8BVI0028HCDS.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
- · Complete safety functionality in dual-axis modules as well

2 Order data

Model number	Short description	
	Cold plate or feed-through mounting	
8BVI0028HCDS.000-1	ACOPOSmulti inverter module, 3.8 A, HV, cold plate or feed- through mounting, 2 axes, SafeMC	
	Required accessories	
	Terminal block sets	
8BZVI0055DS.000-1A	Screw clamp set for ACOPOSmulti 8BVI00xxHxDS modules: 1x 8TB2108.2010-00, 1x 8TB2104.203L-00, 1x 8TB2104.203F-00, 1x 8TB3104.204G-11, 1x 8TB3104.204K-11	
	Optional accessories	
	Fan modules	
8BXF001.0000-00	ACOPOSmulti fan module, replacement fan for ACOPOSmulti modules (8BVP / 8B0C / 8BVI / 8BVE / 8B0K)	
	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	
8SCS000.0000-00	ACOPOSmulti shielding components set: 1x shielding plate 1fold type 0; 1x hose clamp, W 9 mm, D 12-22 mm	
8SCS002.0000-00	ACOPOSmulti shield component set: 1x clamping plate; 2x clamps D 4-13.5 mm; 4x screws	
8SCS009.0000-00	ACOPOSmulti shield component set: 1x ACOPOSmulti holding plate SK8-14; 1x shield terminal SK14	
	Terminal blocks	
8TB2104.203F-00	Screw clamp 4-pin, single row, spacing: 5.08 mm, label 3: T- T + B- B+, F keying: 0101	
8TB2104.203L-00	Screw clamp 4-pin, single row, spacing: 5.08 mm, label 3: T- T + B- B+, L keying: 1010	
8TB2108.2010-00	Screw clamp 8-pin, single row, spacing: 5.08 mm, label 1: num- bered serially	
8TB3104.204G-11	Screw clamp 4-pin, single row, spacing: 7.62 mm, label 4: PE W V U, G coding: 0110	
8TB3104.204K-11	Screw clamp 4-pin, single row, spacing: 7.62 mm, label 4: PE W V U, K keying: 1001	

Table 1: 8BVI0028HCDS.000-1 - Order data

Information:

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

Information:

Only 8BCF EnDat 2.2 cables from B&R may be used to connect the encoder interfaces.

