# 8V1045.00-2

## 1 General information

- Modular mechanical design using plug-in modules
- Integrated line filter
- Integrated braking resistor
- All connections are made using plug-in connectors
- Integrated electronic restart inhibit

## 2 Order data

| Model number | Short description | Figure |
|---|---|---|
| | **Servo drives** | |
| 8V1045.00-2 | ACOPOS servo drive, 3x 400-480 V, 4.4 A, 2 kW, line filter, integrated braking resistor and electronic secure restart inhibit | |
| | **Optional accessories** | |
| | **Plug-in modules** | |
| 8AC110.60-3 | ACOPOS plug-in module, CAN interface | |
| 8AC114.60-2 | ACOPOS plug-in module, POWERLINK V2 interface | |
| 8AC120.60-1 | ACOPOS plug-in module, EnDat encoder and sine incremental encoder interface | |
| 8AC121.60-1 | ACOPOS plug-in module, HIPERFACE interface | |
| 8AC122.60-3 | ACOPOS plug-in module, resolver interface 10 kHz | |
| 8AC123.60-1 | ACOPOS plug-in module, incremental encoder and SSI absolute encoder interface | |
| 8AC125.60-1 | ACOPOS plug-in module, BiSS/SSI SinCos/SSI interface | |
| 8AC125.60-2 | ACOPOS plug-in module, BiSS encoder interface 5 V, baud rate 6.25 Mbit/s | |
| 8AC125.61-2 | ACOPOS plug-in module, BiSS encoder interface 12 V, baud rate 6.25 Mbit/s | |
| 8AC126.60-1 | ACOPOS plug-in module, EnDat 2.2 encoder interface | |
| 8AC130.60-1 | ACOPOS plug-in module, 8 digital I/O configurable in pairs as 24 V input or as output 400/100 mA, 2 digital outputs 2 A, order TB712 terminal block separately | |
| 8AC131.60-1 | ACOPOS plug-in module, 2 analog inputs ±10 V, 2 digital I/Os configurable as 24 V input or output 45 mA, order terminal block TB712 separately! | |
| | **Included in delivery** | |
| | **Shielding component sets** | |
| 8X0010.00-1 | ACOPOS shielding components set for 8V1022.xxx-x up to 8V1090.xxx-x | |
| | **Terminal sets** | |
| 8X0001.00-1 | ACOPOS accessories, plug set for 8V1010.00 and 8V1090.00 (3 phase) | |

Table 1: 8V1045.00-2 - Order data

## 3 Technical data

| Model number | 8V1045.00-2 |
|---|---|
| **General information** | |
| B&R ID code | 0x12C7 |
| Slots for plug-in modules | 4 |
| Certifications | |
|   CE | Yes |
|   Functional safety[1] | Yes |
|   UL | cULus E225616 Power conversion equipment |
|   EAC | Yes |
|   KC | Yes |
| **Mains connection** | |
| Permissible network configurations | TT, TN [2] |
| Mains input voltage | 3x 400 VAC to 480 VAC ±10% 3x 230 VAC ±10% [3] |

