a short time during operation (dynamic overload).

### Overload response: WARNING

When the module exceeds the maximum overload duration, it outputs a warning.

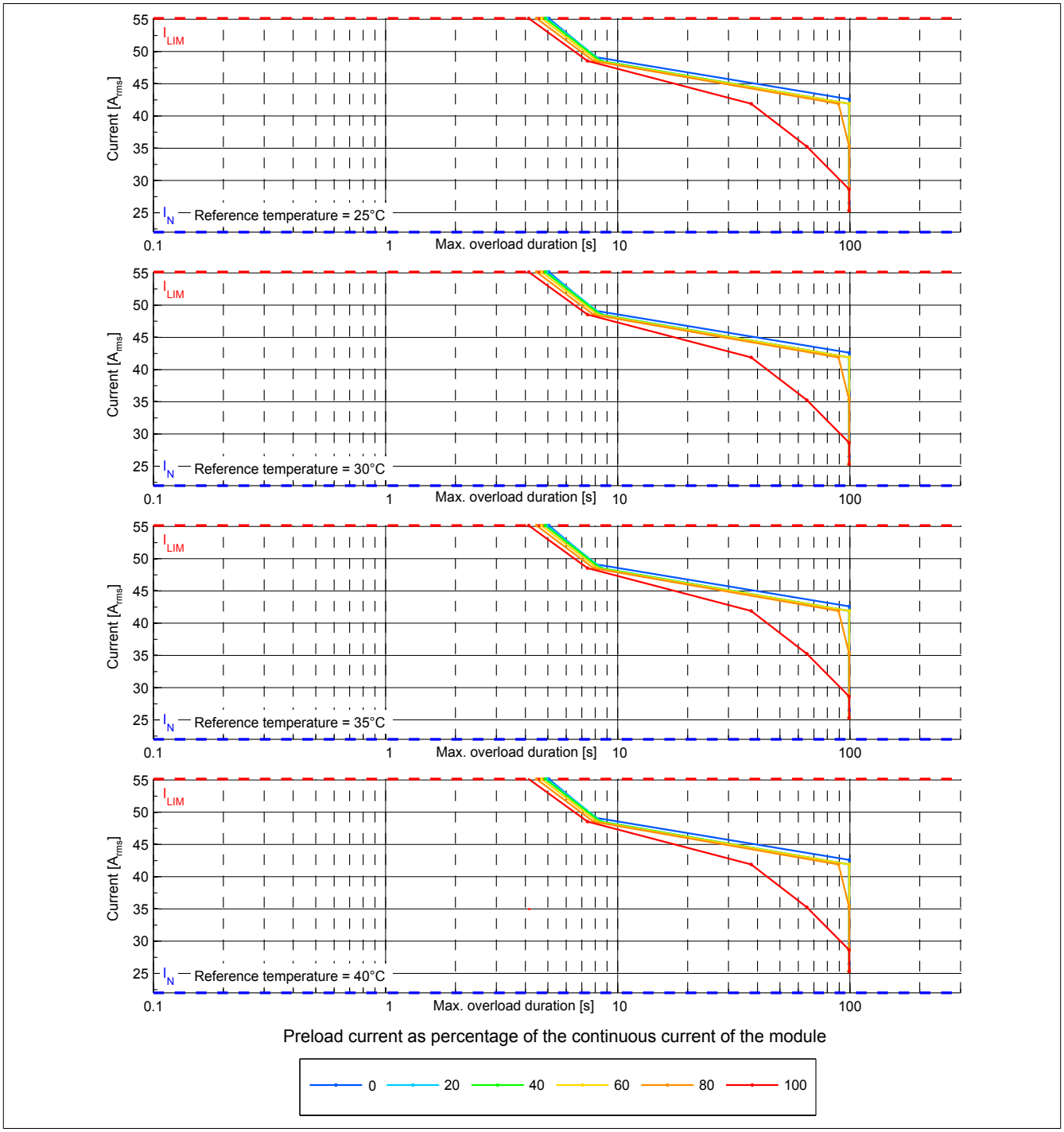



Figure 1: 8BVI0220HWSx.000-x - Overload characteristics, overload response - WARNING

| | |
|---|---|
| $I_N$ | Continuous current of the module [$A_{rms}$] |
| $I_{LIM}$ | Peak current of the module [$A_{rms}$] |
| Mounting type: | Wall mounting |
| DC bus voltage: | 750 V |
| Switching frequency: | 5 kHz |
| Rotary frequency of current indicator: | 20 Hz |
| Reference temperature: | Room temperature on device fan |

## Overload response ERROR + STOP

When the module exceeds the maximum overload duration, it outputs an error and executes a movement stop with current limiting (ERROR + STOP).

