

# COMBIVERT



**GB** Installation Manual  
Control Circuit

F6 with Safety Function STO

Translation of original manual			
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**KEB**

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## 1. Preface

The described hard- and software are developments of the Karl E. Brinkmann GmbH. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.

### 1.1 Information on special measures

The used pictograms have following significance:

**Danger**



Is used, when death or serious bodily injury may be the consequence of non-observance of the measure.

**Warning**



Is used, when bodily injury and/or substantial property damage may be the consequence of non-observance of the measure.

**Caution**



Is used, when property damage may be the consequence of non-observance of the measure.

**Attention**



Is used, when noise sensitive or unrequested operation may be the consequence of non-observance of the measure.

**Info**



Is used, when a better or simpler result can be the consequence of the measure.

For a special case the instructions can be supplemented by additional pictograms and text.

### 1.2 Documentation

Before working with the unit the user must become familiar with it. This includes especially the knowledge and observance of the safety and operating instructions.

**Attention**



**Observe safety and operating instructions**



Precondition for all further steps is the knowledge and observance of the safety and operating instructions. This is provided accompanied by the device or by the download site of [www.keb.de](http://www.keb.de).

Non-observance of the safety and operating instructions leads to the loss of any liability claims. The warnings and safety instructions in this manual work only supplementary. This list is not exhaustive.

### 1.3 Validity and liability

**The use of our units in the target products is beyond of our control and therefore exclusively the responsibility of the machine manufacturer, system integrator or customer.**

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the application. However, they are considered for information only without responsibility. This also applies to any violation of industrial property rights of a third-party.

Selection of our units in view of their suitability for the intended use must be done generally by the user.

**Tests can only be done within the application by the machine manufacturer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.**

Unauthorised opening and tampering may lead to bodily injury and property damage and may entail the loss of warranty rights. Original spare parts and authorized accessories by the manufacturer serve as security. The use of other parts excludes liability for the consequences arising out of.

The suspension of liability is especially valid also for operation interruption loss, loss of profit, data loss or other damages. This is also valid, if we referred first to the possibility of such damages.

If single regulations should be or become void, invalid or impracticable, the effectivity of all other regulations or agreements is not affected.

Through multitude applications not each possible case of installation, operation or maintenance can be considered. If you require further information or if special problems occur which are not treated detailed in the documentation, you can request the necessary information via the local Karl E.Brinkmann GmbH agency.

### 1.4 Copyright

The customer may use the instruction manual as well as further documents or parts from it for internal purposes. Copyrights are with KEB and remain valid in its entirety.

KEB®, COMBIVERT®, COMBICONTROL® and COMBIVIS® are registered trademarks of Karl E. Brinkmann GmbH.

Other wordmarks or/and logos are trademarks (™) or registered trademarks (®) of their respective owners and are listed in the footnote on the first occurrence.

When creating our documents we pay attention with the utmost care to the rights of third parties. Should we have not marked a trademark or breach a copyright, please inform us in order to have the possibility of remedy.

### 1.5 Specified application

The COMBIVERT S6 serves exclusively for the control and regulation of three-phase motors. The operation of other electric consumers is prohibited and can lead to the destruction of the unit. Frequency inverters are components which are intended for the installation in electric systems or machines.

The used semiconductors and components of the Karl E.Brinkmann GmbH are developed and dimensioned for the use in industrial products. If the KEB COMBIVERT F5 is used in machines, which work under exceptional conditions or if essential functions, life-supporting measures or an extraordinary safety step must be fulfilled, the necessary reliability and security must be ensured by the machine builder.

The operation of our products outside the indicated limit values of the technical data leads to the loss of any liability claims.

## 1.6 Product description

The product family COMBIVERT S6 with safety function STO has been developed for the use in safety-oriented applications. The basic standards as well as application and country-specific standards must be observed furthermore. The standards referred in this manual must be observed supplementary!