3 Technical data

General Information 0xAAF Cooling and mounting method Cold plate or lead, through mounting Solits for plugh-in modules 2 '' CEI Yes CULUs Yes CULUs Yes CO Yes Continuous power consumption " 57.3 kW Power local depending on the stricting frequency to stricting frequency to stricting frequency to thits [1.21th/*2.62th,*1.60] W Stricting frequency to thits [2.5th/*2.8th/	Product ID	8BVI0028HCDS.000-1
B&R ID code OxAA0F Coding and mounting method Code plate or evel strong h mounting Stots for play-in modules 2 " CE Yes CLLs Yes CE Yes CE Yes CE Yes CE Yes Voltage Yes Voltage Yes Voltage Yes Voltage S7.3 W/ Power loss depending on the switching frequency % [1.2*th/*2.8*th/*400 W/ Continuous power construmption = Foxer loss depending on the switching frequency % Switching frequency S totz [2.5*th/*2.8*th/*2.00 W/ Switching frequency % [2.5*th/*2.8*th/*2.00 W/ Deal appact on the switching frequency % [2.5*th/*2.8*th/*2.00 W/ Switching frequency % [2.5*th/*2.8*th/*0.00 W/ Deal appact on the switching frequency % [2.5*th/*2.8*th/*0.00 W/ Deal appact on the switching frequency % [2.5*th/*2.8*th/*0.00 W/ Deal appact on the switching frequency % [2.5*th/*2.8*th/*0.00 W/ Deal appact on the switching frequency % [2.5*th/*2.8*th/*0.00 W		
Coding and mounting method Cod pate or freed-trough mounting Continuous 2 ''' Cell Yes Cell Yes Colling and mounting Yes Cell Yes Colling and mounting Yes Colling and mounting on the switching frequency '' Yes Continuous prover consumption '' 57.3 kW Power loss diponding on the switching frequency '' 57.3 kW Power loss diponding on the switching frequency '' 57.3 kW Switching frequency 50 kHz (12 'k'', 2 2 k'', 4'', 00) W Debag 25 VDC xH 5%, Besign ACCPCOSmult backplane 24 VDC caspectance 28 k'' Maccut * Pragmaturi * Pragets, * Debag 25 VDC xH 5%, Input valage 25 VDC xH 5%, Debag 28 VDC caspectance 24 VDC caspectance 28 kg Debag on the strength 28 VDC xH 5%, Coding and anothing in the instance insta		0xAA0F
Stote for plug-in modules 2 ** CE Yes CE Yes CULus Yes KC Yes FSC Yes CV Data Yes De bus connection 0 Voltage 750 VDC Normaling input consumption ? 0.73 kW Switching frequency Set (12 % A 2 87% + 100 W) Switching frequency Set (12 % A 2 87% + 100 W) Switching frequency Set (12 % A 2 87% + 100 W) Switching frequency Set (16 % F Design ACCPOSmult backgloine 24 VOC cataget (16 % F Design ACCPOSmult backgloine 24 VOC cataget (20 % 16 % % Outspace consumption 28 W P Hain + Parice + Pari	Cooling and mounting method	
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cLus Yes KC Yes DC bus connection Yes Voltage 750 VDC Continuous power consumption ** 573 WU Power loss depending on the switching frequency ** [1.21*,*2.20*,400] W Switching frequency 10 kHz [1.21*,*2.42*,400] W Continuous power consumption ** 6.02*,400] W Switching frequency 10 kHz [2.41*,*2.43*,400] W DC bus capacitance 105*,5* Tiput capacitance 25*,5* Imput capacitance 23*,5* Descip ACCPOSmult backplane 24 UDC cappit 2 Descip ACCPOSmult backplane 24 UDC solution 235 µF Continuous power comsumption 26 VDC * *	Certification	
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Motor connection ** 2 Quantity 2 Continuous power per motor connection ** 2.8 kW Continuous current per motor connection ** 3.8 A _w r Reduction of continuous current depending on the switching frequency 5 kHz No reduction ** Cold plate mounting ** 0.6 A/K (from 57°C) Feed-through mounting ** 0.6 A/K (from 57°C) Feed-through mounting ** 0.4 A/K (from 5°C) ** Cold plate mounting ** 0.4 A/K (from 5°C) ** Reduction of continuous current depending on the installation elevation 0.12 A/K (from 5°C) ** Starting at 500 m above sea level 0.38 A _w per 1000 m Peak current per motor connection 9.5 A _w Nominal switching frequencies ** 5/10/20 kHz Electrical stress of the connected motor in accordance with IEC TS 60034-25 ** Yes Overload protection Yes Short circuit and ground fault protection Yes Max: output frequency 600 Hz **		
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CSA 28 to 10 Terminal cable cross section dimension of the 12 to 22 mm		30 to 10
Terminal cable cross section dimension of the 12 to 22 mm		