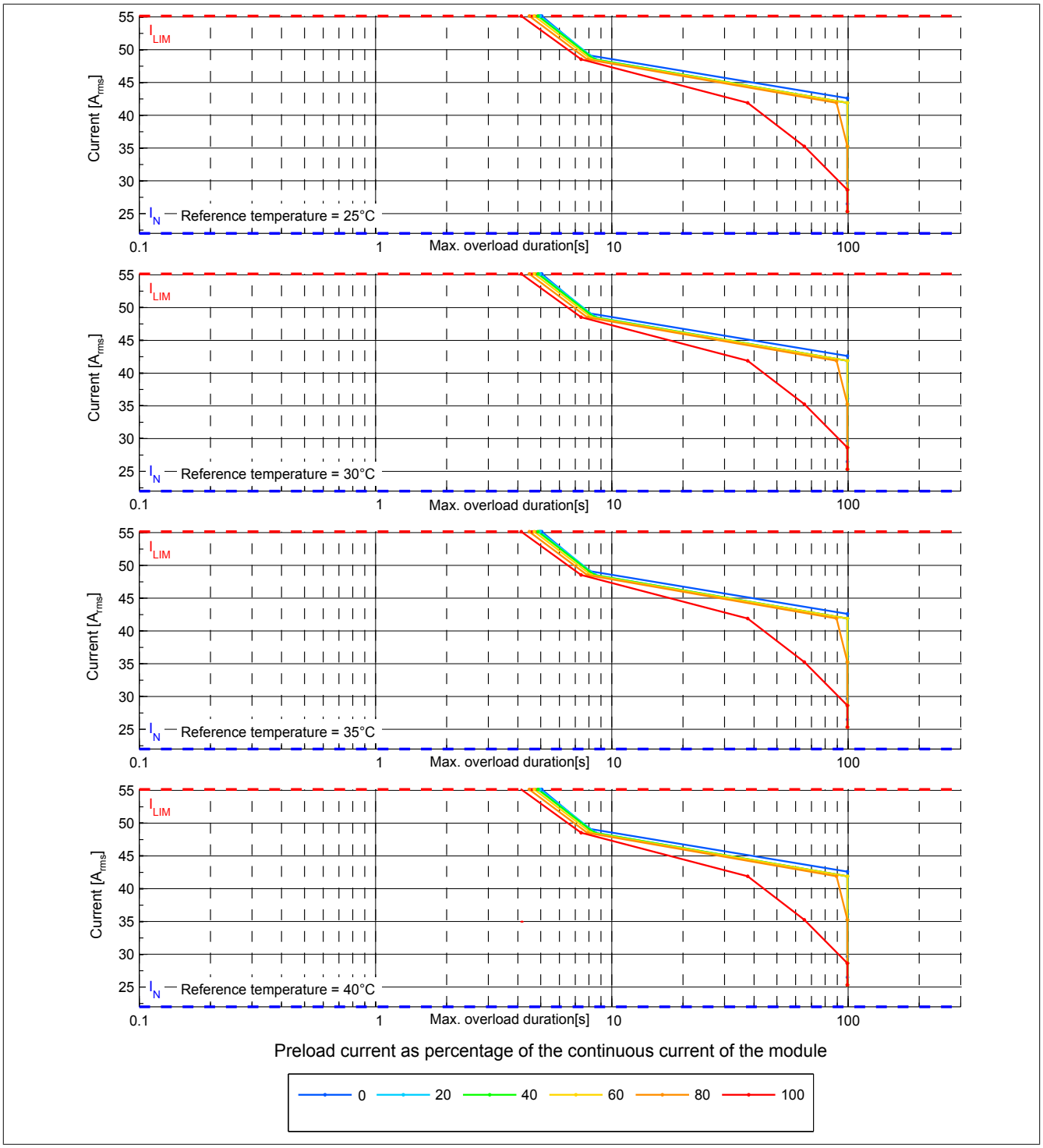



Figure 2: 8BVI0220HWSx.000-x - Overload characteristics, overload response - ERROR+STOP