Table 2: 8V1045.00-2 - Technical data

## 8V1045.00-2

| Model number | 8V1045.00-2 |
|---|---|
| Frequency | 50 / 60 Hz ±4% |
| Installed load | Max. 5 kVA |
| Inrush current at 400 VAC | 7 A |
| Switch-on interval | >10 s |
| Integrated line filter per EN 61800-3, category C3 [4] | Yes |
| Power dissipation at device nominal power without braking resistor | Approx. 180 W |
| **DC bus connection** | |
| DC bus capacitance | 235 µF |
| **24 VDC power supply** | |
| Input voltage [5] | 24 VDC ±25% |
| Input capacitance | 8200 µF |
| Current consumption [6] | Max. 2.5 A + current for motor holding brake |
| **Motor connection** | |
| Quantity | 1 |
| Continuous current [7] | 4.4 $A_{eff}$ |
| Reduction of continuous current depending on ambient temperature | |
|   Mains input voltage: 400 VAC | |
|     Switching frequency 5 kHz | No reduction |
|     Switching frequency 10 kHz | No reduction |
|     Switching frequency 20 kHz | 0.13 $A_{eff}$ per °C (starting at 45°C) [8] |
|   Mains input voltage: 480 VAC | |
|     Switching frequency 5 kHz | No reduction |
|     Switching frequency 10 kHz | No reduction |
|     Switching frequency 20 kHz | 0.13 $A_{eff}$ per °C (starting at 35°C) [8] |
| Reduction of continuous current depending on installation elevation | |
|   Starting at 500 m above sea level | 0.44 $A_{eff}$ per 1000 m |
| Peak current | 24 $A_{eff}$ |
| Nominal switching frequency | 20 kHz |
| Possible switching frequencies | 5 / 10 / 20 kHz |
| Electrical stress of connected motor per IEC TS 60034-25 [9] | Limit value curve A |
| Max. motor cable length | 25 m |
| Protective measures | |
|   Overload protection | Yes |
|   Short circuit and ground fault protection | Yes |
| Max. output frequency | 598 Hz [10] |
| Terminal connection cross section | |
|   Flexible and fine-stranded wires | |
|     With wire end sleeves | 0.25 to 4 mm² |
|   Approbation data | |
|     UL/C-UL-US | 30 to 10 AWG |
|     CSA | 28 to 10 AWG |
| **Motor holding brake connection** | |
| Response threshold for open circuit monitoring | Approx. 385 mA |
| Max. output current | 1 A |
| Max. number of switching cycles | Unlimited since handled electronically |
| **Braking resistor** | |
| Peak power output | 7 kW |
| Continuous power | 200 W |
| **Limit switch and reference inputs** | |
| Quantity | 3 |
| Circuit | Sink |
| Electrical isolation | |
|   Input - ACOPOS | Yes |
|   Input - Input | No |
| Input voltage | |
|   Nominal | 24 VDC |
|   Maximum | 30 VDC |
| Switching threshold | |
|   Low | <5 V |
|   High | >15 V |
| Input current at nominal voltage | Approx. 4 mA |
| Switching delay | Max. 2.0 ms |
| Modulation compared to ground potential | Max. ±38 V |
| **Enable inputs** | |
| Quantity | 1 |
| Circuit | Sink |
| Electrical isolation | |
|   Input - ACOPOS | Yes |

Table 2: 8V1045.00-2 - Technical data

| Model number | 8V1045.00-2 |
|---|---|
| Input voltage | |
|     Nominal | 24 VDC |
|     Maximum | 30 VDC |
| Input current at nominal voltage | Approx. 30 mA |
| Switching threshold | |
|     Low | <5 V |
|     High | >15 V |
| Switching delay | |
|     Enable 0 → 1, ready for PWM | Max. 100 µs |
|     Enable 1 → 0, PWM off | Max. 2.0 ms |
| Modulation compared to ground potential | Max. ±38 V |
| OSSD signal connections [11] | Not permitted |
| **Trigger inputs** | |
| Quantity | 2 |
| Circuit | Sink |
| Electrical isolation | |
|     Input - ACOPOS | Yes |
|     Input - Input | No |
| 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 |
| **Electrical properties** | |
| Discharge capacitance | 660 nF |
| **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 [12] | 2000 m |
| Pollution degree per EN 61800-5-1 | 2 (non-conductive pollution) |
| Overvoltage category per EN 61800-5-1 | II |
| Degree of protection per EN 60529 | IP20 |
| **Ambient conditions** | |
| Temperature | |
|     Operation | |
|         Nominal | 5 to 40°C |
|         Maximum [13] | 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 | |
|     Width | 70.5 mm |
|     Height | 375 mm |
|     Depth | 235.5 mm |
| Weight | 4.1 kg |

Table 2: 8V1045.00-2 - Technical data

1)     Achievable safety classifications (safety integrity level, safety category, performance level) are documented in the user's manual (section "Safety technology").
2)     In the USA, TT and TN power mains are commonly referred to as "Delta/Wye with grounded Wye neutral".
3)     If the module is operated with a mains input voltage of 3x 230 VAC, then automatic nominal voltage detection doesn't work for the DC bus. The UDC_NOMINAL parameter must be set to 325 [V] by the user in this case.
4)     Limit values from EN 61800-3 C3 (second environment).
5)     The permissible input voltage range is reduced when using motor holding brakes. The input voltage range should be selected so that the proper supply voltage for the motor holding brake can be maintained.
6)     The current requirements depend on the configuration of the ACOPOS servo drive
    The inrush current is significantly higher than the value for current consumption and can be estimated according to the input capacitance.
7)     Valid in the following conditions: 400 VAC mains input voltage, nominal switching frequency, 40°C ambient temperature, installation elevation <500 m above sea level.
8)     Value for the nominal switching frequency.

