



Instructions for Use

# COMBIVERT F6

Installation F6 PRO Elevator

Translation of the original manual

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## Imprint

KEB America, Inc.

5100 Valley Industrial Blvd S, Shakopee, MN 55379

United States

Tel: +1 952 224 1400 • Fax: +1 952 224 1499

E-Mail: [info@kebamerica.com](mailto:info@kebamerica.com) • URL: <https://www.kebamerica.com>

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# 1 Introduction

The hardware, software and accessories described in this document are products of KEB. The information contained in this document is valid at the time of publishing. KEB reserves the right to update this document in response to misprints, mistakes or technical changes.

## 1.1 Warning Signs and Key Symbols

Certain procedures within this document can cause safety hazards during the installation or operation of the device.

Refer to the safety warnings in this document when performing these procedures. Safety signs are also located on the device where applicable. A safety warning is marked by one of the following warning signs:

### **DANGER**



#### Type and/or source of the hazard.

**Indicates a hazardous situation which will result in death or serious injury if not avoided.**

- a) Measures to avoid the hazard.
- b) Can be supplemented by an additional warning sign or symbol.

### **WARNING**



#### Type and/or source of the hazard.

**Indicates a hazardous situation which may result in death or serious injury if not avoided.**

- a) Measures to avoid the hazard.
- b) Can be supplemented by an additional warning sign or symbol.

### **CAUTION**



#### Type and/or source of the hazard.

**Indicates a hazardous situation which may result in minor or moderate injury if not avoided.**

- a) Measures to avoid the hazard.
- b) Can be supplemented by an additional warning sign or symbol.

### **NOTICE**



#### Type and/or source of the hazard.

**Indicates a situation that may result in damage to the product or other property if not avoided.**

- a) Measures to avoid the hazard.
- b) Can be supplemented by an additional symbol.



Informational message, prerequisite or recommended procedure.



This is a reference to further documentation. The barcode is for smartphones, the following link is for online users or for typing.

( <https://www.keb-automation.com/search>)



## 1.2 More Symbols

|                  |                                                              |
|------------------|--------------------------------------------------------------|
| ✓                | Condition                                                    |
| a)               | Action step                                                  |
| ⇒                | Result or intermediate result                                |
| (⇒ ► Refe [► 6]) | Reference to a chapter, table or picture with page reference |
| ru21             | Parameter name or parameter index                            |
| (🌐 ► )           | Hyperlink                                                    |
| <Strg>           | Control code                                                 |
| COMBIVERT        | Glossary entry                                               |

## 1.3 Laws and Requirements

KEB America, Inc. has certified the product against the US, Canadian and European standards. Additionally, KEB Automation KG provides the EU Declaration of Conformity that the product complies with the essential safety requirements.

The UL, CSA and CE marks are located on the nameplate when applicable.

The EU Declaration of Conformity can be downloaded on demand via our website.

Further information is provided in the 'Certifications and Approvals' section.

## 1.4 Warranty

KEB provides a limited warranty on all products. This warranty can be found in the terms and conditions at our website.



General sales conditions for North America.

(🌐 ► <https://www.kebamerica.com/terms-and-conditions>)



General sales conditions for Europe.

(🌐 ► <https://www.keb-automation.com/de/agb>)



Further agreements or specifications require written confirmation between the zwischen den contracting parties.

## 1.5 Support and Liability

It is not possible to cover every potential application of our device in a single manual. If further information is required or if problems occur which are not covered in this document, the necessary information can be requested via KEB America, Inc. or the local KEB Automation KG agency.

**The use of KEB products in the target application is beyond KEB control. Therefore responsibility lies exclusively with the machine manufacturer, system integrator or customer.**

The information contained in this document, as well as any user-specific advice in spoken or written form or generated through testing, is provided to the best of KEB knowledge and is considered for informational purposes only. KEB bears no responsibility or liability for the accuracy of the information listed above, nor for any violation of industrial property rights committed by a third-party in relation to this information.

Selection of the most suitable product for any given application is the responsibility of the machine manufacturer, system integrator or customer.

**Evaluation of the product can only be performed by the machine manufacturer in combination with the application. Any tests performed must be repeated every time any part of the hardware or software is modified, or any time the unit adjustment is changed.**

## 1.6 Validity of this manual

This part of the instruction manual describes the control card PRO for use in elevators.

- It is an extract of the control card PRO as well as the safety module type5 according to the firmware-dependent presetting for elevator applications.
- It is only valid in conjunction with the instruction manual power unit "F6 Peak Power", the programming manual "Elevator" and the safety manual "Elevator".
- If certain functions or properties are version-dependent, this is indicated at the appropriate place. The version number of the COMBIVERT can be found in brackets after the material number.

Further information



Elevator Support (KEB America)

( <https://www.kebamerica.com/elevator-support>)



## 2 General Safety Instructions

The KEB F6 Elevator Drive is designed and constructed with state-of-the-art technology in accordance with recognized safety rules and regulations. Improper use of this device may cause hazards to life and limbs of the user or third-parties, or damage to the application and other material property.

The following safety instructions have been created by KEB for elevator drive technology. These instructions can be supplemented by local, country- or application-specific safety instructions where relevant.

This list is not exhaustive. Non-observance of the safety instructions by the customer, user or other third party leads to the loss of all resulting claims against the manufacturer.

### NOTICE



#### Stay safe! Stay informed!

- ✓ Prior any work on the device
  - a) Read the instruction manual.
  - b) Follow all safety and warning instructions.
  - c) If you are unsure of any part of these instructions, please contact KEB prior to operating the device.

### 2.1 Installation

#### DANGER



#### Electrical voltage at terminals and in the device!

##### Danger to life due to electric shock!

- ✓ For any work on the device
  - a) Switch off the supply voltage.
  - b) Secure it against switching on.
  - c) Wait until all drives have been stopped to ensure that no regenerative energy can be generated.
  - d) Await capacitor discharge time (min. 5 minutes). Measure DC voltage at the terminals.
  - e) Never bridge upstream protective devices, even for test purposes.

### NOTICE



#### Use of suitable voltage sources!

##### Electric shock!

- a) Use for the connection suitable voltage sources with safe insulation (SELV/PELV) with a nominal voltage 24V DC  $\pm 10\%$ .
- b) Pay attention to a sufficient overvoltage category of the voltage supply.
- c) With existing or newly-wired circuits, the person installing the device or machine must ensure that the PELV requirements are met.

For a successful operation, please read the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses must be dimensioned by the user according to the specified minimum/maximum values for the application.
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Disregard can cause destruction of the components by equalizing currents.

## 2.2 Start-up and operation

Before the elevator is put into operation, several automatic identification procedures must be carried out. More details can be found in the manual start-up.

### WARNING



#### **Incorrect parameterization or unintended behavior of the drive**

- ✓ For initial start-up or replacement of the drive controller:
  - a) Check that the parameter settings meet the requirements of the application.
  - b) Always operate the elevator in inspection mode first in order to check that the elevator drive has control over the motor.

### WARNING

#### **Do not use software protection functions as the only protection of the system.**

- a) Use redundant mechanisms independent of the elevator drive to support critical safety functions.
- b) Exception: The safety functions implemented on the safety module 5 are functionally safe. Further information can be found in the instruction manual for the safety module 5.

## 2.3 Maintenance

### DANGER

#### **Unauthorized exchange, repair and modifications**

##### **Unpredictable malfunctions**

- a) The function of the drive controller is dependent on its parameterization. Never replace without knowledge of the application.
- b) Modification or repair is permitted only by KEB authorized personnel.
- c) Only use original manufacturer parts.
- d) Infringement will annul the liability for resulting consequences.

## 3 Product description

### 3.1 Description of the Elevator control board

The control board PRO (Lift version) provides the following basic functions:

- Digital and analog inputs and outputs
- Serial diagnostic interface
- TCP/IP interface
- Control hardware "safely separated" according to UL 61800-5-1
- Brake control, brake supply and feedback
- Motor protection by I<sup>2</sup>t, KTY, PT1000 or PTC input
- Internal supply of the control board possible
- External supply of the control board

### 3.2 Variants of the control board

The 11-digit type code indicates the variants of the control board. Positions that are not listed are irrelevant for this manual.

|                 |                                                                                                     |
|-----------------|-----------------------------------------------------------------------------------------------------|
| 1. and 2. digit | <b>Device size</b>                                                                                  |
| 3. and 4. digit | <b>Series</b>                                                                                       |
| 5. digit        | <b>Control type</b>                                                                                 |
| P               | PRO                                                                                                 |
| 6. digit        | <b>Variants</b>                                                                                     |
| 5               | Safety module type 5                                                                                |
| 7. digit        | <b>Housing</b>                                                                                      |
| 8. digit        | <b>Connection, voltage, options</b>                                                                 |
| 9. digit        | <b>Switching frequency, software current limit, overcurrent</b>                                     |
| 10th place      | <b>Control board design</b>                                                                         |
| 3               | PRO   Multi-encoder interface, CAN®, RS485 potential-free, Ethernet TCP/IP, standard relay (form C) |
| 11. digit       | <b>Heat sink version</b>                                                                            |

### 3.3 Accessories

The following terminal strip set is included in the delivery:

| Control board  | Set contains                                                              | Material number |
|----------------|---------------------------------------------------------------------------|-----------------|
| PRO (elevator) | Terminal strip 28-pole<br>Terminal strip 10-pole<br>Terminal strip 8-pole | 00F6V80-005P    |

### 3.4 Connection and control elements

|                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------|
|  <p>The diagram shows a KEB motor control unit with various connection points labeled. At the top, X1C, X3A, and X3B are indicated. On the right side, FS ST, VCC, NET ST, DEV ST, and OPT are labeled. At the bottom, X2A, X4B, X2B, and X4C are indicated. The unit features a central display and several status LEDs.</p> | X1C    | Temperature monitoring, brake control/monitoring                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X2A    | Control terminal block for digital inputs/outputs; 24V supply; relay output; analog inputs and outputs; CAN bus |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X2B    | Safety module                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X3A    | Encoder interface channel A                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X3B    | Encoder interface channel B                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X4A    | Diagnostic interface with RS232/485 interface according to DIN66019 protocol; operator slot                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X4B    | RS485 potential-free                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | X4C    | Ethernet TCP/IP                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | FS ST  | LED Safety state                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | VCC    | LED voltage supply (24V)                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | NET ST | LED fieldbus state                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | DEV ST | LED inverter/ device state                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                 | OPT    | LED state / limitation active                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                                                                                                                 |

Tab. 1: Overview Connection and control elements

### 3.5 Motor monitoring X1C (temperature, brake)

The X1C terminal strip is a 10-pin, pluggable terminal strip with spring-loaded connection. It includes:

- 2 outputs for controlling 24V motor brakes
- 2 control inputs for brakes or relays
- 1 analogue input for temperature measurement (not for variant with Hiperface)
- Hiperface DSL OCT input (depending on variant)

### 3.6 Control terminal strip X2A

The control terminal strip X2A is a 28-pole pluggable, double-row terminal strip with spring-cage connection. It includes:

- 8 digital inputs
- 2 digital outputs
- 1 relay output
- 2 analog inputs
- 1 analog output
- CAN bus interface
- 24V input and output

### 3.7 Safety module X2B

Terminal block X2B contains 3 two-channel, digital safety inputs and two single-channel, digital outputs. The description is given in the manual Safety module type 5.

### 3.8 Encoder interfaces X3A, X3B

Der Drive Controller mit Liftsteuerung ist mit zwei universellen Geberschnittstellen ausgestattet (variantenabhängig). The interfaces can be adapted to different encoders independently of each other.

### 3.9 Diagnostic interface X4A

The integrated RS232/485 interface is used to connect service tools (e.g. USB or Bluetooth adapter). The interface also serves as a connection point for the F6 keyboard/display operator. DIN 66019II is used as communication protocol.