| | |
|---|---|
| $I_N$ | Continuous current of the module [$A_{rms}$] |
| $I_{LIM}$ | Peak current of the module [$A_{rms}$] |
| Mounting type: | Wall mounting |
| DC bus voltage: | 750 V |
| Switching frequency: | 5 kHz |
| Rotary frequency of current indicator: | 20 Hz |
| Reference temperature: | Room temperature on device fan |

# 5 Status indicators

Status indicators are located on the black cover of each module.

## 5.1 8BVI SafeMOTION inverter modules

### 5.1.1 1-axis modules

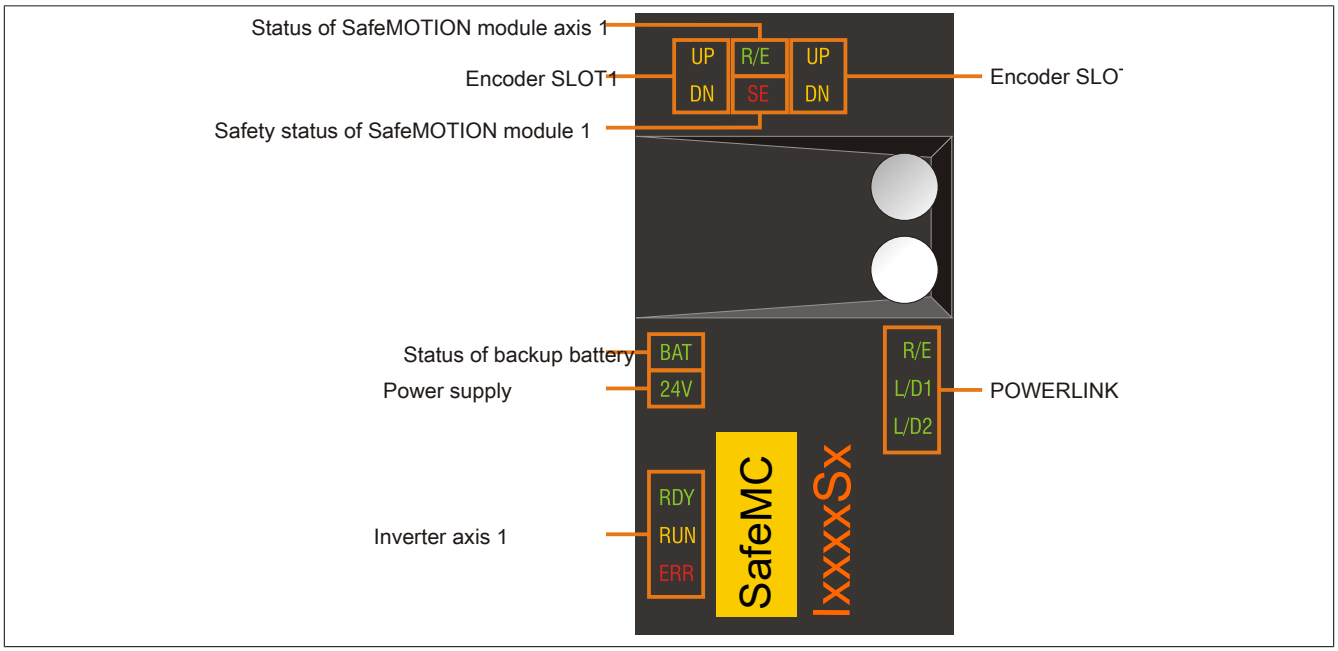



Figure 3: 8BVI SafeMOTION inverter modules (1-axis modules) - Status indicator groups[1)]

[1)] Status indicator group "Backup battery status" is only available for modules with an integrated battery holder. Starting with a certain revision, the integrated battery holder is not included and using accessory kit 8BXB000.0000-00 (battery for encoder buffering) is no longer possible. For details, see the revision information of the respective module (www.br-automation.com).