9) 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!

10) The module's electrical output frequency (SCTRL_SPEED_ACT * MOTOR_POLEPAIRS) is monitored to protect against dual use in accordance with EC regulation 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 element: Limit speed exceeded).

11) OSSD (output signal switching device) signals are used to monitor signal lines for short circuits and cross faults.

12) Continuous operation of ACOPOS servo drives at elevations ranging from 500 m to 2000 m above sea level is possible (taking the specified continuous current reductions into consideration).

13) Continuous operation of ACOPOS servo drives 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.

# 4 Status indicators

ACOPOS servo drives are equipped with three LEDs for direct diagnostics:



Figure 1: ACOPOS servo drive indicators

### LED status indicators

| Label | Color | Function | Description | |
|---|---|---|---|---|
| READY | 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. Examples: • No signal on one or both enable inputs • DC bus voltage outside the tolerance range • Overtemperature on the motor (temperature sensor) • Motor feedback not connected or defective • Motor temperature sensor not connected or defective • Overtemperature on the module (IGBT junction, heat sink, etc.) • Disturbance on network |
| RUN | Orange | Run | Solid orange | The module's power stage is enabled. |
| ERROR | Red | Error | Solid red [1] | There is a permanent error on the module. Examples: • Permanent overcurrent • Invalid data in EPROM |

Table 3: ACOPOS servo drive - LED status indicators

1) Firmware V2.130 and later.

If no LED is lit up, the ACOPOS servo drive is not supplied with 24 VDC mains voltage.

## Danger!

**After switching off the device, wait for the DC bus to discharge for at least five minutes. To avoid a hazard, the current voltage on the DC bus must be measured with a suitable measuring instrument and less than 42 VDC before starting work. An unlit operating LED does not indicate that the device is de-energized!**

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

The following intervals are used for the LED status indicators:

Width of box: 125 ms
Repeats after: 3000 ms

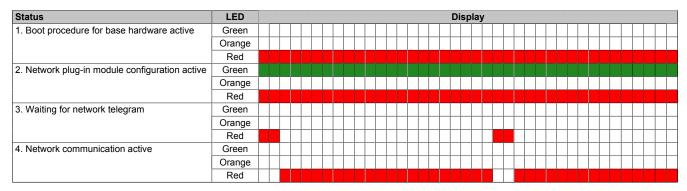| Status | LED | Display |
|---|---|---|
| 1. Boot procedure for base hardware active | Green | |
| | Orange | |
| | Red | ██████████████████████ |
| 2. Network plug-in module configuration active | Green | ██████████████████████ |
| | Orange | |
| | Red | ██████████████████████ |
| 3. Waiting for network telegram | Green | |
| | Orange | |
| | Red | █ ▮▮ |
| 4. Network communication active | Green | |
| | Orange | |
| | Red | ████████████ ██████████ |

Table 4: Status changes when starting up the operating system loader

## Error status with reference to CAN plug-in module AC110

| Status | LED | Display |
|---|---|---|
| Invalid hardware ID [1] | Green | |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ ▮ ▮ ▮ ▮ ▮ |
| Boot error in CAN base hardware | Green | |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ ▮ ▮ ▮ |
| Bus off | Green | |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ ▮ ▮ |
| The CAN station number is 0. | Green | |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ |

Table 5: Error status with reference to CAN plug-in module AC110

1)    Possible errors:
- The ACOPOS servo drive is defective.
- The plug-in module is defective
- The plug-in module is not connected properly in the slot.

## Error status with reference to POWERLINK V2 plug-in module AC114

| Status | LED | Display |
|---|---|---|
| Invalid hardware ID [1] | Green | ██████████████████████ |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ ▮ ▮ ▮ ▮ ▮ |
| Boot error in POWERLINK base hardware | Green | ██████████████████████ |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ ▮ ▮ ▮ |
| Error booting the AC114-ARM | Green | ██████████████████████ |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ ▮ ▮ |
| The POWERLINK station number is 0. | Green | ██████████████████████ |
| | Orange | |
| | Red | ▮ ▮ ▮ ▮ |

Table 6: Error status with reference to POWERLINK V2 plug-in module AC114

1)    Possible errors:
- The ACOPOS servo drive is defective (plug-in module not detected).
- The plug-in module is defective
- The plug-in module is not connected properly in the slot.
- The plug-in module works but is not automatically detected by the ACOPOS servo drive (old bootstrap loader).