### 3.10 Fieldbus interface X4B

The fieldbus interface X4B supports the following protocols depending on the variant:

- RS485 potential-free
- DIN 66019II with KEB Elevator application layer
- Elevator control DCP 3

### 3.11 Fieldbus interface X4C

The fieldbus interface X4B supports the following protocols:

- Ethernet TCP/IP

## 3.12 Status LEDs

### 3.12.1 Boot display

Before the LEDs start their normal function, they signal the boot procedure after switching on:

| LEDs                                   | Status              | Note                                                                                      |
|----------------------------------------|---------------------|-------------------------------------------------------------------------------------------|
| VCC ○<br>NET ○ ST<br>DEV ○ ST<br>OPT ○ | off                 | Device off                                                                                |
| VCC ●<br>NET ○ ST<br>DEV ○ ST<br>OPT ○ | Initialization      | Control is supplied with 24 V                                                             |
| VCC ●<br>NET ● ST<br>DEV ● ST<br>OPT ○ | ready for operation | Device is ready for operation and the LEDs start with their normal function (approx. 3 s) |

Tab. 2: LEDs at power on

### 3.12.2 FS ST - LED

| FS ST | LED color                                                                                 | Description                             |
|-------|-------------------------------------------------------------------------------------------|-----------------------------------------|
| Off   |  -     | No voltage supply of the safety module. |
| On    |  Green | Safety module in operation.             |
| On    |  Red   | Safety module in 'Error' status.        |

Tab. 3: Function DEV ST - LED

### 3.12.3 VCC - LED

| VCC | LED color                                                                                 | Description                                              |
|-----|-------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Off |  -     | Power supply to the control board has been switched off. |
| On  |  Green | The control unit is supplied with 24V.                   |

Tab. 4: VCC LED function

### 3.12.4 NET ST - LED

| NET ST     | LED color                                                                                   | Description                                       |
|------------|---------------------------------------------------------------------------------------------|---------------------------------------------------|
| Off        |  -       | Device off or booting.                            |
| Blink code |  various | Depending on the fieldbus => fieldbus interfaces. |

Tab. 5: NET ST function – LED

## 3.12.5 DEV ST - LED

| DEV ST | LED color                                                                         |        | Description                                                      |
|--------|-----------------------------------------------------------------------------------|--------|------------------------------------------------------------------|
| Off    |  | -      | Device off or booting.                                           |
| On     |  | Red    | Error                                                            |
| On     |  | Yellow | No error, DC link not charged.                                   |
| On     |  | Green  | No error, ready for operation.                                   |
| On     |  | Blue   | Configuration mode / Edit active parameters / FTP mode active... |

Tab. 6: Function DEV ST - LED

## 3.12.6 OPT - LED

| OPT | LED color                                                                           |        | Description                                             |
|-----|-------------------------------------------------------------------------------------|--------|---------------------------------------------------------|
| Off |    | -      | Drive idle state.                                       |
| On  |    | Red    | Operational – Torque, current or voltage limit reached. |
| On  |    | Yellow | Operational – Special function active.                  |
| On  |   | Green  | Operational – Running motor under normal operation.     |
| On  |  | Blue   | Operational – Learn mode is active.                     |
| On  |  | White  | Not operational - STO released without SBC.             |

Tab. 7: Function OPT - LED

## Tip



The DEV ST and OPT LEDs can be re-programmed for diagnostic purposes (i.e., the OPT LED could be programmed to represent the status of one of the digital inputs).

Refer to the Configuration Handling parameters in the programming manual.

## 4 Connection of the control board

### Observe the following instructions to avoid malfunctions!

- Install control and power cable separately (approx. 10..20 cm (4"..8") distance).
- Cross high voltage conductors at a right angle.
- In case of inductive load on the relay outputs a protective wiring must be provided (e.g. free-wheeling diode).
- Electromagnetic interferences can be prevented by the following measures:
  - Always use twisted and shielded cables for analog control cables. Place the shield on one side of the source.
  - Twist digital control cables. For lengths longer than 3 m (10'), a shield may be required. In this case, place on both sides.
  - When the brake conductors or motor temperature sensor conductors are run together with the motor conductors, the brake and temperature conductors should be shielded. The shield of the brake and temperature sensor conductors should be connected to earth ground together with the motor conductor shield. The shields should be kept as long as possible to prevent cross coupling with the motor conductors.

The terminals of the control terminal blocks, encoder inputs and the communication interface are securely isolated in accordance with IEC 61800-5-1.

### 4.1 Assembly of wires

#### NOTICE

#### Loose and slack cable connections!

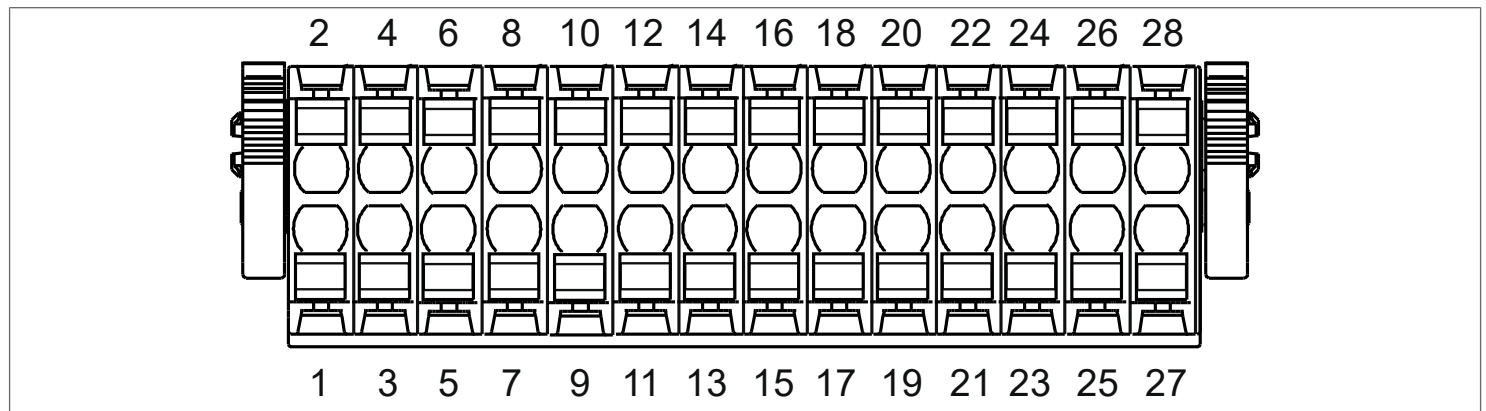
#### Malfunctions due to loose contacts.

- a) Observe metal sleeve length and stripping length according to table.
- b) Use a suitable pressing tool.
- c) Make sure that all wires are inserted into the wire-end sleeve.
- d) After inserting the cable into the terminal, check that it is firmly seated.

| Cross section                                                      | Wire end ferrule         | Metal sleeve length | Stripping length |
|--------------------------------------------------------------------|--------------------------|---------------------|------------------|
| 0.5...1 mm <sup>2</sup><br>(20...17 AWG)                           | With plastic collars     | 10 mm               | 12 mm            |
| 0.5...1.5 mm <sup>2</sup><br>(20...16 AWG)                         | Without plastic collars  | 10 mm               | 10 mm            |
| 0.2...1.5 mm <sup>2</sup><br>(24...16 AWG)<br>Solid or fine strand | Without wire end ferrule | -                   | 10 mm            |

Tab. 8: Wire end ferrules and stripping length

## 4.2 Terminal strip X2A



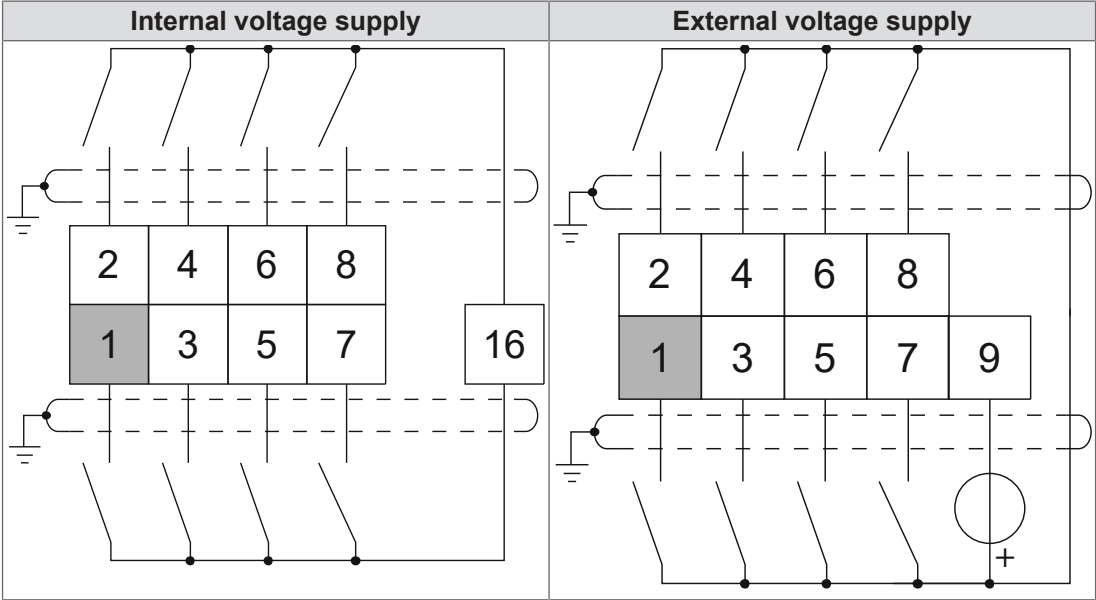
| PIN | Name       | Description                                                                                              |
|-----|------------|----------------------------------------------------------------------------------------------------------|
| 1   | DI1        | Digital input 1 / Standard function: not assigned                                                        |
| 2   | DI2        | Digital input 2 / Standard function: speed selection 1                                                   |
| 3   | DI3        | Digital input 3 / Standard function: speed selection 2                                                   |
| 4   | DI4        | Digital input 4 / Standard function: speed selection 3                                                   |
| 5   | DI5        | Digital input 5 / Standard function: direction Up                                                        |
| 6   | DI6        | Digital input 6 / Standard function: direction down                                                      |
| 7   | DI7        | Digital input 7 / Standard function: not assigned                                                        |
| 8   | DI8        | Digital input 8 / Standard function: fault reset                                                         |
| 9   | 0V         | Reference potential for digital inputs                                                                   |
| 10  | DO1        | Digital output 1 / Standard function: at speed                                                           |
| 11  | 0V         | Reference potential for digital outputs                                                                  |
| 12  | DO2        | Digital output 2 / Standard function: Deceleration active                                                |
| 13  | RLB        | Relay output / NC contact                                                                                |
| 14  | RLA        | Relay output / NO contact                                                                                |
| 15  | RLC        | Relay output / Switching contact / Standard function: not assigned                                       |
| 16  | 24Vout     | DC voltage output 24V (max. 100 mA together with terminal 26) for controlling the inputs (SELV).         |
| 17  | AN1-       | Non-isolated differential input 1                                                                        |
| 18  | AN1+       | Non-isolated differential input 1                                                                        |
| 19  | AN2-       | Non-isolated difference input 2 / Standard function: Analog pre-torque input -                           |
| 20  | AN2+       | Non-isolated difference input 2 / Standard function: Analog pre-torque input +                           |
| 21  | 0V         | Reference potential for analog inputs and outputs                                                        |
| 22  | ANOUT      | Analogue output DC 0–10 V Standard function: absolute actual speed                                       |
| 23  | CAN low    | CAN bus ISO High Speed according to ISO/DIN 11896 => fieldbus interfaces                                 |
| 24  | CAN high   | CAN bus ISO High Speed according to ISO/DIN 11896 => fieldbus interfaces                                 |
| 25  | CAN GND    | CAN Ground (⇒ <a href="#">Fieldbus interfaces</a> [► 30])                                                |
| 26  | 24VoutCtrl | DC voltage output (SELV) to supply the digital inputs. Caution, do not couple with other power supplies! |
| 27  | 0V         | Reference potential for P24Vin at external supply                                                        |
| 28  | P24Vin     | Voltage input DC 24 V supplying the control board and the brake output                                   |

Tab. 9: Assignment of the terminal strip X2A

### 4.2.1 Digital inputs

|               |                       |                                    |
|---------------|-----------------------|------------------------------------|
| Specification | Number                | 8                                  |
|               | Name                  | DI1...DI8                          |
|               | Terminals             | X2A.1...X2A.8                      |
|               | Classification        | Type 3 according to DIN EN 61131-2 |
|               | Low level (logical 0) | -3 ... +5 V                        |
|               | High level (logic 1)  | 11 ... 30 V / 2 ... 6 mA           |

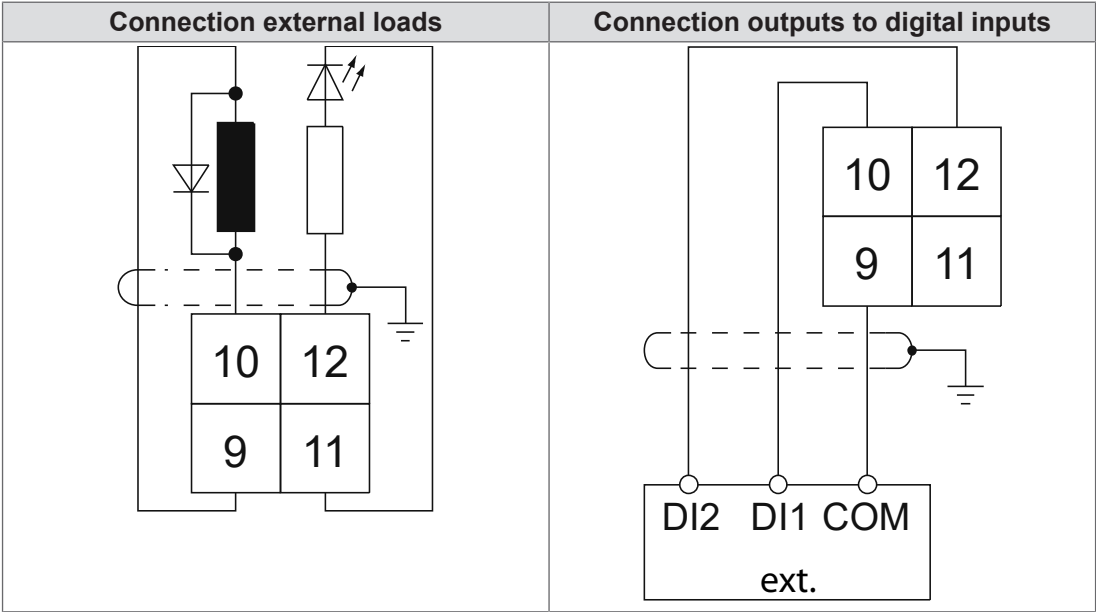
#### Connection



4.2.2 Digital outputs

|               |                  |                                                                                                                                                     |
|---------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Specification | Number           | 4 (2 at terminal strip X2A and 2 at terminal strip X2B)                                                                                             |
|               | Name             | DO1 ... DO2 (Out1 and Out2 on X2B)                                                                                                                  |
|               | Terminals        | X2A.10, X2A.12 (X2B.7 and X2B.8)                                                                                                                    |
|               | Type             | 24 V high-side Switch                                                                                                                               |
|               | Classification   | DIN EN 61131-2                                                                                                                                      |
|               | Output voltage   | Minimum P24Vin – 3 V<br>Maximum P24Vin                                                                                                              |
|               | Output current   | Maximum 100 mA per output (short-circuit proof)                                                                                                     |
|               | Special features | No internal free-wheeling diode. External free-wheeling diode required for inductive load. The outputs on X2B are controlled via the safety module. |