### 5.1.2 LED status indicators

| Status indicator group | Label | Color | Function | Description |
|---|---|---|---|---|
| POWERLINK | R/E | Green/Red | Ready/Error | see "POWERLINK - LED status indicators" on page 9 |
| | L/D1 | Green | Link/Data activity on port 1 | |
| | L/D2 | | Link/Data activity on port 2 | |
| Inverter axis 1 | RDY | Green | Ready | see "RDY, RUN, ERR (8BVI, 8BVP, 8B0P) - LED status indicators" on page 9 |
| | RUN | Orange | Run | |
| | ERR | Red | Error | |
| Status of backup battery [1] | BAT | Green/Red | Ready/Error | see "Backup battery (ACOPOSmulti SafeMOTION EnDat 2.2) - LED status indicators" on page 10 |
| Power supply | 24 V | Green | 24 V OK | The 24 V module power supply voltage is within the tolerance range. |
| Encoder SLOT1 | UP | Orange | Encoder direction of rotation + | Indicates that the position of the connected encoder is changing in the positive direction. The faster the encoder position changes, the brighter the LED is lit. |
| | DN | | Encoder direction of rotation - | Indicates that the position of the connected encoder is changing in the negative direction. The faster the encoder position changes, the brighter the LED is lit. |
| Encoder SLOT2 | UP | Orange | Encoder direction of rotation + | see Encoder SLOT1 |
| | DN | | Encoder direction of rotation - | |
| Status of SafeMOTION module axis 1 | R/E | Green/Red | Ready/Error | see "SafeMOTION module - LED status indicators" on page 11 |
| Safety status of SafeMOTION module 1 | SE | Red | Safe/Error | |

Table 3: 8BVI SafeMOTION inverter modules (1-axis modules) - LED status indicators

1) Status indicator group "Backup battery status" is only available for modules with an integrated battery holder. Starting with a certain revision, the integrated battery holder is not included and using accessory kit 8BXB000.0000-00 (battery for encoder buffering) is no longer possible. For details, see the revision information of the respective module (www.br-automation.com).

### 5.1.3 RDY, RUN, ERR (8BVI, 8BVP, 8B0P) - LED status indicators

| Label | Color | Function | Description | |
|---|---|---|---|---|
| RDY | Green | Ready | Solid green | The module is operational and the power stage can be enabled (operating system present and booted, no permanent or temporary errors). |
| | | | Blinking green [1] | The module is not ready for operation.<br>**Examples:**<br>• No signal on one or both enable inputs<br>• DC bus voltage outside the tolerance range<br>• Overtemperature on the motor (temperature sensor)<br>• Motor feedback not connected or defective<br>• Motor temperature sensor not connected or defective<br>• Overtemperature on the module (IGBT junction, heat sink, etc.)<br>• Disturbance on network |
| RUN | Orange | Run | Solid orange | The module's power stage is enabled. |
| ERR | Red | Error | Solid red [1] | There is a permanent error on the module.<br>**Examples:**<br>• Permanent overcurrent<br>• Invalid data in EPROM |

Table 4: RDY, RUN, ERR (8BVI, 8BVP, 8B0P) - LED status indicators

1) Firmware V2.130 and later.