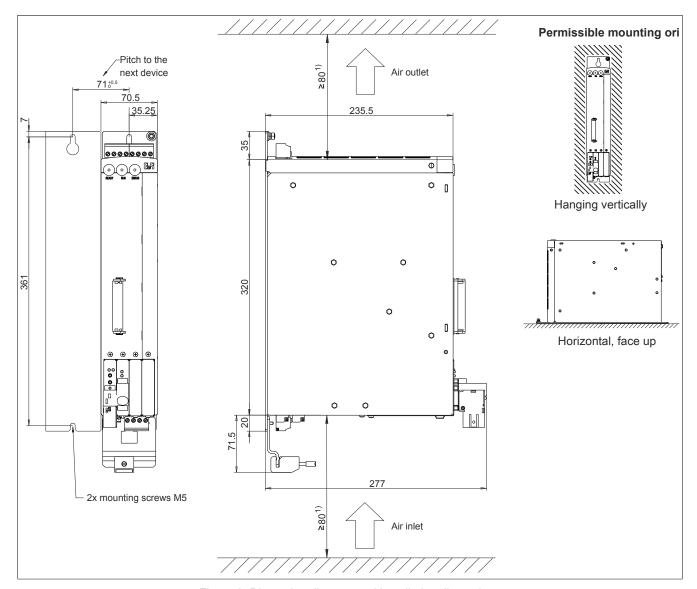# 5 Dimension diagram and installation dimensions



Figure 2: Dimension diagram and installation dimensions
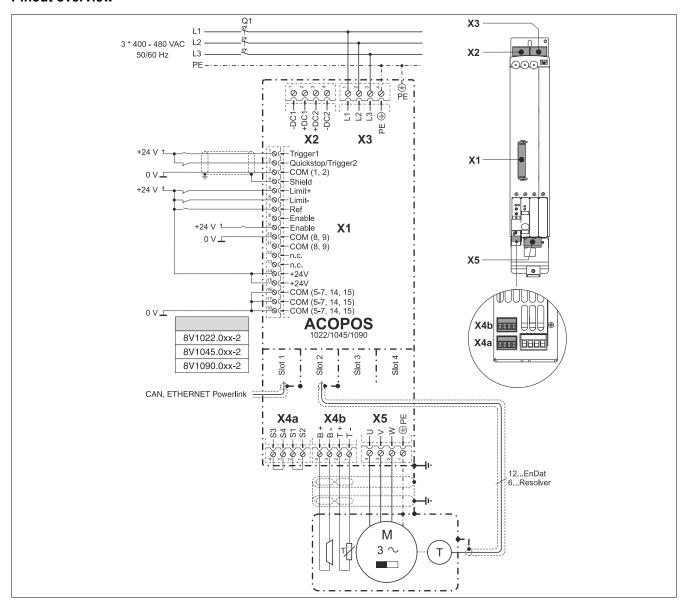
# 6 Wiring

## Pinout overview



Figure 3: ACOPOS 1022, 1045, 1090 - Pinout overview

## 6.1 X1 - Pinout

| X1 | Pin | Name | Function |
|---|---|---|---|
| | 1 | Trigger1 | Trigger 1 |
| | 2 | Quickstop/Trigger2 | Quickstop/Trigger2 |
| | 3 | COM (1, 2) | Trigger 1, Quickstop/Trigger 2 0 V |
| | 4 | Shield | Shield |
| | 5 | Limit+ | Positive HW limit |
| | 6 | Limit- | Negative HW limit |
| | 7 | Ref | Reference switch |
| | 8 | Enable [1] | Enable |
| | 9 | Enable [1] | Enable |
| | 10 | COM (8, 9) | Enable 0 V |
| | 11 | COM (8, 9) | Enable 0 V |
| | 12 | --- | --- |
| | 13 | --- | --- |
| | 14 | +24 V | +24 V supply |
| | 15 | +24 V | +24 V supply |
| | 16 | COM (5-7, 14, 15) | 0 V supply |
| | 17 | COM (5-7, 14, 15) | 0 V supply |
| | 18 | COM (5-7, 14, 15) | 0 V supply |