### 1.6.1 Overview of functions

The control provides the following functions:


- hardware-installed supply of digital and analog inputs and outputs.
- Diagnostic interface
- Ethernet-based fieldbus interface (EtherCAT / Varan)
- CAN fieldbus interface
- Multi encoder interface
- KTY interface
- Brake control
- STO functionality
- Status LED's

### 1.6.2 Safety function

The safety function STO according to IEC 61800-5-2 contains:

- Safe torque off (Safe Torque Off - STO)



The safety function meet the requirements in accordance with performance level e (ISO13849-1) and SIL 3 (IEC 61508 and IEC 62061). In case of proper project design, installation and operation the safety function protects people against mechanical damages.

<b>Attention</b>  <b>Validity of certificates</b>	
FS	The certification of controllers with safety technology is only valid if the material number corresponds with the specified numerical code <b>und</b> the FS logo is printed on the type plate.

Numerical code:

Steuerung mit STO-Funktion	eingesetzt in	Steller
1KF6Kxx-xxxx	Frequenzumrichter bis Gehäuse E (x=variabel y=D, E)	xxF6Kxy-xxxx
2KF6Kxx-xxxx	Frequenzumrichter ab Gehäuse G (x=variabel y=G...W)	xxF6Kxy-xxxx

### 1.6.3 Corresponding documentation

<b>Attention</b>  <b>Further documentation via <a href="http://www.keb.de">www.keb.de</a></b>	
	<ul style="list-style-type: none"><li>• EMC and safety instructions</li><li>• Installation power unit</li><li>• Programming Manual</li></ul>



## 2. Control

### 2.1 Features of the control

The control provides the following analog and digital functions:

- Hardware allocation of digital and analog inputs and outputs.
- CAN bus interface
- Two field bus interfaces
- Serial interface for connection to a pc
- Two universal encoder interfaces
- Hardware of the control circuit „safety separated“ according to EN61800-5-1 (base TN-C/S mains)
- Safety function STO (two channel torque off)

### 2.2 Overview

Control 2KF6			
Control 1KF6			
X2A	Control terminal strip	X4A	Diagnostic interface
X2B	Terminal block safety function	X4B	Fieldbus interface
X2C	CAN interface	X4C	
X2D	Analog inputs		
X3A	Encoder interface channel 1		
X3B	Encoder interface channel 2		

### **2.2.1 Control terminal strip X2A**

The control terminal block X2A is designed as double, plug-in terminal block with spring cage connection. It contains 28 pole.

### **2.2.2 Safety terminal block X2B**

The safety terminal block X2B is designed as double, plug-in terminal block with spring cage connection. It contains 10 pole.

### **2.2.3 CAN terminal block X2C**

The control terminal block X2C is designed as double, plug-in terminal block with spring cage connection. It contains 4 pole.

### **2.2.4 Analog inputs X2D**

The safety terminal block X2D is designed as double, plug-in terminal block with spring cage connection. It contains 6 pole.

### **2.2.5 Diagnostic interface X4A**


The integrated RS232/485 interface serves for the connection of service tools (e.g. COM-BIVIS) and displays. Telegram DIN66019II is used as communication protocol.


### **2.2.6 Encoder interfaces X3A, X3B**

Der COMBIVERT contains two universal encoder interfaces. The interfaces can be adapted independently by parameter to different encoder.

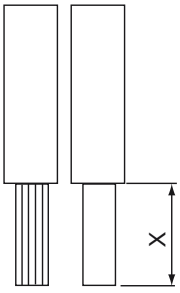
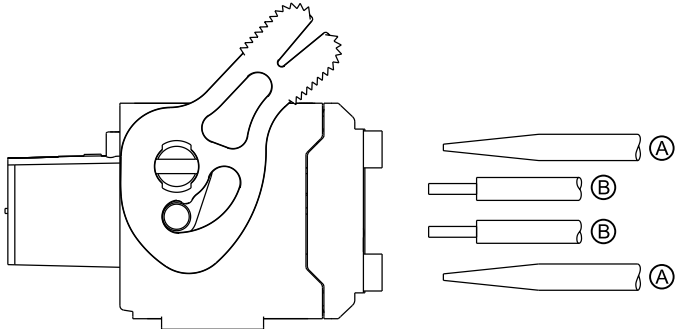
## 2.3 Connection of the control