### 5.1.4 POWERLINK - LED status indicators

| Label | Color | Function | Description | |
|---|---|---|---|---|
| R/E | Green/Red | Ready/Error | LED off | The module is not supplied with power or network interface initialization has failed. |
| | | | Solid red | The POWERLINK node number of the module is 0. |
| | | | Blinking red/green | The client is in an error state (drops out of cyclic operation). |
| | | | Blinking green (1x) | The client detects a valid POWERLINK frame on the network. |
| | | | Blinking green (2x) | Cyclic operation on the network is taking place, but the client itself is not yet a participant. |
| | | | Blinking green (3x) | Cyclic operation of the client is in preparation. |
| | | | Solid green | The client is participating in cyclic operation. |
| | | | Flickering green | The client is not participating in cyclic operation and also does not detect any other stations on the network participating in cyclic operation. |

Table 5: POWERLINK - LED status indicators

| Label | Color | Function | Description | |
|---|---|---|---|---|
| L/D1 | Green | Link/Data activity on port 1 | Solid green | A physical connection has been established to another station on the network. |
| | | | Blinking green | Activity on port 1 |
| L/D2 | Green | Link/Data activity on port 2 | Solid green | A physical connection has been established to another station on the network. |
| | | | Blinking green | Activity on port 2 |

Table 5: POWERLINK - LED status indicators

### 5.1.5 Backup battery (ACOPOSmulti SafeMOTION EnDat 2.2) - LED status indicators

| Label | Color | Function | Description | |
|---|---|---|---|---|
| BAT [1)] | Green/Red | Ready/Error | LED off | **Possible causes:**<br>• The voltage of the installed backup battery is within the tolerance range, but an EnDat encoder with backup battery is not connected.<br>• A battery-backed EnDat encoder is connected and registering "Battery OK", but the module's firmware version does not support EnDat encoders with battery backup. |
| | | | Solid green | A battery-backed EnDat encoder is connected and registering "Battery OK" (voltage of the installed backup battery is within the tolerance range). |
| | | | Solid red | A battery-backed EnDat encoder is connected and registering "Battery not OK".<br>**Possible causes:**<br>• Voltage of the installed backup battery outside of tolerance range<br>• No backup battery installed in module |

Table 6: Backup battery - LED status indicators

1) Status indicator group "Backup battery status" is only available for modules with an integrated battery holder. Starting with a certain revision, the integrated battery holder is not included and using accessory kit 8BXB000.0000-00 (battery for encoder buffering) is no longer possible. For details, see the revision information of the respective module (www.br-automation.com).

### 5.1.6 SafeMOTION module - LED status indicators

There are 3 additional LEDs for each safe axis behind the front cover of an ACOPOSmulti SafeMOTION inverter module:

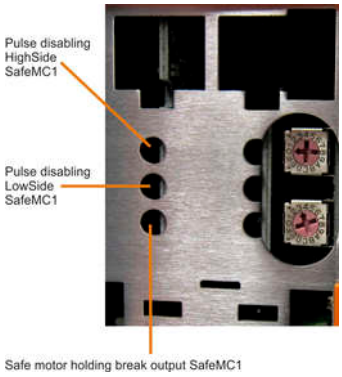



Figure 4: 1-axis modules

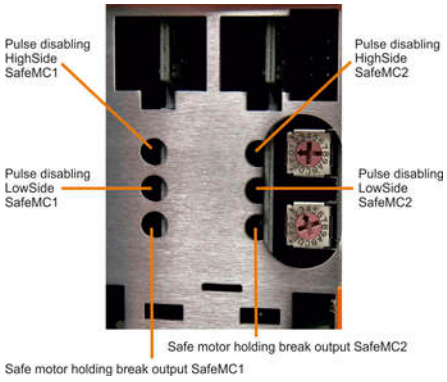



Figure 5: 2-axis modules

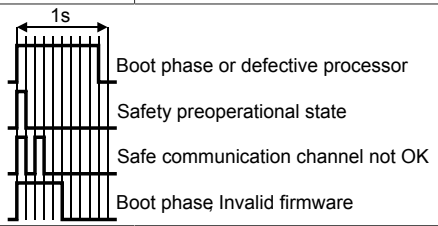
| LED | Color | | Description |
|---|---|---|---|
| R/E | Green | Red | |
| | Off | Off | Module not supplied with power, no communication |
| | Single flash | | Mode "Unlink" |
| | Double flash | | Updating the firmware |
| | Blinking | | Mode PREOPERATIONAL |
| | On | | Mode RUN |
| | On | Single flash, inverse | Safety-related firmware invalid |
| | | Triple flash, inverse | Updating safety-related firmware |
| | | On | Communication error |
| | Off | On | Error |
| LED status indicator<br>Pulse disabling output, high-side | Red | | Warning/Error on the channel<br>During the startup phase, the channel LEDs are always lit constantly red. |
| | Orange | | 24 V on the output |
| | Off | | 0 V on the output |
| LED status indicator<br>Pulse disabling output, low-side | Red | | Warning/Error on the channel<br>During the startup phase, the channel LEDs are always lit constantly red. |
| | Orange | | 24 V on the output |
| | Off | | 0 V on the output |
| LED status indicator<br>Motor holding brake output | Red | | Warning/Error on the channel<br>During the startup phase, the channel LEDs are always lit constantly red. |
| | Orange | | 24 V on the output |
| | Off | | 0 V on the output |
| SE | Red | Off | Mode RUN |
| | |  | |
| | | On | Non-acknowledgeable error state, FAIL SAFE state |
| | The two "SE" indicators are two separate LEDs that show the states of safety processor 1 and safety processor 2. This is only distinguishable when the front cover is open, however. | | |



Table 7: SafeMOTION module - LED status indicators

## Danger!

**Constantly lit "SE" LEDs indicate a non-acknowledgeable FAIL SAFE state. The cause of this could be a defective module or faulty configuration.**
**Check the entries in the logbook! If you are able to rule out a faulty configuration, then the module is defective and must be replaced immediately.**

**It is your responsibility to ensure that all necessary repair measures or corrections to the configuration are initiated after an error occurs since subsequent errors can result in dangerous situations!**

### 5.1.7 Status changes when starting up the operating system loader

The following intervals are used for the LED status indicators:

Width of box: 50 ms
Repeats after: 3,000 ms

| Status | LED | Display |
|---|---|---|
| 1. Boot procedure for base hardware active | RDY | |
| | RUN | |
| | ERR | |
| 2. Network configuration active | RDY | |
| | RUN | |
| | ERR | |
| 3. Waiting for network telegram | RDY | |
| | RUN | |
| | ERR | |
| 4. Network communication active | RDY | |
| | RUN | |
| | ERR | |
| 5. ACOPOS operating system being transferred/burned [1] | RDY | |
| | RUN | |
| | ERR | |

Table 8: Status changes when starting up the operating system loader

1) Firmware V2.140 and later.

### 5.1.8 Setting the POWERLINK node number

The POWERLINK node number can be set using the two coded hexadecimal rotary switches located behind the black cover.

| Figure | | Coded rotary switches | POWERLINK node number |
|---|---|---|---|
| Cover closed | Cover open | | |
|  |  | 1 | Position 16 |
| | | 2 | Position 1 |
| | | The POWERLINK node number change takes effect the next time the ACOPOS-multi drive system is switched on. | |

**Information:**

**Node numbers in the range from 0x01 to 0xFD are allowed.**

***Recommendation*: For compatibility reasons, avoid node numbers between 0xF0 and 0xFD since these are intended for future system expansions.**