The following connections are linked with each other internally in the device:

- Pin 8 --> Pin 9 (Enable)
- Pin 10 --> Pin 11 (Enable 0 V)
- Pin 14 --> Pin 15 (Supply +24 V)
- Pin 16 --> Pin 17 --> Pin 18 (Supply 0 V)

Table 7: X1 - Pinout

1)    The wiring is not permitted to exceed a total length of 30 m.

## Information:

**To obtain a defined reference of ground to ground potential, B&R recommends grounding the COM connections (5-7, 14, 15) on connector X1.**
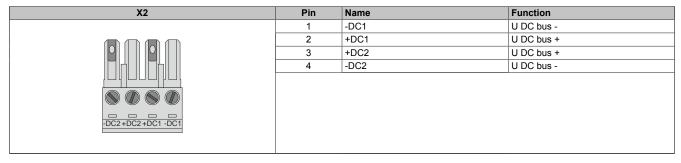
## 6.2 X2 - Pinout

| X2 | Pin | Name | Function |
|---|---|---|---|
| | 1 | -DC1 | U DC bus - |
| | 2 | +DC1 | U DC bus + |
| | 3 | +DC2 | U DC bus + |
| | 4 | -DC2 | U DC bus - |

Table 8: X2 - Pinout

## 6.3 X3 - Pinout

## Danger!

**Servo drives are not permitted to be operated directly on IT power systems and corner-grounded TN-S power systems with protective ground conductor!**
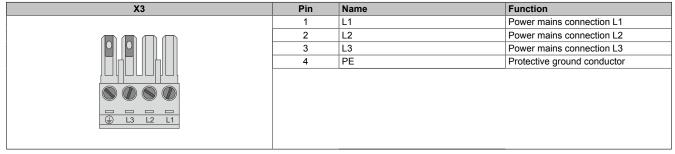
| X3 | Pin | Name | Function |
|---|---|---|---|
| | 1 | L1 | Power mains connection L1 |
| | 2 | L2 | Power mains connection L2 |
| | 3 | L3 | Power mains connection L3 |
| | 4 | PE | Protective ground conductor |

Table 9: X3 - Pinout

## 6.4 X4a, X4b - Pinout

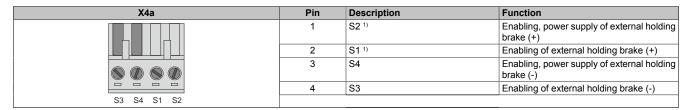| X4a | Pin | Description | Function |
|---|---|---|---|
| <br>S3  S4  S1  S2 | 1 | S2 [1] | Enabling, power supply of external holding brake (+) |
| | 2 | S1 [1] | Enabling of external holding brake (+) |
| | 3 | S4 | Enabling, power supply of external holding brake (-) |
| | 4 | S3 | Enabling of external holding brake (-) |
| | | | |

Table 10: X4a - Pinout

[1] If the holding brake is connected via an additional external relay contact (ground-in e.g. via connections S1/S2) instead of only via the internal transistor, then the internal quenching circuit has no effect! In this case, the customer must make sure that neither the relay contact nor the braking coil are damaged when switching off the brake. This can be done by interconnecting the coil or - better still - interconnecting the contact with a quenching circuit.

| X4b | Pin | Description | Function |
|---|---|---|---|
| <br>B+  B-  T+  T- | 1 | T- | Temperature sensor - |
| | 2 | T+ | Temperature sensor + |
| | 3 | B- [1] | Brake - |
| | 4 | B+ [1] | Brake + |
| | | | |

Table 11: X4b - Pinout

[1] If the holding brake is connected via an additional external relay contact (ground-in e.g. via connections S1/S2) instead of only via the internal transistor, then the internal quenching circuit has no effect! In this case, the customer must make sure that neither the relay contact nor the braking coil are damaged when switching off the brake. This can be done by interconnecting the coil or - better still - interconnecting the contact with a quenching circuit.