Connection



### 4.2.3 Relay output

#### 4.2.3.1 Relay output form C

|                                   |                  |                                                                                            |
|-----------------------------------|------------------|--------------------------------------------------------------------------------------------|
| Specification relay output Form C | Number           | 1                                                                                          |
|                                   | Name             | R1                                                                                         |
|                                   | Terminals        | X2A.13 (NC contact)<br>X2A.14 (NO contact)<br>X2A.15 (switching contact)                   |
|                                   | Type             | Form C                                                                                     |
|                                   | Voltage          | Maximum DC 30 V                                                                            |
|                                   | Current          | 0.01...1 A                                                                                 |
|                                   | Switching cycles | 10 <sup>8</sup> mechanical<br>500,000 at 30 V / 1 A                                        |
|                                   | Special features | No internal free-wheeling diode. External free-wheeling diode required for inductive load. |

#### WARNING



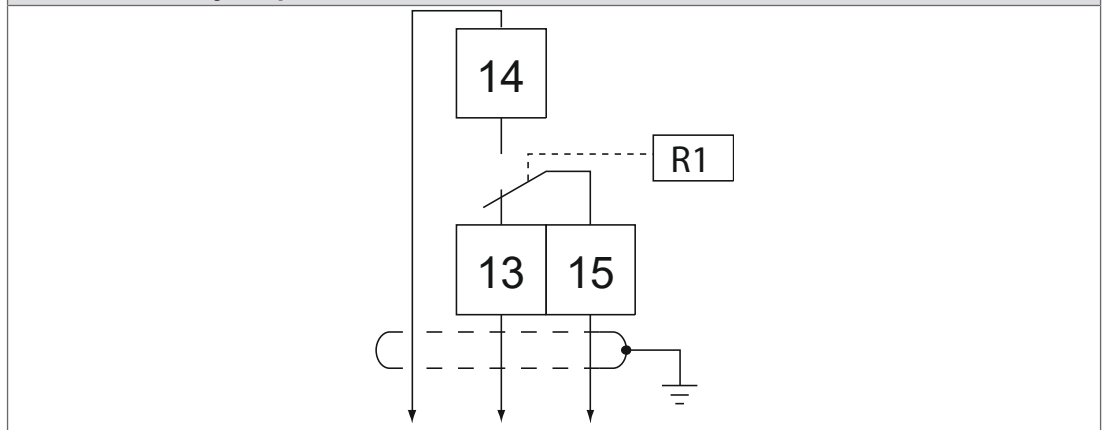
**No internal fusing of the relay contacts!**

**Welding of the relay contacts due to inadmissible overload!**

- a) Limit the current by the normally open contact to 2 A (e.g. by using a fuse type 2A gG).
- b) Observe further instructions in the safety manual.

Connection relay output form C

#### Connection relay output form C



4.2.4 Analog input

4.2.4.1 Differential input

|                               |                                                                                                                                                                                                                                                                                                                                                                                |                                                                                            |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Specification (analog inputs) | <b>NOTICE</b>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                            |
|                               | <b>No potential separation of the analog inputs to the control voltage!</b><br><b>Malfunctions or defects due to voltage differences.</b><br>a) If the analog value is outside the common mode range, a potential equalisation cable is required between the analog source and the analog input. Connect the potential equalisation cable to 0V of the control terminal block. |                                                                                            |
|                               | Number                                                                                                                                                                                                                                                                                                                                                                         | 2                                                                                          |
|                               | Name                                                                                                                                                                                                                                                                                                                                                                           | AN1, AN2                                                                                   |
|                               | Terminals                                                                                                                                                                                                                                                                                                                                                                      | X2A.18 (AN1+)<br>X2A.17 (AN1-)                                                             |
|                               | Classification                                                                                                                                                                                                                                                                                                                                                                 | non-isolated differential voltage input                                                    |
|                               | Input signals                                                                                                                                                                                                                                                                                                                                                                  | DC 0...±10 V<br>Bi-polar differential voltage signal<br>Accuracy ±2 %<br>Resolution 12 bit |
|                               | Terminals                                                                                                                                                                                                                                                                                                                                                                      | X2A.20 (AN2+)<br>X2A.19 (AN2-)                                                             |
|                               | Classification                                                                                                                                                                                                                                                                                                                                                                 | non-isolated voltage input                                                                 |
|                               | Input signals                                                                                                                                                                                                                                                                                                                                                                  | DC 0...+10 V<br>Uni-polar voltage signal<br>Accuracy ±2 %<br>Resolution 12 bit             |
|                               | Common mode range                                                                                                                                                                                                                                                                                                                                                              | -12.5 V...17.5 V                                                                           |

Connection

Connection of the analog inputs AN1 and AN2

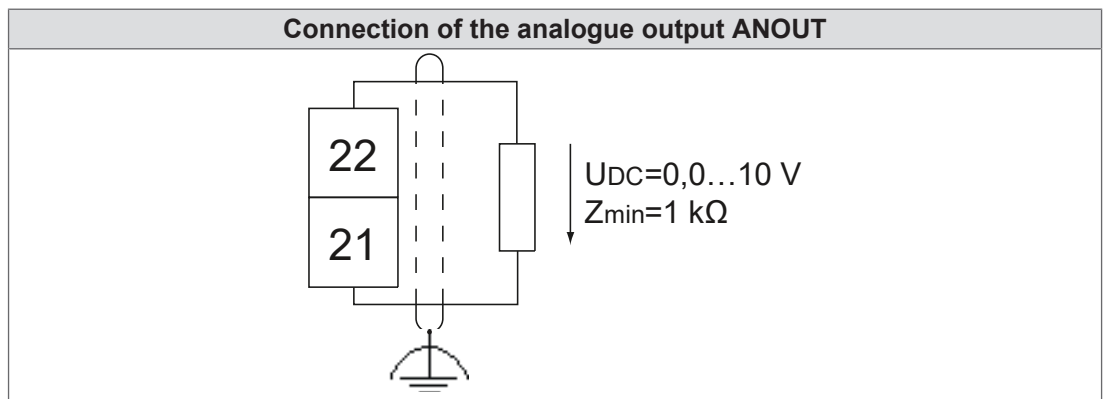
\*) Twist signal lines in pairs, potential equalisation cable is routed separately

## 4.2.5 Analog output

### Specification

|                        |                                                                                |
|------------------------|--------------------------------------------------------------------------------|
| Number                 | 1                                                                              |
| Name                   | ANOUT                                                                          |
| Terminals              | X2A.22 analog output<br>X2A.21 reference potential                             |
| Classification         | DIN EN 61131-2                                                                 |
| Voltage output         | DC 0.0...10 V (corresponds to 0...100 % output value)                          |
| Resolution             | 11 bit                                                                         |
| Minimum load impedance | 1 kΩ                                                                           |
| Notes                  | In the range up to 0.1 V the output value is not linear to the output voltage. |

### Connection



## 4.2.6 Voltage supply

### 4.2.6.1 Voltage input

The control board can be supplied:

- externally by a central 24 V supply.
- internally, by its own switching power supply.
- in mixed operation, by external and internal supply.

To select a suitable voltage source, the maximum current consumption must always be determined.

#### 4.2.6.1.1 Calculation the current consumption

The input P24Vin (X2A.28) supplies following components:

- Control (control board with safety module)
- Brake
- HCT
- Encoder

| Loads           |                   | Current consumption |
|-----------------|-------------------|---------------------|
| Control         |                   | 0.6 A               |
| Power unit      | Housing 2 / 3 / 4 | 0.6 A               |
|                 | Housing 6         | 0.6 A               |
|                 | Housing 2 / 3 / 4 | 0.6 A               |
| Ancillary loads | Brake             | Max. 2.0 A          |

| Loads |                       | Current consumption |
|-------|-----------------------|---------------------|
|       | Encoder               | Max. 2.0 A          |
|       | Digital output DO1    | Max. 2.0 A          |
|       | Digital output DO1    | Max. 2.0 A          |
|       | Voltage output 24Vout | Max. 2.0 A          |
|       | Sum DO safety modules | Max. 2.0 A          |

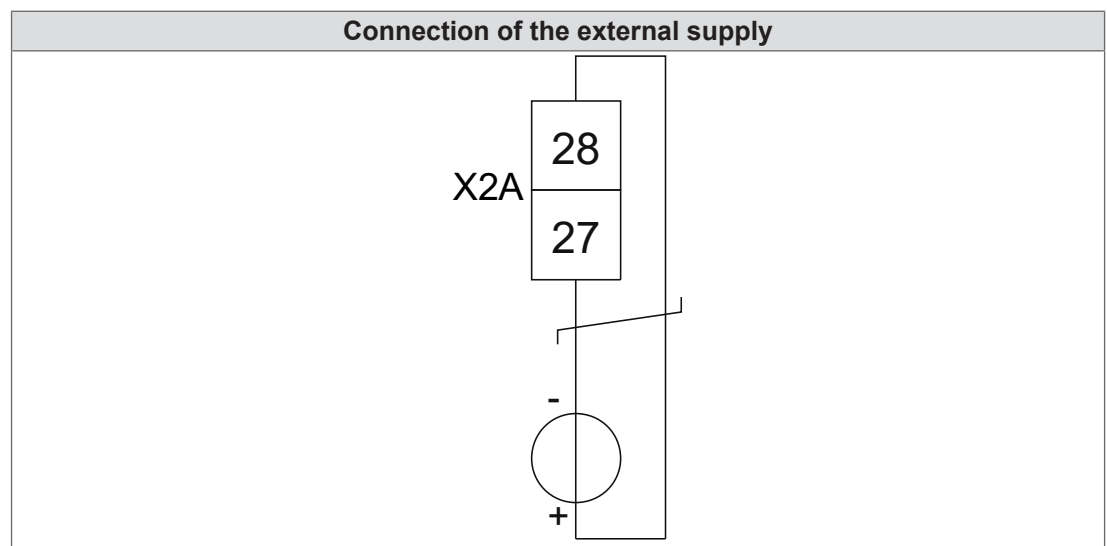
Tab. 10: Calculation the current consumption

In order to calculate the input current, the currents of the power unit, control and other loads must be added together. The actual current required can be used for the loads. The maximum current must not be exceeded.

#### 4.2.6.1.2 External supply

##### Specification external supply

|                     |                                   |
|---------------------|-----------------------------------|
| Name                | P24Vin, 0V                        |
| Terminals           | X2A.28 (P24Vin)<br>X2A.27 (0V)    |
| Voltage             | DC 24 V (+20 % / -17 %)           |
| Current consumption | Calculated value up to max. 4.8 A |



#### 4.2.6.1.3 Internal supply

The internal supply occurs via the 24VoutCtrl output. This is connected with the P24Vin input. The output may only be used to supply the control board.

##### Specification internal supply

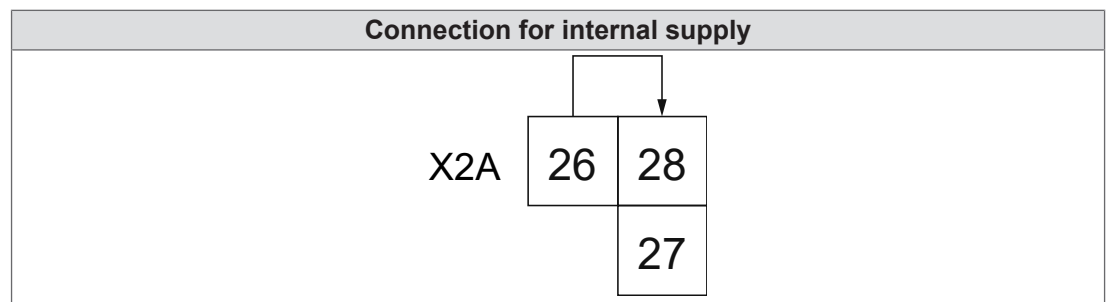
|                        |                                                                             |
|------------------------|-----------------------------------------------------------------------------|
| Name                   | 24VoutCtrl; P24Vin                                                          |
| Terminals              | X2A.26 (24VoutCtrl)<br>X2A.28 (P24Vin)                                      |
| Output voltage         | DC 24 V (-17 % / +20 %)                                                     |
| Maximum output current | 1.5 A (housing 2 / 3 / 4)<br>2.1 A (housing 6)<br>2.5 A (housing 7 / 8 / 9) |
| Reference potential    | 0V (terminal X2A.27)                                                        |

**NOTICE****Too much current load!****Malfunctions can occur at the device and in the application.**

- a) Determine the maximum current according "Determination of the current consumption".
- b) If current consumption at P24Vin is higher than max. output current at 24VoutCtrl, then select external or mixed supply.