**Node numbers 0x00, 0xFE and 0xFF are reserved and therefore not permitted to be set.**

Table 9: Setting the POWERLINK node number

# 6 Wiring: Safe double-width inverter modules (1-axis modules)

## 6.1 ACOPOSmulti SafeMOTION EnDat 2.2 - Pinout overview

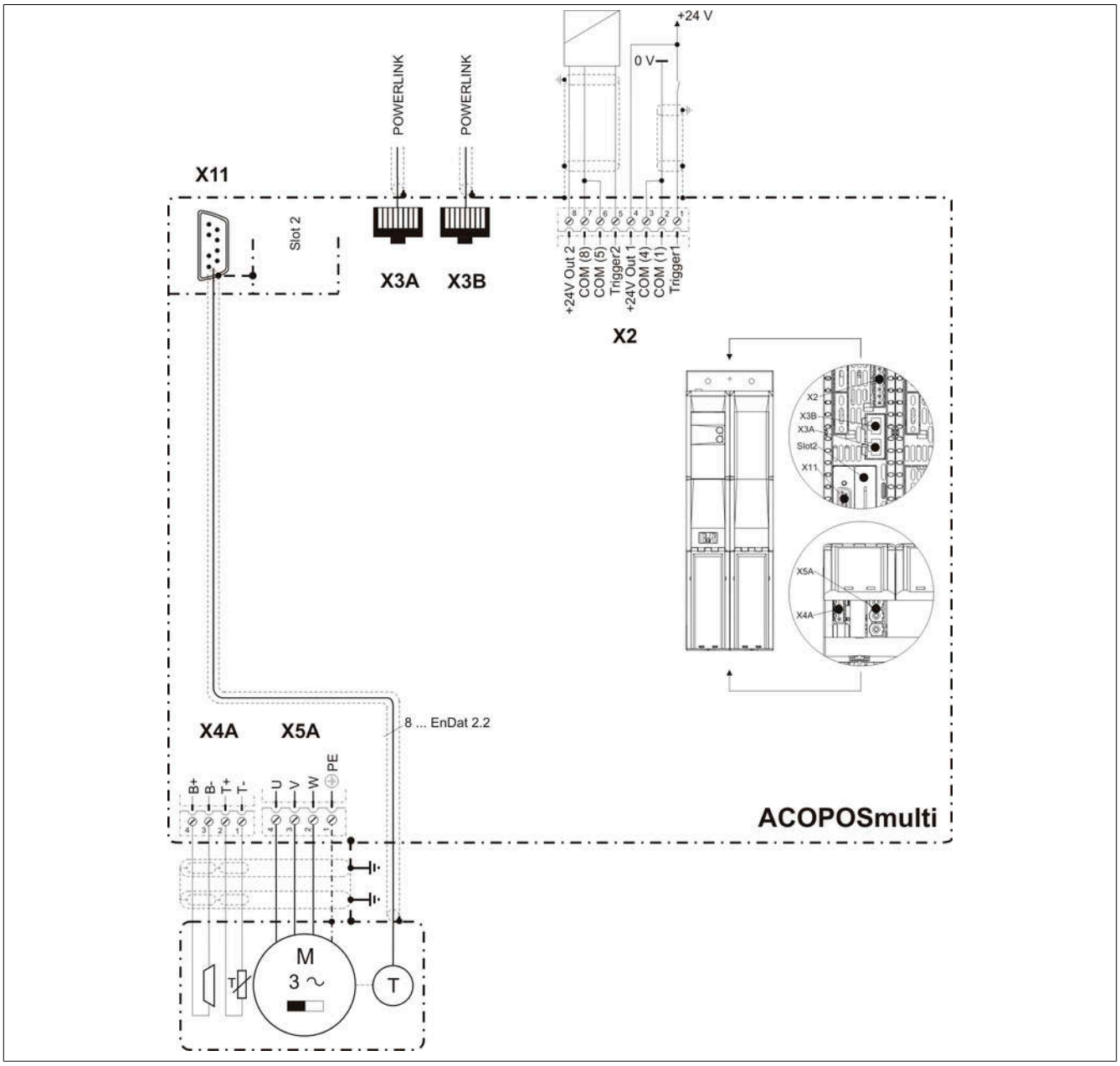



Figure 6: Pinout overview

## 6.2 Connector X2 - Pinout

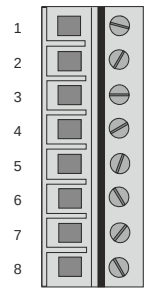
| X2 | Pin | Name | Function |
|---|---|---|---|
|  8TB2108.2010-00 | 1 | Trigger 1 | Trigger 1 |
| | 2 | COM (1) | Trigger 1 0 V |
| | 3 | COM (2) | +24 V output 1 0 V |
| | 4 | +24 V Out 1 | +24 V output 1 |
| | 5 | Trigger 2 | Trigger 2 |
| | 6 | COM (5) | Trigger 2 0 V |
| | 7 | COM (8) | +24 V output 2 0 V |
| | 8 | +24 V Out 2 | +24 V output 2 |