# 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 per 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! ACOPOS servo drives cannot determine if a holding brake is connected with reverse polarity!**

## 6.4.1 Wiring the connections for the motor holding brake

The power supply, enabling and monitoring of the output for the motor holding brake can be carried out in three different ways via the wiring of connector X4a:
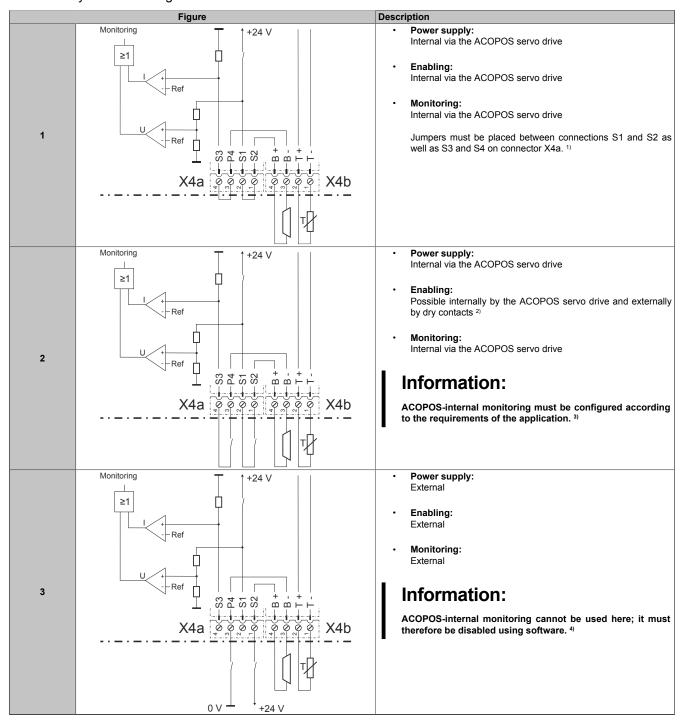
| | Figure | Description |
|---|---|---|
| 1 |  | • **Power supply:**<br>Internal via the ACOPOS servo drive<br><br>• **Enabling:**<br>Internal via the ACOPOS servo drive<br><br>• **Monitoring:**<br>Internal via the ACOPOS servo drive<br><br>Jumpers must be placed between connections S1 and S2 as well as S3 and S4 on connector X4a. [1] |
| 2 |  | • **Power supply:**<br>Internal via the ACOPOS servo drive<br><br>• **Enabling:**<br>Possible internally by the ACOPOS servo drive and externally by dry contacts [2]<br><br>• **Monitoring:**<br>Internal via the ACOPOS servo drive<br><br>## Information:<br>**ACOPOS-internal monitoring must be configured according to the requirements of the application. [3]** |
| 3 |  | • **Power supply:**<br>External<br><br>• **Enabling:**<br>External<br><br>• **Monitoring:**<br>External<br><br>## Information:<br>**ACOPOS-internal monitoring cannot be used here; it must therefore be disabled using software. [4]** |

Table 12: Enabling the external holding brake

1) The two jumpers are already wired on connector X4a supplied with ACOPOS servo drives.
2) External dry contacts can be connected between S1 and S2 and between S3 and S4. This makes it possible to enable the holding brake via external safety circuits independently of the control integrated in the ACOPOS servo drive.
3) Configuration takes place using ParID 90 (1 ... Internal monitoring active, 5 ... Internal monitoring not active).
4) Disabling takes place using ParID 90 (5 ... Internal monitoring not active).

## 6.5 X5 - Pinout

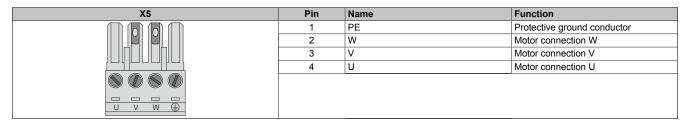| X5 | Pin | Name | Function |
|---|---|---|---|
| | 1 | PE | Protective ground conductor |
| | 2 | W | Motor connection W |
| | 3 | V | Motor connection V |
| | 4 | U | Motor connection U |
| | | | |