**Observe the input voltage of the device!**

- a) The connected loads must be designed for the voltage tolerance of the voltage output 24VoutCtrl.

**see also**

- 📄 Calculation the current consumption [► 21]

## 4.2.6.1.4 Mixed supply

Mixed voltage supply is used,

- if the drive controller is to remain in operation when the high voltage supply of the drive controller is switched off.
- so that the drive controller can continue to operate if the external power supply fails.

**Install protective diode**

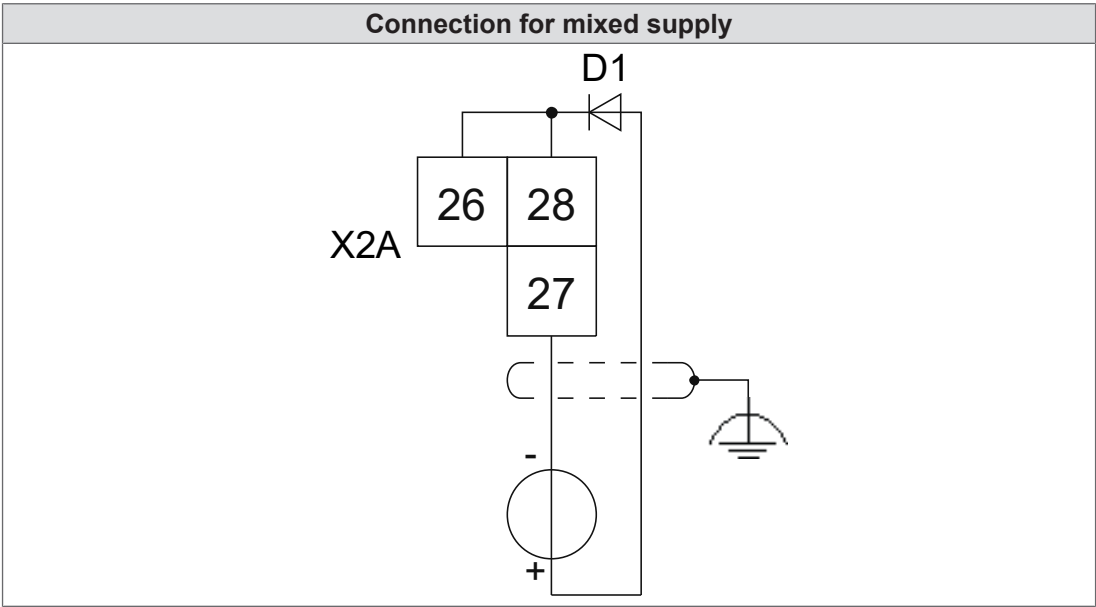
- a) Diode D1 prevents the voltage output from supplying other loads if the external supply fails (see connection diagram "Connection with mixed supply").

**NOTICE****Too much current load!****Malfunctions can occur at the device and in the application.**

- a) Determine the maximum current according "Determination of the current consumption".
- b) If current consumption at P24Vin is higher than max. output current at 24VoutCtrl, then select external or mixed supply.

**Observe the input voltage of the device!**

- a) The connected loads must be designed for the voltage tolerance of the voltage output 24VoutCtrl.



see also

📄 Calculation the current consumption [► 21]

4.2.6.2 Voltage output to supply the inputs

|                              |                                                            |                                                         |
|------------------------------|------------------------------------------------------------|---------------------------------------------------------|
| Specification voltage output | Name                                                       | 24Vout<br>0V (reference potential)                      |
|                              | Terminals                                                  | X2A.16 (24Vout)<br>X2A.27 (0V)                          |
|                              | Output current                                             | max. 100 mA (short-circuit proof)                       |
|                              | Output voltage                                             | minimum P24Vin - 3V<br>maximum P24Vin                   |
|                              | Notes                                                      | DC voltage output (SELV ) to supply the digital inputs. |
|                              | Connection see (≡► <a href="#">Digital inputs [► 17]</a> ) |                                                         |

## 5 Safety module X2B

Elevator devices contain a safety module type 5 with preset safety functions for **STO** and **SBC**. Further safety functions are not provided for the "Elevator" application and cannot be changed on site.

### WARNING



#### Changed behavior during start-up due to presetting!

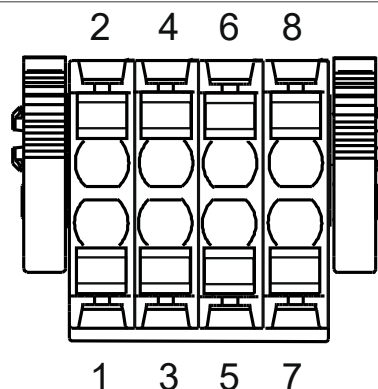
**The safety module is already configured by default. The drive can rotate immediately after the safety inputs are switched on and control released.**

- a) Prevent start of the drive by further measures if this behavior is not required.

To operate the F6 Elevator Drive, both **STO** and **SBC** must be enabled. For the intended use, it is essential to observe the connection examples for the inputs.

More information about the safety module can be found at the end of this chapter.

### 5.1 Terminal X2B



| PIN | I/O      | Channel | Function               |
|-----|----------|---------|------------------------|
| 1   | Input 1  | 1       | reserved - no function |
| 2   | Input 1  | 2       | reserved - no function |
| 3   | Input 2  | 1       | STO and SBC            |
| 4   | Input 2  | 2       | STO and SBC            |
| 5   | Input 3  | 1       | STO                    |
| 6   | Input 3  | 2       | STO                    |
| 7   | Output 1 | 1       | STO feedback           |
| 8   | Output 2 | 1       | SBC feedback           |

The voltages of all inputs and outputs refer to the 0V of the control terminal block X2A.

Tab. 11: Assignment of terminal X2B

## 5.2 Digital safety inputs

### 5.2.1 Safety inputs specification

|               |                       |                                              |
|---------------|-----------------------|----------------------------------------------|
| Specification | Number                | 6 (4 preset, 2 reserved)                     |
|               | Name                  | STO1 / STO2 / SBC1 / SBC2                    |
|               | Terminals             | X2B.5/ .6/ .3/ .4 (X2B.1 and X2B.2 reserved) |
|               | Classification        | Type 3 according to DIN EN 61131-2           |
|               | Low level (logical 0) | -3 ... +5 V / 15 mA                          |
|               | High level (logic 1)  | 11 ... 30 V / 2 ... 15 mA                    |

### 5.2.2 Connection example STO two-channel

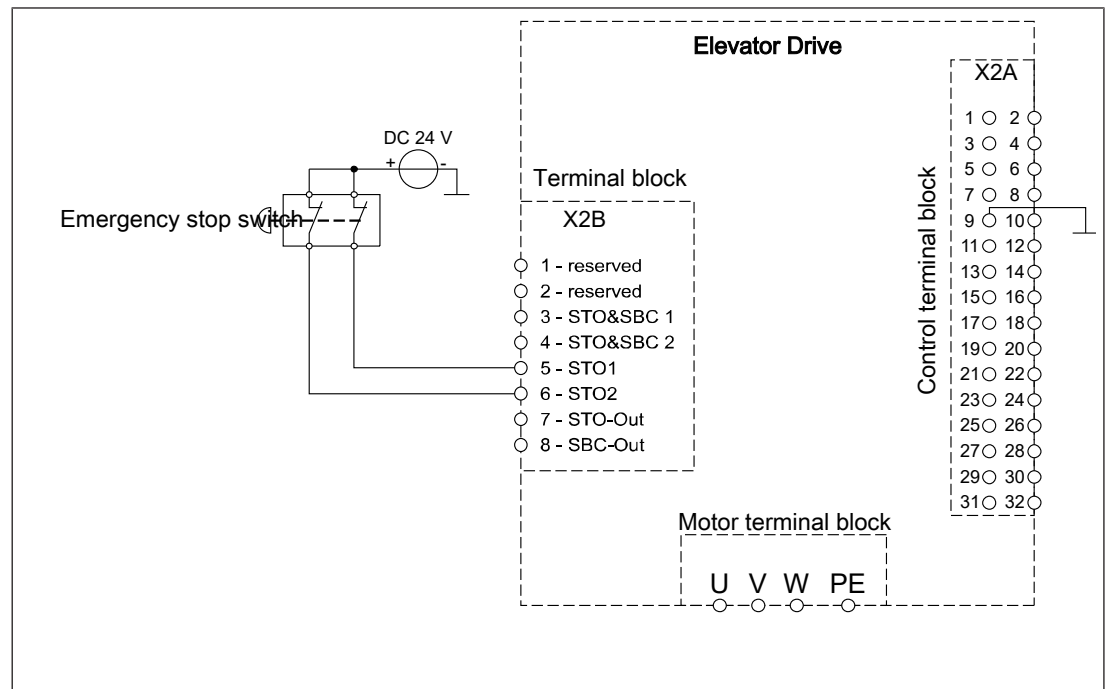


Fig. 1: Direct switching off with emergency stop switch

## 5.3 Digital outputs

### 5.3.1 Feedback outputs specification

|               |                |                                                                                            |
|---------------|----------------|--------------------------------------------------------------------------------------------|
| Specification | Number         | 2                                                                                          |
|               | Name           | STO feedback<br>SBC feedback                                                               |
|               | Terminals      | X2B.7<br>X2B.8                                                                             |
|               |                | X2A.11 (reference potential control terminal block)                                        |
|               | Classification | Type 0.1 according to DIN EN 61131-2                                                       |
|               | Output voltage | Min. P24Vin - 3 V<br>Max. P24Vin                                                           |
|               | Output current | Max. 100 mA per output (short-circuit proof)                                               |
|               | Others         | No internal free-wheeling diode. External free-wheeling diode required for inductive load. |

### 5.3.2 Connection example feedback outputs

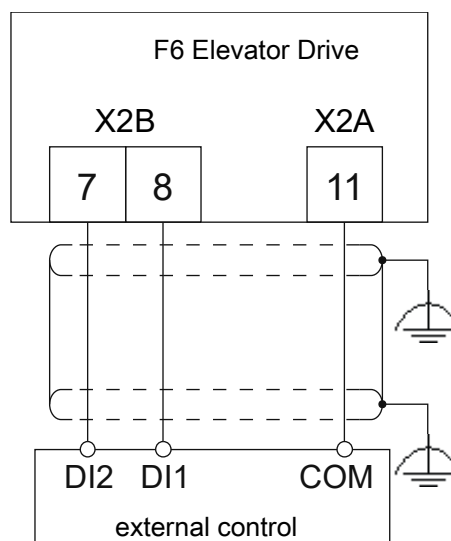


Fig. 2: Connection example feedback outputs STO and SBC

|                                        |                     |                                         |
|----------------------------------------|---------------------|-----------------------------------------|
| X2B.7                                  | STO feedback output | Is set when the STO function is active. |
| X2B.8                                  | SBC feedback output | Is set when the SBC function is active. |
| X2A.11                                 | 0V                  | Reference potential                     |
| DI1/DI2/COM Inputs of external control |                     |                                         |

## 5.4 More information

The full range of functions of the safety module type 5 when changing the presetting for F6 Elevator drives can be found in the following documentation.



Safety Manual Type 5 Elevator

(<https://www.keb-automation.com/0012>)

Document: ma\_dr\_safety-type5-elev-20430837\_us.pdf



## 6 Diagnosis/visualization X4A

The integrated serial interface provides the following functions:

- Parameterization of the device with the KEB software COMBIVIS.
- Connection for operator keyboard/display.
- Connection for Bluetooth adapter for use with Elevator Phone App.
- DIN66019II as communication protocol.

| Interface | Specification                      |
|-----------|------------------------------------|
| RS485     | Common-mode voltage range 0...12 V |
| RS232     | ANSI TIA/EIA-232                   |

Tab. 12: Serial interfaces

| Name                                     | Material number |
|------------------------------------------|-----------------|
| Bluetooth Adapter for Elevator Phone App | 0058K60-L060    |

Tab. 13: Accessories

| Name                                              | Material number |
|---------------------------------------------------|-----------------|
| RS232 PC inverter (SubD-9 coupling - SubD-9 plug) | 0058025-001D    |
| RS232/USB (USB serial converter inclusive cable)  | 0058060-0040    |

Tab. 14: Connecting cable

### NOTICE

**No potential separation of the diagnostic interface to the control voltage!**

**Malfunction or defect can be caused by voltage differences.**

- a) Install equipotential bonding conductor if voltage differences > common-mode voltage range.



### XML file required for COMBIVIS 6.

- a) A current XML file is required for the operation with COMBIVIS 6.
- b) The download can be done directly from COMBIVIS 6 while an Internet connection is present.