Table 2: 8BVI0028HCDS.000-1 - Technical data

8BVI0028HCDS.000-1

Product ID	8BV10028HCDS.000-1		
Max. motor line length depending on the switching	0BV10020NCD3.000-1		
frequency			
Switching frequency 5 kHz	25 m		
Switching frequency 10 kHz	25 m		
Switching frequency 20 kHz	10 m		
Motor holding brake connection			
Quantity	2		
Output voltage ¹⁴⁾	24 VDC +5.8% / -0% ¹⁵⁾		
Continuous current	1.1 A		
Max. internal resistance	0.5 Ω		
Extinction potential	Approx. 30 V		
Max. extinction energy per switching operation	1.5 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. 0.25 A		
Response threshold for undervoltage monitoring	24 VDC +0% / -4%		
Encoder interfaces ¹⁶⁾			
Quantity	2		
Туре	EnDat 2.2 ¹⁷⁾		
Connections	9-pin female DSUB connector		
Status indicators	UP/DN LEDs		
	OF/DN LEDS		
Electrical isolation Encoder - ACOPOSmulti	Νο		
Encoder monitoring	Yes		
	100 m		
Max. encoder cable length	Depends on the cross section of the encoder's supply wires ¹⁸⁾		
Encoder supply			
Output voltage	Typ. 12.5 V		
Load capability	350 mA		
Protective measures			
Short circuit protection	Yes		
Overload protection	Yes		
Synchronous serial interface			
Signal transmission	RS485		
Data transfer rate	625 Mbit/s		
Max. power consumption per encoder interface	P _{SMC} [W] = 19 V * I _{Encoder} [A] ¹⁹⁾		
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		
Switching delay			
Positive edge	52 μ s ± 0.5 μ s (digitally filtered)		
Negative edge	$53 \ \mu s \pm 0.5 \ \mu s$ (digitally filtered)		
Modulation compared to ground potential	Max. ±38 V		
Electrical characteristics			
Discharge capacitance	0.14 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 ²⁰⁾	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			
EN 60529 protection	IP20		
	-		

Table 2: 8BVI0028HCDS.000-1 - Technical data

8BVI0028HCDS.000-1

Product ID	8BVI0028HCDS.000-1		
Environmental conditions			
Temperature			
Operation			
Nominal	5 to 40°C		
Maximum ²¹⁾	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 ²²⁾			
Width	53 mm		
Height	317 mm		
Depth			
Cold plate	212 mm		
Feed-through mounting	209 mm		
Weight	Approx. 2.3 kg		
Module width	1		

Table 2: 8BVI0028HCDS.000-1 - Technical data

- 1) SLOT 1 and SLOT 2 of the ACOPOSmulti module are occupied by the encoder interfaces.
- 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} ... Average value of the currents on both motor connectors [A].
- 4) P_{SMC1} ... Max. power consumption P_{SMC} [W] of the SafeMC module in SLOT1 (see the "Encoder interfaces" section).
- P_{SMC2} ... Max. power consumption P_{SMC} [W] of the SafeMC module in SLOT2 (see the section "Encoder interfaces")
 P_{24 V Out} ... Power [W] that is output to the connections X2/+24 V Out 1 and X2/+24 V Out 2 on the module (max. 10 W)
 P_{FanBBOM...} ... Portion of the power [W] that is used by the fan modules in the mounting plate or the 8B0M0040HFF0.000-1 fan module (see the technical data for the respective 8B0M... mounting plate / 8B0M0040HFF0.000-1 fan module).
- 5) Only 8BCM motor cables from B&R may be used to connect the motor interfaces.
- 6) Valid in the following conditions: 750 VDC DC bus voltage, minimum permissible coolant flow volume (3 l/min).
- 7) The temperature specifications refer to the return temperature of the cold plate mounting plate.
- 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 return 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.

Caution! Condensation can occur at low flow temperatures and return temperatures.

- 10) 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.
- 11) 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. When using dual-axis modules, the increased CPU load reduces the functionality of the drive; if this is not taken into consideration, the computing time can be exceeded in extreme cases.
- 12) 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!
- 13) 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).
- 14) 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.