Table 13: X5 - Pinout

## 6.6 Additional protective ground connection (PE)

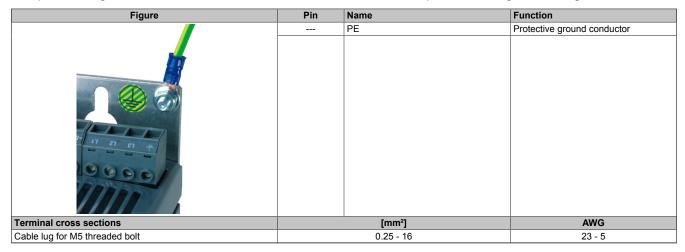The protective ground conductor is connected to the M5 threaded bolt provided using a cable lug.

| Figure | Pin | Name | Function |
|---|---|---|---|
| | --- | PE | Protective ground conductor |
| | | | |
| **Terminal cross sections** | **[mm²]** | | **AWG** |
| Cable lug for M5 threaded bolt | 0.25 - 16 | | 23 - 5 |

Table 14: Protective ground conductor (PE) ACOPOS 1022, 1045, 1090

## Danger!

**Before turning on the servo drive, make sure that the housing is properly connected to ground (PE rail). The ground connection must be established even when testing the drive or operating it for a short time!**

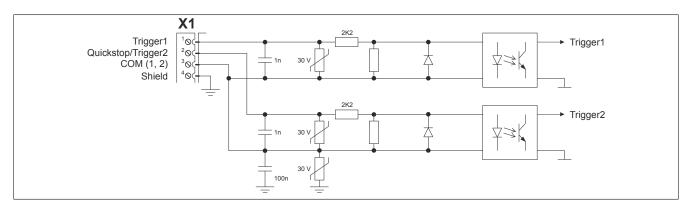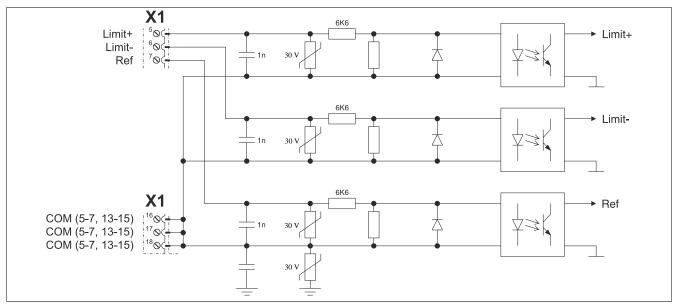## 6.7 Input/Output circuit diagram


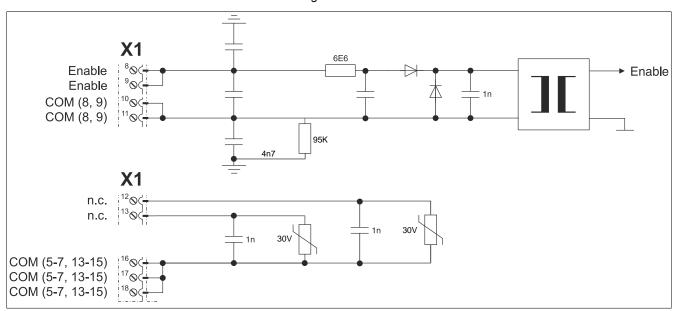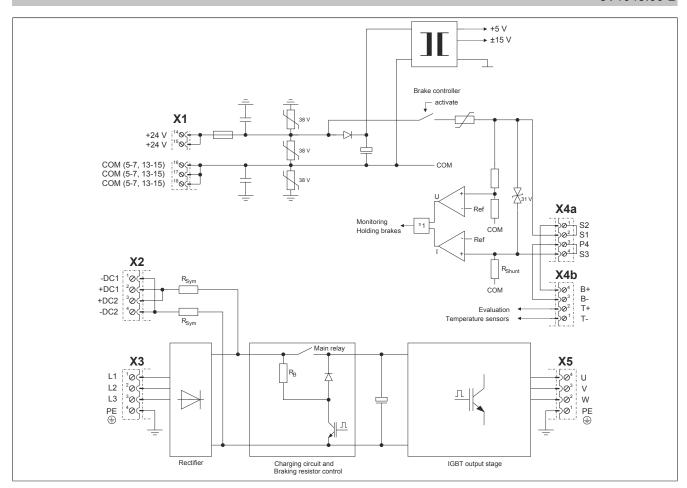
Figure 4: Trigger



Figure 5: Limit



Figure 6: Enable

Figure 7: ACOPOS 1022, 1045, 1090 - Input/Output circuit diagram