### 6.1 Assignment of the terminal strip X4A

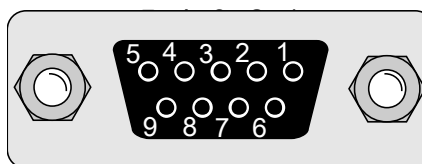


Fig. 3: Pin assignment socket D-Sub-9 (top view)

|                              |                 |
|------------------------------|-----------------|
| 1 reserved                   | 2 TxD (RS232)   |
| 3 RxD (RS232)                | 4 RxD-A (RS485) |
| 5 RxD-B (RS485)              | 6 reserved      |
| 7 DGND (reference potential) | 8 TxD-A (RS485) |
| 9 TxD-B (RS485)              |                 |

## 6.2 Data cable RS232 PC-Drive Controller

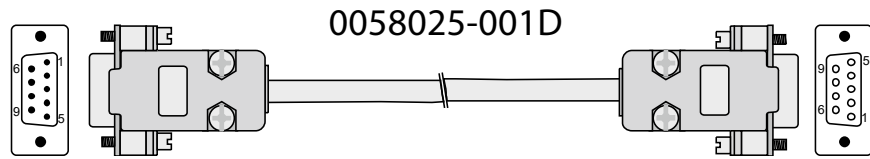


Fig. 4: Serial cable for the connection to a PC

## 6.3 USB-serial converter

The USB serial converter (material number 0058060-0040) is used to connect drive controllers, operators or IPC controllers with DIN 66019 interface or HSP5 interface to the USB port of personal computers. The USB-serial converter is internally electrically isolated.

## 6.4 Connection of the RS485 interface

The RS485 interface supports half-duplex and duplex operation. Wiring examples can be found in the following link:

|  |                                                                                                                                                                                                     |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>Technical information - RS485 connection:</p> <p>( <a href="https://www.keb-automation.com/000C">https://www.keb-automation.com/000C</a>)</p> <p>Document: ti_dr_tn-rs485-connection-0002_en</p> |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

## 6.5 Remote control

The F6 operator with display/keypad can be operated up to 30 m away from the unit.

Recommended connection:

- Commercially available network cable 1:1 with RJ45 plugs (min. CAT5)
- Install to both ends an RJ45 socket on D-SUB DE-9 (1x female; 1x male)
- **Important!** The shielding from X4A to the operator must be connected via the CAT5 cable.

| Signal    | D-SUB DE-9 pin | RJ45 pin |
|-----------|----------------|----------|
| RxD-A     | 4              | 1        |
| RxD-B     | 5              | 2        |
| TxD-A     | 8              | 4        |
| TxD-B     | 9              | 5        |
| reserved  | 6              | 3        |
| DGND      | 7              | 6        |
| Shielding | Housing        | Housing  |

Tab. 15: Wiring of the DE-9 - RJ45 adapters

## 7 Fieldbus interfaces

### 7.1 Fieldbus interfaces

- CAN
- Ethernet TCP/IP
- RS485 potential-free

### 7.2 CAN

|               |                      |                                                                             |
|---------------|----------------------|-----------------------------------------------------------------------------|
| Specification | Fieldbus type        | CAN                                                                         |
|               | Transmission level   | According to DIN ISO 11898; ISO High Speed                                  |
|               | Transmission speed   | 20, 25, 50, 100, 125, 250, 500, 800, 1000 kbit/s; adjustable via CN01       |
|               | Potential separation | Functional insulation between CAN terminals and to the control potential.   |
|               | Bus termination      | 120 Ω external between (CAN High and CAN Low) at both ends of the bus line. |

Connection

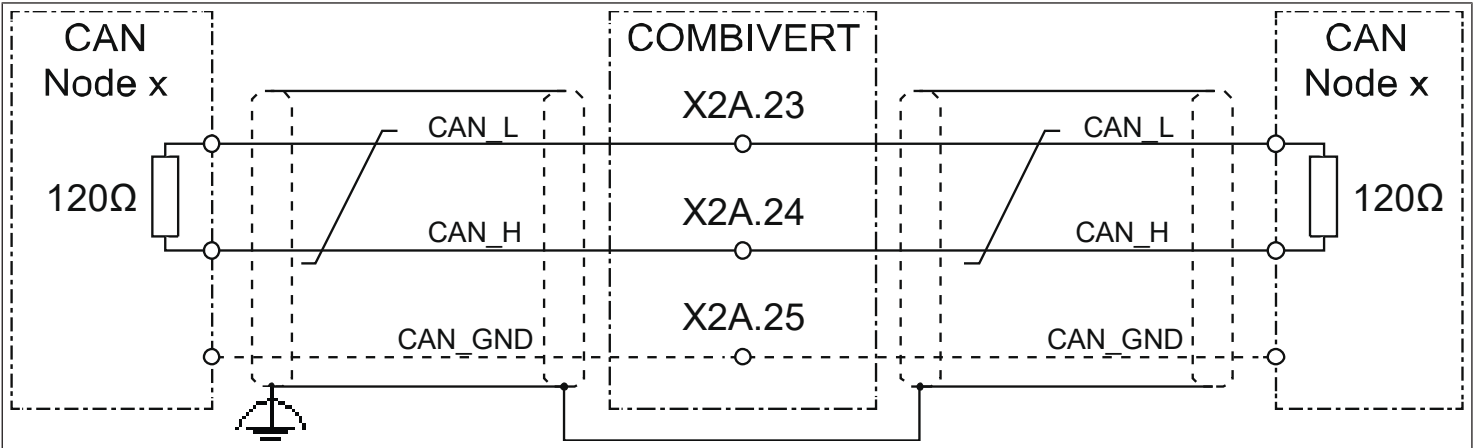


Fig. 5: Connection CAN bus

| Clamp  | Name     | Note                                                           |
|--------|----------|----------------------------------------------------------------|
| X2A.23 | CAN low  | No internal bus termination                                    |
| X2A.24 | CAN high |                                                                |
| X2A.25 | CAN GND  | CAN ground (can be wired depending on the customer subscriber) |

#### NET ST - LED in CAN mode

According to CiA 303-3, the NET ST LED is a combination of RUN and ERROR LED. The NET ST LED indicates the status of the primary fieldbus used for control. For example, if CAN speed or position control is selected in US04, the LED shows the status of the CAN bus. However, if serial speed control is selected in US04, the LED indicates the status of the serial communication bus, even if the CAN interface is used for auxiliary purposes, e.g. weighing loads.

Light pattern NET ST LED (red/  
green combination)

| Status                | Light pattern                | Description                                                                           |
|-----------------------|------------------------------|---------------------------------------------------------------------------------------|
| Pre-Op                | g-0 (grid 200 ms)            | Device in state PRE-OPERATIONAL                                                       |
| Stop                  | g-0-0-0-0-0 (grid 200 ms)    | Device in state STOPPED                                                               |
| Op                    | g (continuously)             | Device in state OPERATIONAL no error                                                  |
| Bus off               | r (continuously)             | CAN bus off.                                                                          |
| Invalid Configuration | r-0 (grid 200 ms)            | General configuration error.                                                          |
| Warning limit reached | r-0-0-0-0-0 (grid 200 ms)    | The error counter has reached or exceeded a warning level.                            |
| Legend                | r: Red<br>g: Green<br>0: off | The signals from red/green are shifted by 180°. Red has priority for superimposition. |

### 7.3 Ethernet TCP/IP

Specification

Fieldbus type

Ethernet

Transmission level

100Base-Tx according to IEEE802.3 with autonegotiation and auto-crossover

Connections

X4C: Ethernet TPC/IP

Device addressing

Ethernet IP address, subnet and gateway are set with LX27...LX27.

Default:

IP 192.168.1.2

Port 8000

Node 0

Protocol

DIN66019II via TCP/IP

Connection

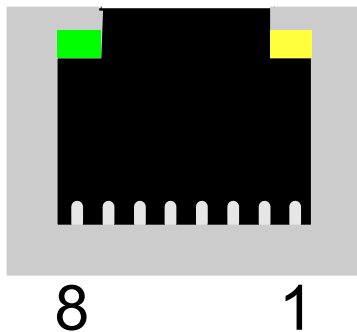


Fig. 6: RJ45 socket front view

| PIN | RJ45 without supply voltage<br>(Viewing with Auto-Cross Over) |     |
|-----|---------------------------------------------------------------|-----|
| 1   | TX+                                                           | RX+ |
| 2   | TX-                                                           | RX- |
| 3   | RX+                                                           | TX+ |
| 4   | reserved                                                      |     |
| 5   | reserved                                                      |     |
| 6   | RX-                                                           | TX- |
| 7   | GND                                                           |     |
| 8   | GND                                                           |     |

Tab. 16: PIN assignment RJ45 Ethernet

| LED / light pattern | Function                       |
|---------------------|--------------------------------|
| Yellow (flashing)   | Port available                 |
| Green               | Link/Activity                  |
| Off                 | Port closed or not connected   |
| On                  | Port opened; no data traffic   |
| Flickering          | Port opened; with data traffic |

Tab. 17: Function of the LEDs

The CANopen interface is then active by default.

## 7.4 KEB Elevator Serial Control - RS485 Isolated

### 7.4.1 Specification

|                                        |                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------|
| Interface                              | RS485 potential-free with bus termination 4W                                  |
| Transmission speed                     | 9.6, 19.2, 38.4, 55.5, 57.6, 100, 115.2, 125, 250, 500 kBit/s                 |
| Bus nodes                              | 2                                                                             |
| Common-mode voltage range              | 0...12 V to the 'bus reference potential' BUS-COM                             |
| Potential separation                   | Potential-free to reference potential 0V/COM (functional isolation)           |
| Bus termination                        | 120 $\Omega$ each (pin 1 and 2; 4 and 5); integrated (cannot be switched off) |
| Connection cable (minimum requirement) | CAT.5e network cable (S/UTP)                                                  |

### 7.4.2 Connection

Connection X4B

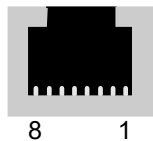


Fig. 7: RJ45 socket front view

| PIN     | Signal name | EIA/TIA-485 name | Function                                                           |
|---------|-------------|------------------|--------------------------------------------------------------------|
| 1       | Rx+         | (RxD-A) / A'     | Lift controller transmit signal + / COMBIVERT receive signal +     |
| 2       | Rx-         | (RxD-B) / B'     | Lift controller transmission signal - / COMBIVERT receive signal - |
| 3       | n.c.        | n.c.             | reserved                                                           |
| 4       | Tx-         | (TxD-B) / B      | COMBIVERT transmit signal - / Lift controller receive signal -     |
| 5       | Tx+         | (TxD-A) / A      | COMBIVERT transmit signal + / Lift controller receive signal +     |
| 6       | n.c.        | n.c.             | reserved                                                           |
| 7       | n.c.        | n.c.             | reserved                                                           |
| 8       | Common      | (BUS-COM) / C/C' | Reference potential                                                |
| Housing | Shielding   | Shielding        | Earth ground                                                       |

Tab. 18: PIN assignment RS485 potential-free to RJ45 connector

Note: new terminology for MOD-BUS:

Master => Client

Slave => Server

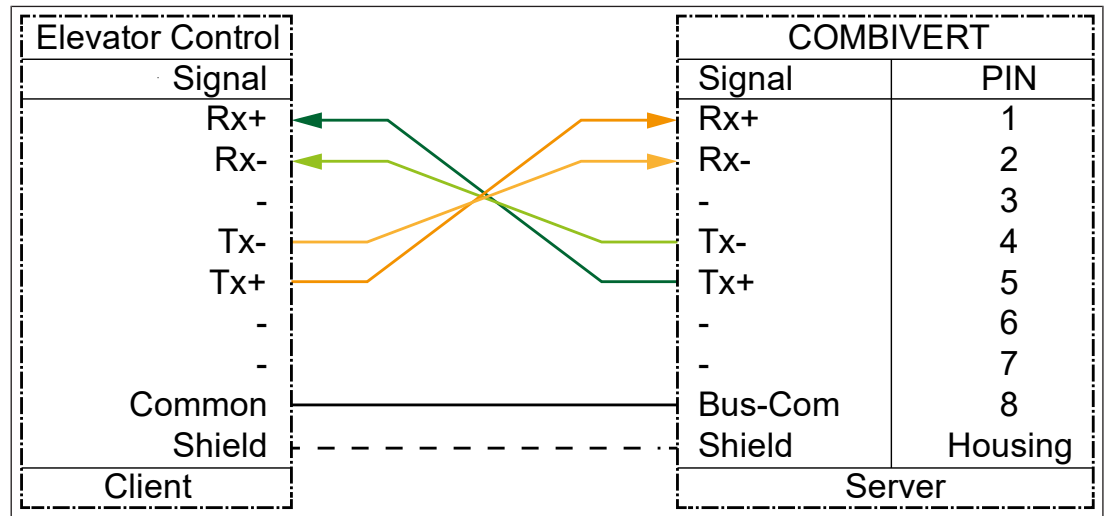


Fig. 8: Schematic diagram 4-Wire connection

### Pre-manufactured cables

Industrial grade serial cables are pre-manufactured in the following lengths. One end is a RJ45 connector. The other end has flying leads.

| Item number  | Length |
|--------------|--------|
| 00F6L60-1001 | 1 m    |
| 00F6L60-1001 | 1 m    |
| 00F6L60-1001 | 1 m    |