The following instructions must be observed at connection:

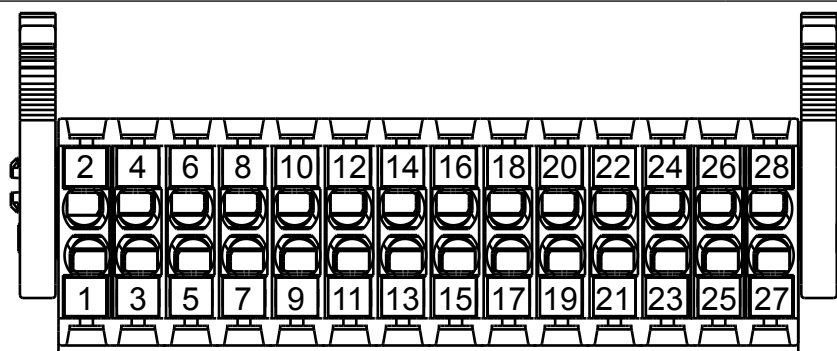
<b>Attention</b>	Prevent EMC malfunctions
	<ul style="list-style-type: none"> <li>• Use shielded / drilled cables</li> <li>• Lay shield on one side of the inverter onto earth potential</li> <li>• Install control cables and power cables separately (approx. 10...20 cm distance); Kreuzungen im rechten Winkel verlegen</li> </ul>
	<ul style="list-style-type: none"> <li>• To avoid interferences a separate shielding must be provided for analog and digital control lines. Depending on the use of the relay outputs, an extra shielding is to be used, too.</li> </ul>
	<ul style="list-style-type: none"> <li>• In case of inductive load on the relay outputs a protective wiring must be provided (e.g. free-wheeling diode)!</li> </ul>

	The terminals of the control terminal strip and the transmitter inputs are securely isolated in accordance with EN 50178.
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### 2.3.1 Assembly of the wires

1.	<table border="1"> <tr> <td>Stranded wire rigidly and flexibly</td> <td>max. perm. cross-section</td> <td>stripping length x =</td> </tr> <tr> <td>without wire-end ferrule</td> <td>1,5 mm<sup>2</sup></td> <td>10 mm</td> </tr> <tr> <td>with wire-end ferrule without plastic collar</td> <td>1,5 mm<sup>2</sup></td> <td>metal ferrule length</td> </tr> <tr> <td>with wire-end ferrule with plastic collar</td> <td>1 mm<sup>2</sup></td> <td>metal ferrule length + 2 mm</td> </tr> </table>	Stranded wire rigidly and flexibly	max. perm. cross-section	stripping length x =	without wire-end ferrule	1,5 mm <sup>2</sup>	10 mm	with wire-end ferrule without plastic collar	1,5 mm <sup>2</sup>	metal ferrule length	with wire-end ferrule with plastic collar	1 mm <sup>2</sup>	metal ferrule length + 2 mm	
Stranded wire rigidly and flexibly	max. perm. cross-section	stripping length x =												
without wire-end ferrule	1,5 mm <sup>2</sup>	10 mm												
with wire-end ferrule without plastic collar	1,5 mm <sup>2</sup>	metal ferrule length												
with wire-end ferrule with plastic collar	1 mm <sup>2</sup>	metal ferrule length + 2 mm												
2.	Press with screw driver (A) or something else onto the labelling													
3.	Plug stranded wire (B) into the square slot, that no wires can be seen from the outside.													
4.	Remove screw driver (A) and check if the line (B) is fixed. Make sure that the stranded wire and not the insulation is clamped.													