15) 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.
- 16) Only 8BCF EnDat 2.2 cables from B&R may be used to connect the encoder interfaces.
- 17) An EnDat 2.2 functional safety encoder is required when using ACOPOSmulti with SafeMC! With standard EnDat 2.2 encoders, only the STO, SBC and SS1 functions are monitored with respect to timing!
- 18) The maximum encoder cable length I_{max} can be calculated as follows (the maximum permissible encoder cable length of 100 m must not be exceeded):

 $I_{max} = 7.9/I_{G} * A * 1/(2*\rho)$

- $I_{G} \hdots$ Max. current consumption of the encoder [A]
- A ... Cross section of the supply wire [mm²]
- ρ ... Specific resistance [Ω mm²/m] (e.g. for copper: ρ = 0.0178)
- 19) $I_{Encoder}$... Max. power consumption of the connected encoder [A].
- 20) Continuous operation at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the specified continuous current reductions into consideration).
- 21) 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.
- 22) 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

4.1 Cold plate

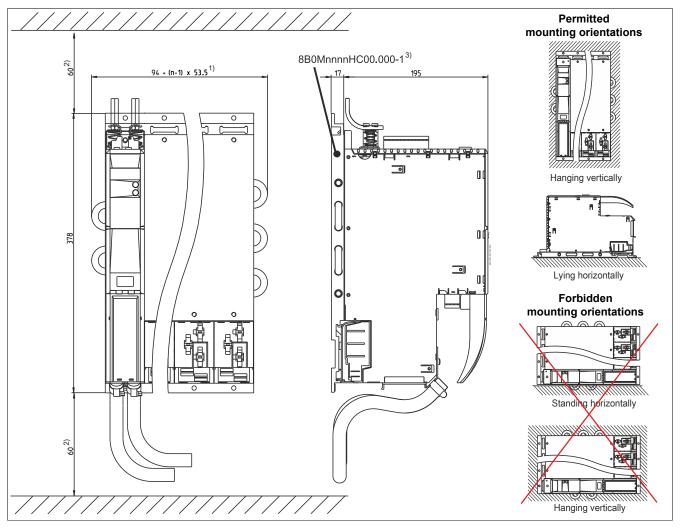


Figure 1: Dimension diagram and installation dimensions - Cold plate

- 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.
- 3) nnnn indicates the number of slots (e.g. 0160 refers to 16 slots).

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not set down ACOPOSmulti modules for cold-plate or feed-through mounting on their bottom side. Doing so could break the clips that hold the unit's fan. Broken clips make it more difficult to replace the fans later on.

4.2 Feed-through mounting

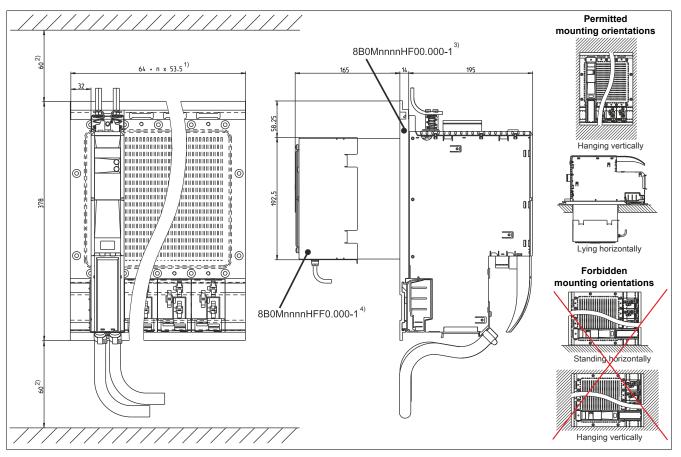


Figure 2: Dimension diagram and installation dimensions - Feed-through mounting

- 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.
- 3) nnnn indicates the number of slots (e.g. 0160 refers to 16 slots).
- 4) For proper air circulation, at least 100 mm has to be left free around the fan module.

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not set down ACOPOSmulti modules for cold-plate or feed-through mounting on their bottom side. Doing so could break the clips that hold the unit's fan. Broken clips make it more difficult to replace the fans later on.