Tab. 19: Pre-manufactured cables

| PIN | Color wire   | COMBIVERT signal | Lift controller signal |
|-----|--------------|------------------|------------------------|
| 1   | White/Orange | Rx+              | Tx+                    |
| 2   | Orange       | Rx-              | Tx-                    |
| 3   | White/Green  | Not used         |                        |
| 4   | Blue         | Tx-              | Rx-                    |
| 5   | White/Blue   | Tx+              | Rx+                    |
| 6   | Green        | Not used         |                        |
| 7   | White/Brown  | Not used         |                        |
| 8   | Brown        | REF              |                        |

Tab. 20: PIN assignment using a CAT cable in accordance with EIA 568B

## 8 Encoder interfaces

### 8.1 Multi-Encoder-Interface

The multi-encoder interface consists of two channels. Channel A supports the following encoder types:

- Incremental encoder input (RS485) with or without zero signal
- Resolver
- EnDat (digital with 1 Vpp incremental signals)
- BiSS (digital)
- Hiperface
- SinCos with/without zero signal; with/without absolute position (SSI or analogue 1 Vpp)

Channel B supports the following encoder types:

- Incremental encoder input (RS485) with or without zero signal
- Incremental encoder input (HTL)
- Incremental encoder output (RS485)
- SSI
- BiSS (digital)
- EnDat (digital)

#### **NOTICE**

---

#### **Connection of analog and digital EnDat encoders!**

- a) Analog EnDat encoders can only be operated on channel A.
  - b) Digital EnDat encoders can be operated on channel A and/or channel B.
  - c) Mixed operation of analog and digital EnDat encoders is not possible.
- 

#### **NOTICE**

---

#### **Undefined states by plugging of encoder cables during operation!**

#### **Malfunctions can be caused by incorrect speed or position values.**

- a) Never plug or unplug the connector on the encoder interface during operation.
-

### 8.1.1 Input signals

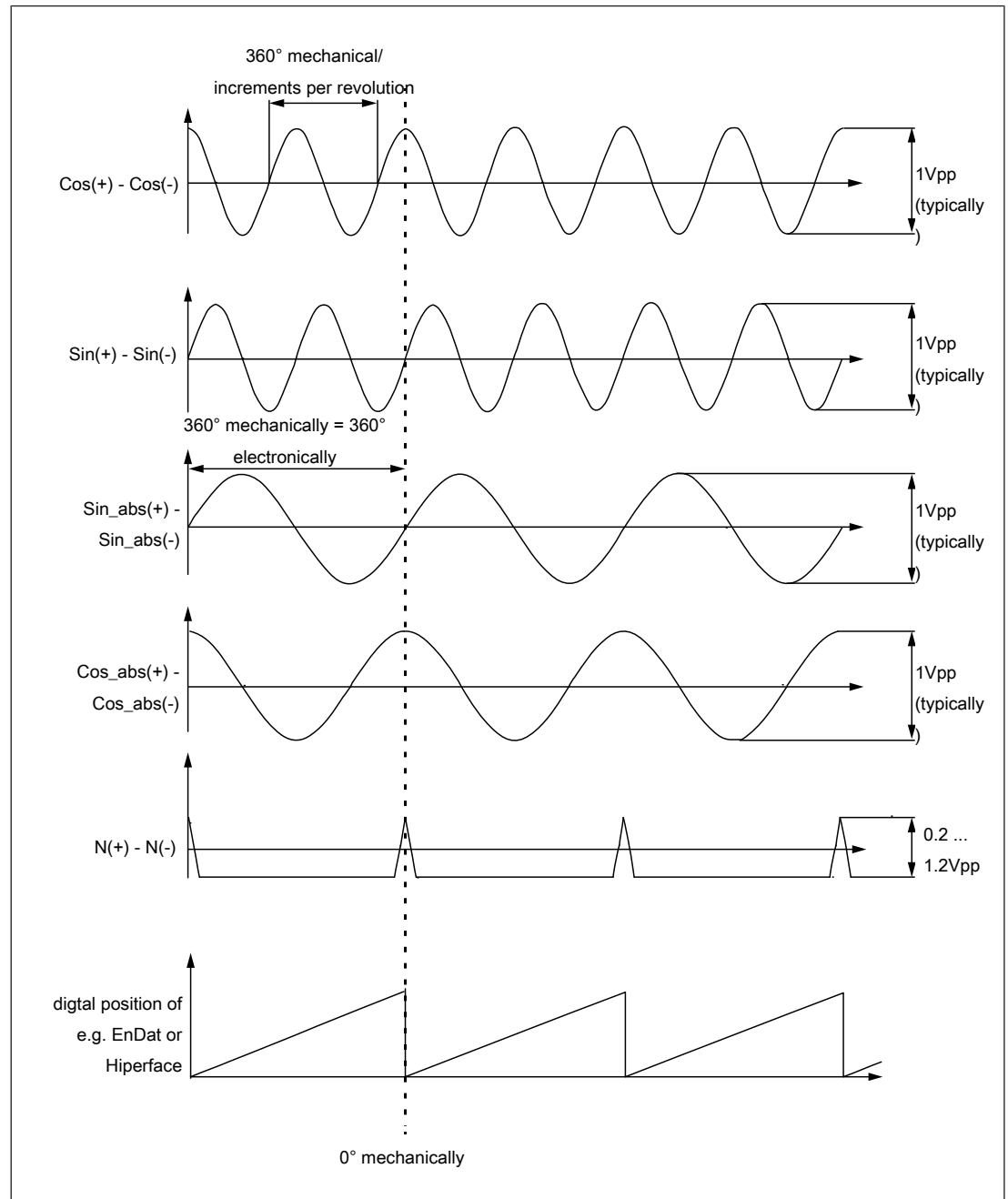


Fig. 9: Assignment of the input signals (as differential signals)



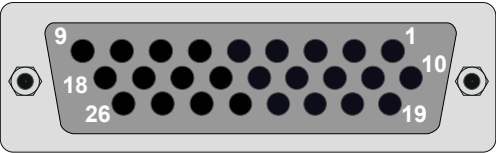
- For rectangular incremental signals, the characteristic of the signal corresponds to A -> COS and B -> SIN.
- The identification "C" and "D" for the absolute signals must be checked. Frequently signal C corresponds to -> SIN\_abs and D to -> (inverted) COS\_abs. Thus D+ is at COS\_abs- and D- is at COS\_abs+.

Alternative designation of encoder signals (⇒ Info)

| Encoder signal | KEB signal input | Encoder signal | KEB signal input |
|----------------|------------------|----------------|------------------|
| A+             | COS+             | B+             | SIN+             |
| A-             | COS-             | B-             | SIN-             |
| R+             | N+               | R-             | N-               |
| C+             | SIN_abs+         | D+             | COS_abs-         |
| C-             | SIN_abs-         | D-             | COS_abs+         |

Tab. 21: Alternative designation of encoder signals

### 8.1.2 Encoder sockets X3A/X3B

| X3A / X3B: connector socket |                                                              |                         | (front view socket)                                                                |           |                   | D-Sub DB-26 (HD), triple row                              |                                                             |                                     |
|-----------------------------|--------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------|-----------|-------------------|-----------------------------------------------------------|-------------------------------------------------------------|-------------------------------------|
| Counterpart: connector      |                                                              |                         |  |           |                   | D-Sub DB-26 (HD), triple row, with fixing screws UNC 4.40 |                                                             |                                     |
| Encoder                     | Incremental encoder RS485 and 1Vpp (only channel 1)          | Incremental encoder HTL | Resolver                                                                           | Hiperface | SinCos (absolute) | SSI, EnDat (digital 2.1/2.2), BiSS (digital)              | Sin/Cos-SSI, EnDat (1Vpp + digital 2.1/2.2), BiSS (digital) | Incremental encoder emulation RS485 |
| Channel                     | A / B                                                        | B                       | A                                                                                  | A         | A                 | A / B                                                     | A                                                           | B                                   |
| PIN                         |                                                              |                         |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 1                           | A+                                                           |                         |                                                                                    | Cos+      | Cos+              |                                                           | Cos+                                                        | A+ (out)                            |
| 2                           | A-                                                           |                         |                                                                                    | Cos-      | Cos-              |                                                           | Cos-                                                        | A- (out)                            |
| 3                           | B+                                                           |                         |                                                                                    | Sin+      | Sin+              |                                                           | Sin+                                                        | B+ (out)                            |
| 4                           | B-                                                           |                         |                                                                                    | Sin-      | Sin-              |                                                           | Sin-                                                        | B- (out)                            |
| 5                           | N+                                                           |                         |                                                                                    | Data+     | N+                | Data+                                                     | Data+                                                       | N+ (out)                            |
| 6                           | N-                                                           |                         |                                                                                    | Data-     | N-                | Data-                                                     | Data-                                                       | N- (out)                            |
| 8, 9                        | 5.25 V (available as soon as a sensor type is set)           |                         |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 10                          |                                                              |                         | Cos+                                                                               |           | Cos_abs+          | Clock-                                                    | Clock-                                                      |                                     |
| 11                          |                                                              |                         | Cos-                                                                               |           | Cos_abs-          |                                                           |                                                             |                                     |
| 12                          |                                                              |                         | Sin+                                                                               |           | Sin_abs+          | Clock+                                                    | Clock+                                                      |                                     |
| 13                          |                                                              |                         | Sin-                                                                               |           | Sin_abs-          |                                                           |                                                             |                                     |
| 14                          |                                                              |                         | Exciter+                                                                           |           |                   |                                                           |                                                             |                                     |
| 15                          |                                                              |                         | Exciter-                                                                           |           |                   |                                                           |                                                             |                                     |
| 7, 16, 17                   | 0V/COM and internal shields                                  |                         |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 18                          | 24 V                                                         | 24 V                    |                                                                                    |           | 24 V              | 24 V                                                      | 24 V                                                        |                                     |
| 19                          |                                                              | A_HTL+                  |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 20                          |                                                              | A_HTL-                  |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 21                          |                                                              | B_HTL+                  |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 22                          |                                                              | B_HTL-                  |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 23                          |                                                              | N_HTL+                  |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 24                          |                                                              | N_HTL-                  |                                                                                    |           |                   |                                                           |                                                             |                                     |
| 25, 26                      | 8 V (depending on parameter ec14, if an encoder type is set) |                         |                                                                                    |           |                   |                                                           |                                                             |                                     |

Tab. 22: Assignment of encoder sockets X3A and X3B

### Notes for PIN 25/26

Supply voltage of  $U_{DC} = 8\text{ V}$  is only output if

- parameter ec14 bit 1 = "manual" and ec14 bit 0 = "8V" is set.
- parameter ec14 bit 1 = "automatic" and ec16 = "Hiperface" or "Resolver" is set.

All other voltages at these contacts are not defined and must not be used to supply encoders!

### 8.1.3 Encoder cable length

The maximum encoder cable length is 50 m. In addition, the value is limited by the signal frequency, cable capacity and supply voltage.

The maximum encoder cable length due to the voltage drop on the supply line is calculated as follows:

$$\text{max. encoder cable length} = \frac{\text{voltage supply} - \text{min. encoder voltage}}{\text{max. encoder current} \cdot 2 \cdot \text{wire resistor per meter}}$$

Fig. 10: Encoder cable length

The supply voltage depends on the set encoder. The other values can be found in the data sheet of the encoder and the encoder cable.

### 8.1.4 Encoder cable

Pre-assembled encoder cables:

- offer the best protection against interference.
- save installation time.
- are available in cable lengths of 5 m, 10 m, 15 m, 20 m, 25 m and 30 m.

Specially designed cables are available for applications with cable lengths of 40 m, 50 m, 75 m, 85 m and 110 m. The maximum length of these KEB cables is 110 m.