Table 10: Connector X2 - Pinout

## 6.3 Connectors X3A, X3B - Pinout

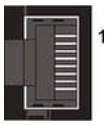
| X3A, X3B | Pin | Name | Function |
|---|---|---|---|
|   | 1 | RXD | Receive signal |
| | 2 | RXD\ | Receive signal inverted |
| | 3 | TXD | Transmit signal |
| | 4 | Shield | Shield |
| | 5 | Shield | Shield |
| | 6 | TXD\ | Transmit signal inverted |
| | 7 | Shield | Shield |
| | 8 | Shield | Shield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

Table 11: X3A, X3B connectors - Pinout

## 6.4 Connector X4A - Pinout

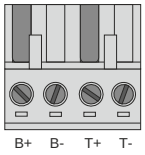
| X4A | Name | Function |
|---|---|---|
|   8TB2104.203L-00 | T- | Axis 1: Temperature sensor - |
| | T+ | Axis 1: Temperature sensor + |
| | B- | Axis 1: Brake - |
| | B+ | Axis 1: Brake + |

Table 12: Connector X4A - Pinout

### Danger!

**A short circuit of SBC output B+ against 24 V results in state FUNCTIONAL FAIL SAFE being enabled. This means that safe pulse disabling is enabled. The brake always remains switched on / released, however, due to the short circuit to 24 V!**
**This can result in dangerous situations since the motor holding brake cannot brake, prevent the spin-out movement or prevent the unbraked lowering movement when loads are suspended!**
**A short circuit of SBC output B+ against 24 V must be prevented by suitable wiring measures!**

### Danger!

**The following applies to the SBC output:**

- **The SBC output is not permitted to be wired across modules!**
- **The SBC output is not permitted to be wired as an open emitter!**
- **The SBC output is not permitted to be wired as an open collector!**

### Danger!

**Only an output voltage of ≤ 5 V can be ensured for the safe motor holding brake output in the switched-off state. When selecting the motor holding brake, the user must ensure that the required braking torque is achieved with a voltage of 5 V applied.**

### 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 account when choosing the motor holding brake!**

### Danger!

**The connections for the motor temperature sensors and the motor holding brake are safely isolated circuits. As a result, only devices or components that have at least safe isolation per IEC 60364-4-41 or EN 61800-5-1 are permitted to be connected to these connections.**

### 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:**

- **SLOT1 of the ACOPOSmulti module does not contain an ACOPOSmulti plug-in module to which a temperature sensor is connected on the T+ and T- connections.**

**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!**

**Connections T+ and T- are not required when using 8BCHxxxx hybrid motor cables.**

### 6.5 Connector X5A - Pinout

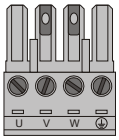
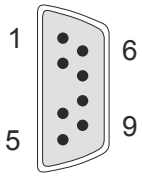
| X5A | Description | Function |
|---|---|---|
|  8TB3104.204G-11 | ⏚ | Axis 1: Protective ground conductor |
| | W | Axis 1: Motor connection W |
| | V | Axis 1: Motor connection V |
| | U | Axis 1: Motor connection U |

Table 13: Connector X5A - Pinout

## Information:

**An additional PE wire does not have to be connected to the threaded bolt beside the X5A connector. The PE connection on the male X5A connector is required and sufficient.**

### 6.6 SafeMOTION EnDat 2.2 module - Pinout

| Figure | X11 (X12) | Pin | Description | Function |
|---|---|---|---|---|
|  |  | 1 | U+ | Encoder power supply +12.5 V |
| | | 2 | --- | --- |
| | | 3 | --- | --- |
| | | 4 | D | Data input |
| | | 5 | T | Clock output |
| | | 6 | COM (1) | Encoder power supply 0 V |
| | | 7 | --- | --- |
| | | 8 | D\ | Data input inverted |
| | | 9 | T\ | Clock output inverted |

## Information:

**Only B&R 8BCF EnDat 2.2 cables or B&R 8BCH hybrid motor cables are permitted to be used for wiring the encoder interfaces!**

## Information:

**The SafeMOTION module cannot be replaced! The SafeMOTION module and the ACOPOSmulti SafeMOTION inverter module together form a single unit. In the event of an error, the entire module must be replaced.**