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

5.1 Pinout overview

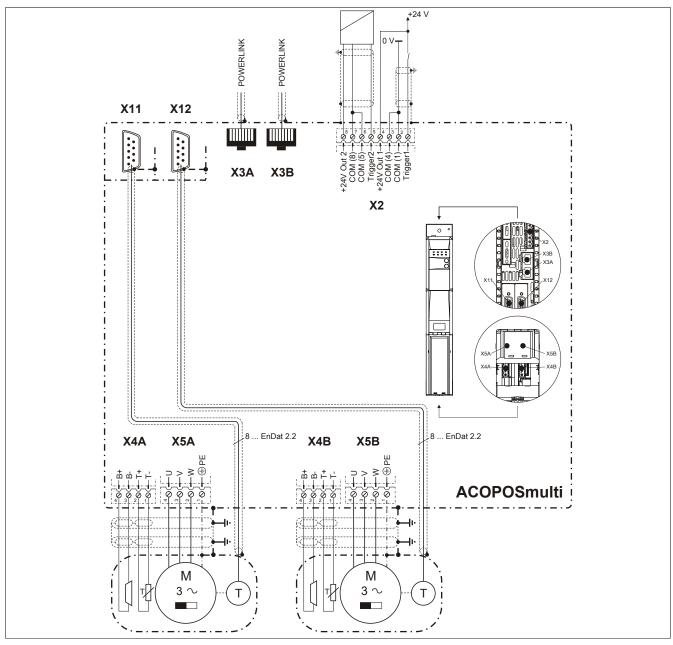


Figure 3: Pinout overview

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
2	4	+24V Out 1	+24 V output 1
3	5	Trigger 2	Trigger 2
	6	COM (5)	Trigger 2 0 V
4	7	COM (8)	+24 V output 2 0 V
5 🔲 🕖	8	+24V Out 2	+24 V output 2
6			
7			
8			



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 +
B+ B- T+ T-		

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!

For a double-axis module, it is therefore especially important to prevent a cross fault between the two B+ connections of the two axes!

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 \leq 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 Pinout - X4B connector

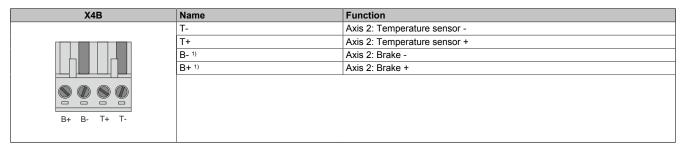


Table 6: Pinout - X4B connector

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!

For a double-axis module, it is therefore especially important to prevent a cross fault between the two B+ connections of the two axes!

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 \leq 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 X4B/T+ and X4B/T- on an ACOPOSmulti module under the following conditions:

• There is no ACOPOSmulti plug-in module in SLOT2 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!

5.6 X5A connector - Pinout

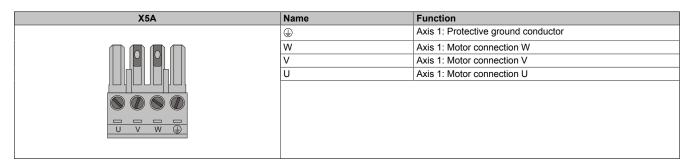


Table 7: X5A connector - Pinout

Information:

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

5.7 X5B connector - Pinout

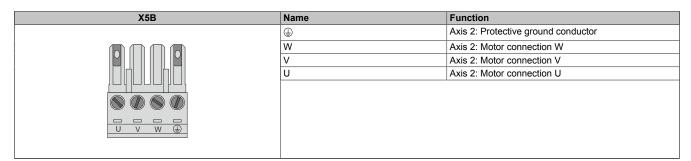


Table 8: X5B connector - Pinout

Information:

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

5.8 Pinout - SafeMC module

Figure	X11 (X12)	Pin	Name	Function
E-D-400		1	U+	Encoder supply +125 V
EnDat 2.2 Safety		2		
		3		
		4	D	Data input
		5	Т	Clock output
(0)	1 • 6	6	COM (1)	Encoder supply 0 V
		7		
		8	D\	Data input inverted
	- 9	9	Т\	Clock output inverted
	5			
House I				
L. Harris I.				
-				

Information:

Only 8BCF EnDat 2.2 cables from B&R may be used to connect the encoder interfaces.

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.