#### Installation in conduits

When routing the encoder cables through conduits, use a cross-section of at least 1½ inches so that the connectors do not need to be removed. **Cutting the cable or removing the connectors or their housings may cause electrical faults and will invalidate the warranty.**

The following encoder cables are available:

| Encoder type             | Mat.no.<br>(xx=line length) | Connector<br>inverter | Connector<br>encoder |
|--------------------------|-----------------------------|-----------------------|----------------------|
| Resolver                 | 00S6L50-10xx                | D-Sub HD-26 (M)       | M23 Speedtec 12-pole |
| BISS-C/EnDat 2.2/<br>SSI | 00S5L51-20xx                | D-Sub HD-26 (M)       | M17 Speedtec 17-pole |
| BISS/EnDat/SinCos<br>SSI | 00S6L53-20xx                | D-Sub HD-26 (M)       | M17 Speedtec 17-pole |
| EnDat/SSI                | 00S6L53-L0xx                | D-Sub HD-26 (M)       | M23 Speedtec 17-pole |

| Encoder type | Mat.no.<br>(xx=line length) | Connector<br>inverter | Connector<br>encoder        |
|--------------|-----------------------------|-----------------------|-----------------------------|
| Hiperface    | 00S6L55-10xx                | D-Sub HD-26 (M)       | M23 Intercontec 615 12-pole |
| Inc          | 00S6L54-10xx                | D-Sub HD-26 (M)       | M23 Speedtec 12-pole        |
| SIN/COS      | 00S6L56-60xx                | -                     | M23 Speedtec 17-pole        |

Tab. 23: Available encoder cables

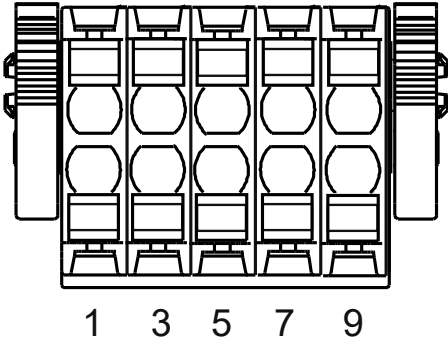
### 8.1.5 Description of the encoder interfaces

| PIN            | Signals                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1, 2, 3, 4     | A+/-<br>B+/-<br>Cos+/-<br>Sin+/-             | <p><b>Channel A only:</b></p> <p>Input for two sine-wave differential signals shifted by 90° with <math>U_{pp}=1V</math>, maximum 200kHz.<br/>Ground-referenced (e.g. Cos+ against GND):<br/>DC component 2.5 V <math>\pm 0.5</math> V</p> <p>Differential (e.g. Cos+ versus Cos-):<br/>DC component 0 V <math>\pm 0.1</math> V<br/>Signal level <math>U_{ss}=0.6</math> V... 1.2 V</p> <p><b>Channel A:</b></p> <p>Input for square-wave incremental signals according to RS485, maximum 200kHz.</p> <p><b>Channel B:</b></p> <p>Input for square-wave incremental signals according to RS485, maximum 500kHz.</p> <p>Incremental encoder simulation: Position changes of channel A are output to channel B with two 90° shifted RS485 signals. Maximum output frequency 500 kHz.</p> |
| 5, 6           | N+/-<br>Data+/-                              | <p><b>Channel A only:</b></p> <p>Zero signal input once per revolution.</p> <p>Differential signal level (N+ ... N-):</p> <ul style="list-style-type: none"> <li>• higher than 50 mV: Zero signal is active</li> <li>• from 50 mV to -50 mV: undefined</li> <li>• Lower than -50 mV: zero signal is inactive</li> </ul> <p>Signal length 330°...360° of the signal length of the incremental signals.</p> <p><b>Channels A and B:</b></p> <p>. Zero signal is 1-active, if signals A and B are also 1-active.</p> <p><b>Channel B only:</b></p> <p>Output zero signal RS485.<br/>Zero signal is 1-active, if signals A and B are also 1-active.<br/>Is output, if the position on channel A is 0°.</p>                                                                                 |
| 10, 11, 12, 13 | Sin+/-<br>Cos+/-<br>Sin_abs+/-<br>Cos_abs+/- | <p><b>Channel A only:</b></p> <p>Input for sinusoidal absolute signals<br/><math>U_{pp}=1V</math> for SinCos encoders<br/><math>U_{pp}=3.8V</math> maximum for resolvers</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 10, 12         | Clock+/-                                     | Output for RS485 clock signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 14, 15         | Exciter+/-                                   | <p><b>Channel A only:</b></p> <p>Output of the variable excitation voltage for resolvers (default):<br/><math>U_{eff}=2.54</math> V <math>\pm</math> <math>U_{pp}=7.2</math> V <math>\pm 5\%</math> for a coupling factor of the resolver of 0.5 <math>\pm 10\%</math>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| PIN                          | Signals                          | Description                                                                                                                                                                                                                                                                                                                                           |
|------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              |                                  | <p>Output frequency: 10 kHz<br/> Maximum output current: <math>i_{eff} = 30 \text{ mA}</math><br/> Phase shift: <math>0^\circ \pm 5^\circ</math></p> <p><b>Only control board APPLICATION and PRO:</b><br/> Further setting options for the excitation voltage can be found in the corresponding programming manual (from software version V3.3).</p> |
| 25, 26                       | 5.25 V / 8 V                     | <p>Output supply voltage for encoder:</p> <p><math>ec14 = 0 \Rightarrow 5.25 \text{ V} +5\%/-10\%</math><br/> <math>ec14 = 1 \Rightarrow 8 \text{ V} +5\%/-10\%</math><br/> <math>ec14 = 2 \Rightarrow</math> automatic, depending on the set encoder type (ec16)<br/> Max. 500 mA in total (250 mA per channel)</p>                                  |
| 8, 9                         | 5.25 V                           | <p>Output supply voltage for encoder:</p> <p><math>5.25 \text{ V} +5\%/-10\%</math><br/> Max. 500 mA total (250 mA per channel)</p>                                                                                                                                                                                                                   |
| 18                           | 24 V                             | <p>Output supply voltage for encoder:</p> <p><math>U_{dc}=24\text{V}</math> max. 500mA total (250mA per channel)</p> <ul style="list-style-type: none"> <li>• Minimum P24V_IN - 3V</li> <li>• Maximum P24V_IN</li> </ul>                                                                                                                              |
| 19, 20,<br>21, 22,<br>23, 24 | A_HTL+/-<br>B_HTL+/-<br>N_HTL+/- | <p><b>Channel B only:</b></p> <p>HTL signal input 10 V...30 V maximum 150 kHz</p>                                                                                                                                                                                                                                                                     |

Tab. 24: Encoder specifications

## 9 Brake control and temperature detection

| X1C                                                                              |    | PIN | Name     | Notes                                                                  |
|----------------------------------------------------------------------------------|----|-----|----------|------------------------------------------------------------------------|
|  | 2  | 1   | BR+      | Brake control / output                                                 |
|                                                                                  | 4  | 2   | BR-      | Brake control / output                                                 |
|                                                                                  | 6  | 3   | 0V       | To power the feedback inputs                                           |
|                                                                                  | 8  | 4   | 24Vout   | U = P24Vin – 0.5V<br>I = max. 1A<br>(BR+ and 24Vout combined: max. 2A) |
|                                                                                  | 10 | 5   | BCF1     | Feedback input for brake control                                       |
|                                                                                  |    | 6   | BCF2     | Feedback input for brake control                                       |
|                                                                                  |    | 7/8 | reserved |                                                                        |
|                                                                                  | 1  | 9   | TA1      | Temperature measurement / input+ <sup>1)</sup>                         |
|                                                                                  | 3  | 10  | TA2      | Temperature measurement / input- <sup>1)</sup>                         |
|                                                                                  | 5  |     |          |                                                                        |

Tab. 25: Assignment of the terminal block X1C

1) Note special assignment for Hiperface DSL® OCT variant.

### 9.1 Brake control

#### ⚠ CAUTION

**Incorrect dimensioning of the brake may cause malfunctions**

**Brake does not release or only with delay**

- Choose the input voltage tolerance of the brake corresponding to the tolerance of the output voltage.
- Use an auxiliary relay or contactor if necessary.

#### Specification brake /relay output

|                        |                                                                               |
|------------------------|-------------------------------------------------------------------------------|
| Name                   | BR+ (X1C.1); BR- (X1C.2)                                                      |
| Function               | Output to control one/two brake(s) or relay(s).                               |
| Output voltage (DC)    | minimum P24Vin – 1.2V<br>maximum P24Vin                                       |
| Maximum output current | One brake: 2 A<br>two brakes: 2 x 1 A                                         |
| Others                 | Internal free-wheeling path; internal filter circuit; not short-circuit proof |

#### Features

- Safely control one brake/relay
- Control two single brakes/relays together (it must be the same brake/relay twice).
- Internal brake feedback without additional wiring or external via two brake control feedback inputs.
- Rapid demagnetization with a counter voltage of 27.5 V (maximum every 5 s).
- Current monitoring

The adjustment of the brake control in the safety module is preset at the factory.

When using the internal supply

- the total current consumption of the control card must be observed.

## 9.1.1 Connection examples

### 9.1.1.1 Two independent brakes

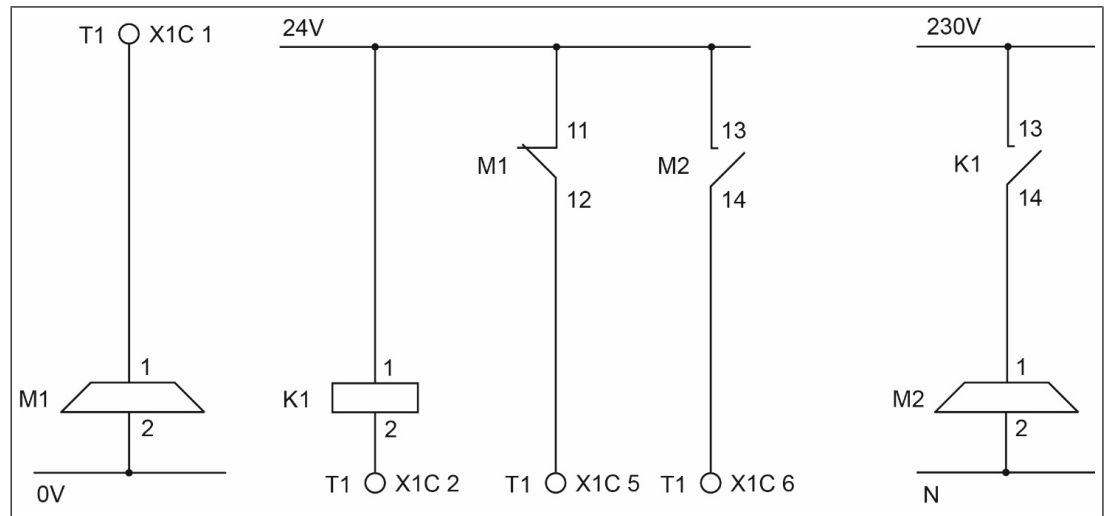


Fig. 11: Wiring proposal: Two independent brakes

M1 Brake 24V with microswitch

M2 High voltage brake 230V with microswitch

K1 Auxiliary relay

### 9.1.1.2 Two-channel switch device with diagnostics

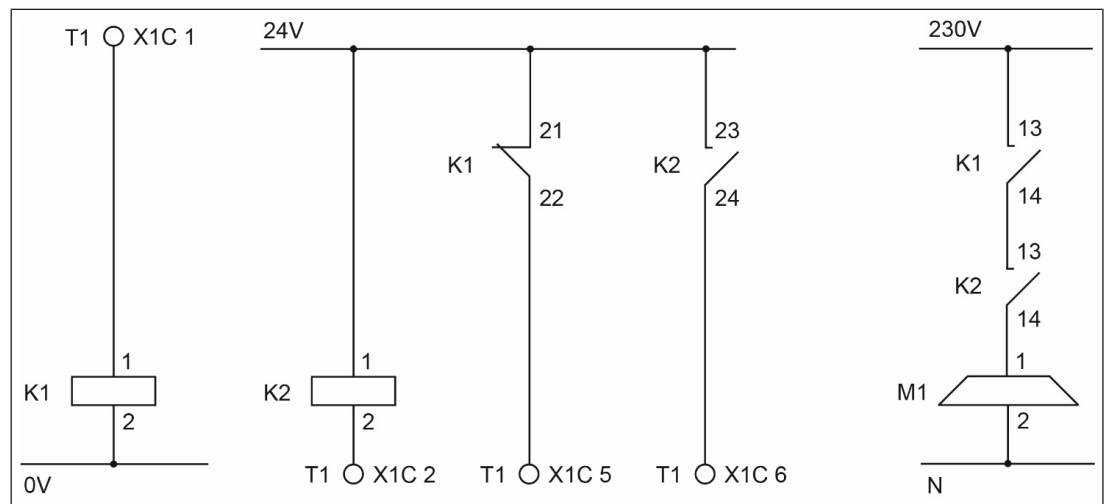


Fig. 12: Wiring proposal: „Two-channel switch device with diagnostics“

K1 Auxiliary relay with additional contacts

K2 Auxiliary relay with additional contacts

M1 High voltage brake 230V

9.1.1.3 Single-channel switch device with high-voltage brake

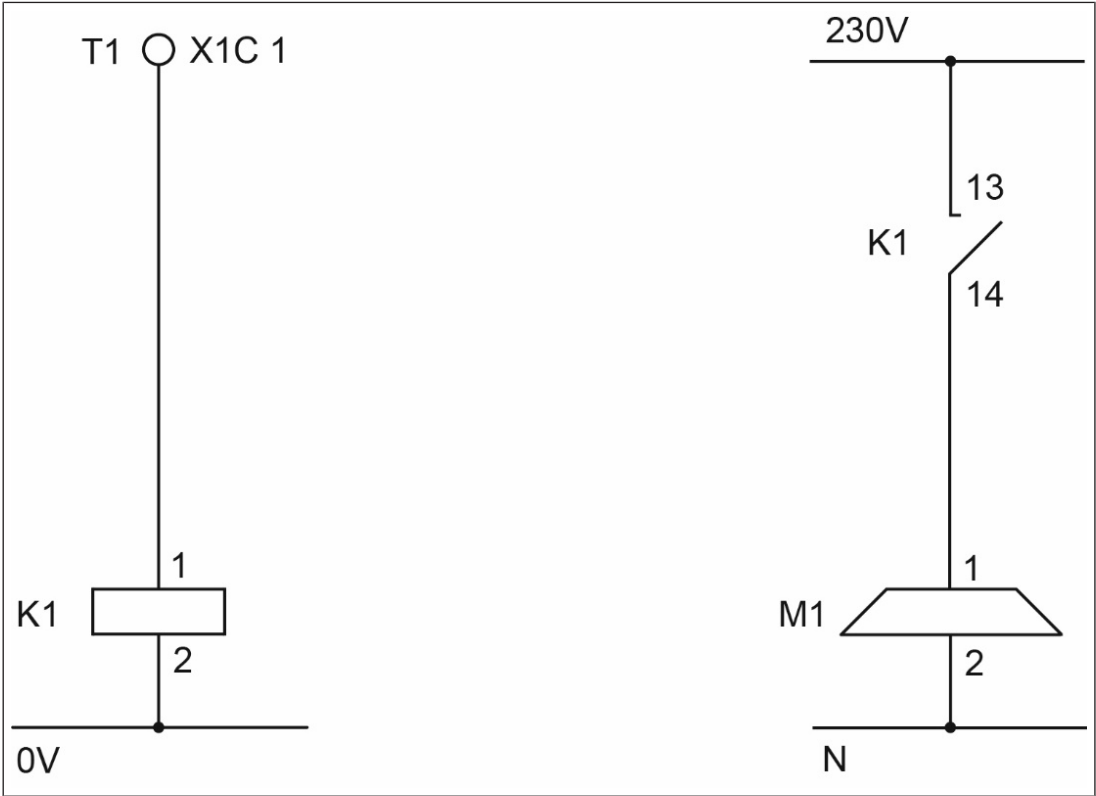


Fig. 13: Wiring proposal: "Switch device single-channel with high voltage brake"

|    |                 |    |                         |
|----|-----------------|----|-------------------------|
| K1 | Auxiliary relay | M1 | High voltage brake 230V |
|----|-----------------|----|-------------------------|

#### 9.1.1.4 Direct control 24V brake

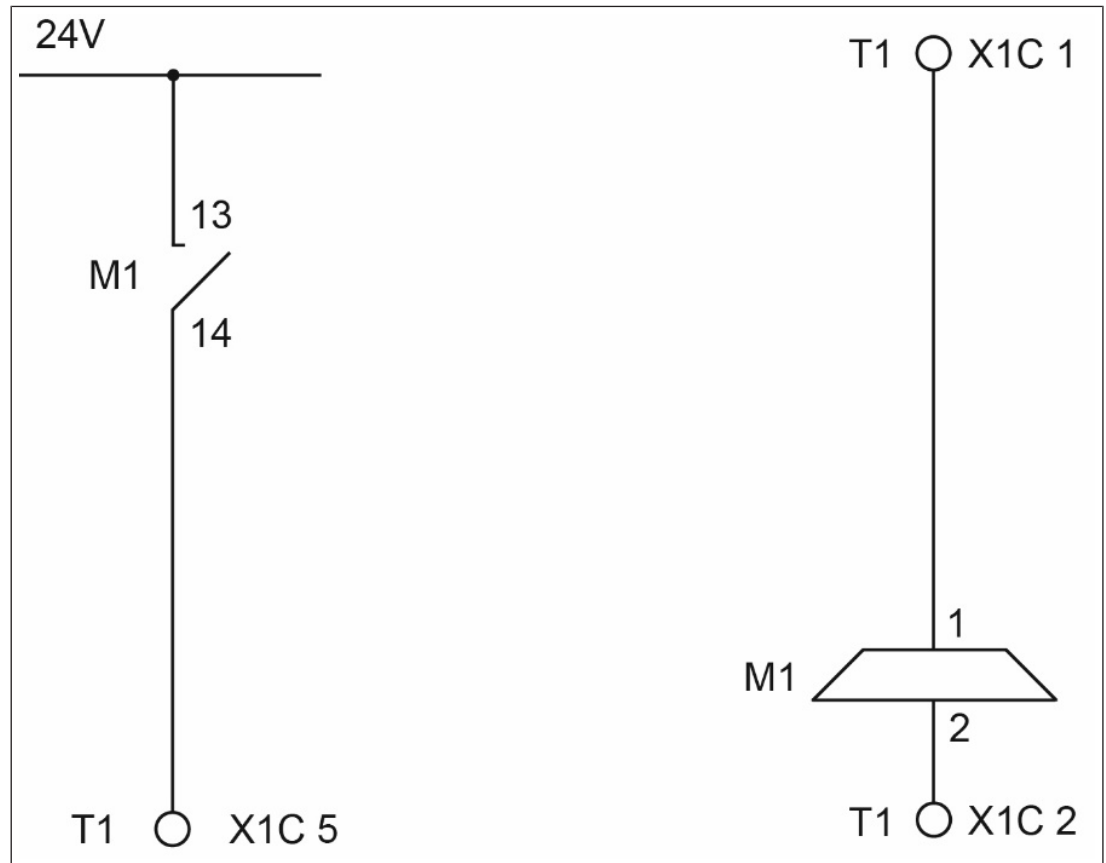


Fig. 14: Wiring proposal "Direct control with diagnosis via microswitch"

M1 Brake 24V with microswitch

## 9.2 Temperature detection

**DANGER**



**NOTICE**

**Electric shock by sensors without protective separation!**

a) Only use sensors with basic insulation.

**Malfunctions due to wrong cables or incorrect placement!**

**Malfunctions of the control due to capacitive or inductive coupling.**

a) Motor temperature sensor conductors must not be routed together with other low voltage control cables; even when shielded.

b) Motor temperature sensor conductors must be double shielded when inclosed in the same overall cable containing the U,V,W motor conductors.

Specification temperature input

|           |                                             |
|-----------|---------------------------------------------|
| Name      | TA1; TA2                                    |
| Terminals | X1C.9 (TA1) input +<br>X1C.10 (TA2) input - |
| Function  | Temperature sensor input (switchable)       |

### 9.2.1 Operation without temperature detection

Use of the F6 Elevator Drive without evaluation of the temperature input:

Switch off evaluation (LM12=0) or install jumper between terminal TA1 (X1C.9) and TA2 (X1C.10).

9.2.2 Connection of a KTY sensor

NOTICE

No protection of the motor winding in case of wrong connection!

Non-observance leads to incorrect measurements and possibly to the destruction of the motor winding.

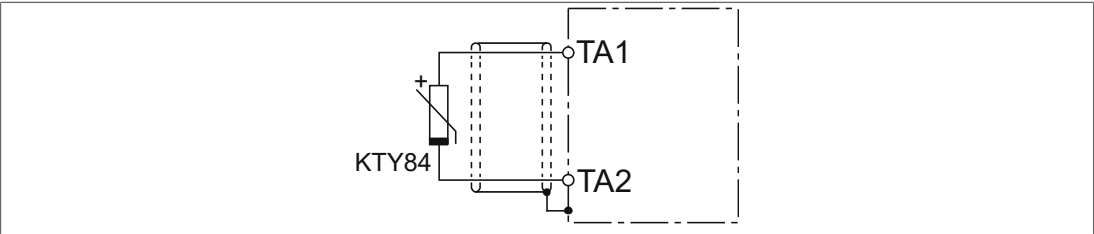
a) Operate KTY sensors in forward direction.

b) KTY sensors may not be combined with other sensors.

Settings KTY input

|         |                       |
|---------|-----------------------|
| Setting | LM12 = 2 => KTY84/130 |
|         | KM12 = 3 => KTY83/110 |

Connection KTY sensor



9.2.3 Connection of PTC, temperature switch or PT1000

Settings for PTC, thermal contact or PT1000

|         |                                       |
|---------|---------------------------------------|
| Setting | LM12 = 1 => PTC or temperature switch |
|         | LM12 = 4 => PT1000                    |

Connection

|                                    |  |
|------------------------------------|--|
| Thermal contact (NC contact)       |  |
| Temperature sensor (PTC) or PT1000 |  |
| Mixed sensor chain                 |  |

① Connection via shield bracket (if not available, place on mounting plate).

Tab. 26: Connection examples

## 10 Certifications and approvals

Current certificates, declarations and revision lists for your product can be viewed or downloaded from our website at the following link:

( [keb-automation.com/search](https://keb-automation.com/search))

By entering the article number, you will receive a list of the corresponding documents in the "Certificates" drop-down menu.

If you need help or further documentation, please contact our customer service.

### 10.1 CE marking

Conformity with the EU directives and guidelines applicable on the production date is confirmed by the CE mark on the nameplate.

The current EU Declaration of Conformity for this product is available via the link above.

### 10.2 FS marking

The safety-relevant functions integrated in this product have been developed, implemented and tested in accordance with the applicable standards and guidelines for functional safety. These safety functions were approved as part of a qualified testing and assessment procedure.

The function of the safety-related functions was documented and successfully validated. This ensures that the safety functions fulfil the specified requirements and work reliably under the intended operating conditions.

A corresponding certificate and further information on functional safety are available on our website.

Please note that changes to the product, especially to safety-relevant components, may affect the validity of the acceptance and thus the certificate. In such cases, a re-examination is required.

### 10.3 UL certification

UL (Underwriters Laboratories) approval ensures that a product fulfils the safety-related requirements for the North American market. UL is an independent organisation that tests and certifies products, components and systems for safety, quality and conformity with applicable standards.

Products that have received UL approval are marked with the UL logo on the nameplate. This symbol indicates that the product has been successfully tested in accordance with UL specifications and is approved for use in the USA or Canada. Depending on the type of approval, the logo with the UL file can also be marked with additional information (e.g. "cULus" for Canada and the USA).

The approval is linked to certain requirements. These are marked accordingly in this and/or further instructions. Only the assemblies/components described in the approval may be used.

A deviation from the tested specifications or the use of non-certified parts can lead to the loss of UL approval and thus jeopardise the operating permit in the target market.

### 10.4 Further markings

Other markings and approvals not listed here are identified by a corresponding logo on the rating plate or device, if applicable. The corresponding certificates are available on our website.

## 11 Revision history

| Edition | Version | Note                                                                                                                                                                                                                                                                                                                                                       |
|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2023-12 | 00      | Creation of F6-Lift based on the F6-PRO.                                                                                                                                                                                                                                                                                                                   |
| 2024-07 | 01      | Fieldbus interface RS485 without bus termination inserted. Assignment RS485 changed. Designation GND to (⇒► <a href="#">0V/COM [► 36]</a> ) changed at encoder interfaces. Note for common-related operation of the analog differential inputs inserted. (⇒► <a href="#">Warning notice [► 19]</a> ) inserted for fuse protection for relay output form C. |
| 2025-05 | 02      | Resolution for analogue inputs and outputs added. Attention changed by warning for analogue inputs. Editorial changes.                                                                                                                                                                                                                                     |
| 2025-11 | 03      | Variable excitation voltage for resolver inserted. Editorial changes.                                                                                                                                                                                                                                                                                      |
| 2026-08 | 04      | Description: LEDs changed. Default terminal assignments for the elevator have been added. The pin configuration of the safety module has been changed. RS-485 interface revised. Editorial changes.                                                                                                                                                        |

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## Glossary

### 4W

4-Wire; is used in the field of network technology for serial full duplex operation.

### Autonegotiation

Procedure for determining the max. transmission speed.

### BiSS

Open source real-time interface for sensors and actuators.

### CAN®

Serial bus system running protocols such as CANopen, Devicenet or J1939. CAN is a registered trademark of the CAN in AUTOMATION - International Users and Manufacturers Group e.V.

### Client

The client initiates communication and sends requests (formerly the master). Typical clients include PLCs, HMIs or generally higher-level control systems.

### COMBIVERT

Proper name for a KEB Drive Controller.

### COMBIVIS

KEB start-up and parameterizing software.

### DIN 66019

Information processing; control method with the 7-bit code during data transmission.

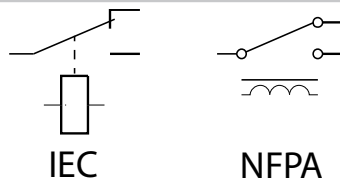
### DIN EN 61131-2

Programmable controllers - Part 2: Equipment requirements and tests.

### EnDat

Bidirectional encoder interface of the company Heidenhain.

### Form C



IEC

NFPA

Form C describes a relay with three contacts (switching contact, NC contact and NO contact). Also named as SPDT (single pole, double throw).

### Functional earth

Functional earth is used exclusively to dissipate interferences. It offers no contact protection for persons.

### HCT

Component for current measurement in the power circuit.

### Hiperface

Bidirectional encoder interface of the company Sick-Stegmann.

### HSP5

Fast, serial protocol.

### HTL

Incremental signal with an output voltage (up to 30V) -> TTL.

### IEC 61800-5-1

Electric power drive systems with adjustable speed. Part 5-1: Safety requirements - Electrical, thermal and energy requirements. German version EN 61800-5-1.

### PELV

Safe protective extra-low voltage (earthed).

### RS485

RS-485 is an industry standard according to EIA-485 for a physical interface for asynchronous, serial data transmission.

### SBC

Safe Brake Control.

**SELV**

---

Safe extra-low voltage (unearthed).

**Server**

---

A server (formerly known as a slave) waits for requests. There may be several servers connected to a single client. A frequency inverter is a typical server.

**SinCos**

---

Incremental encoder with sinusoidal signals.

**SSI**

---

Synchronous serial interface for encoder.

**STO**

---

Safe torque off (STO).

**UL 61800-5-1**

---

Electric power drive systems with adjustable speed – Part 5-1: Safety requirements - Electrical, thermal and energy requirements. Replaces the older UL 508C. Harmonised standard IEC 61800-5-1.

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## Notes

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