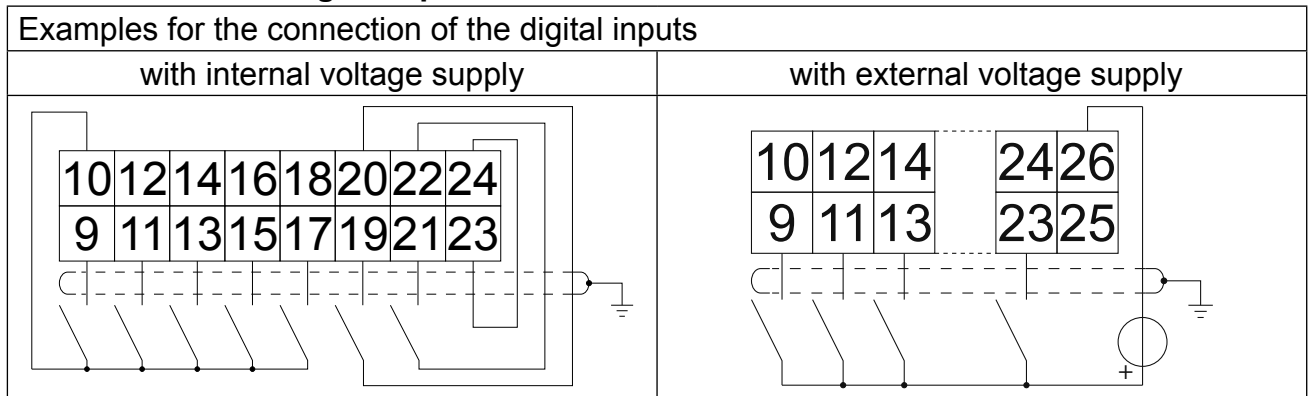
## 2.4 Assignment of the terminal strip X2A



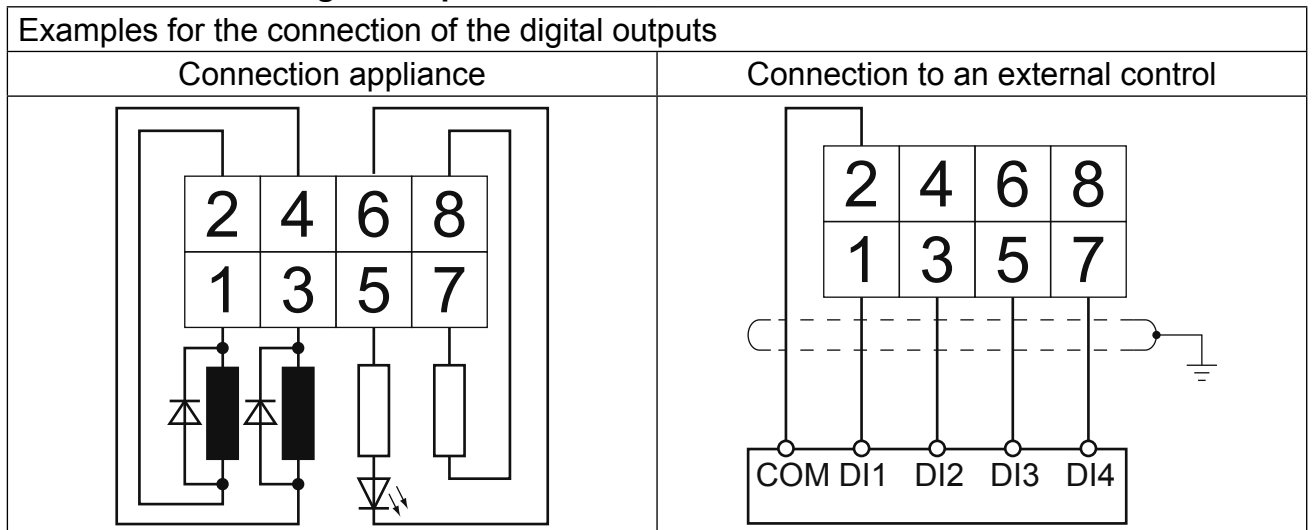
PIN	Name	Description	Specifications
1	Out1	Digital output 1	$I_{max} = 100 \text{ mA}$
2	0V	Reference potential for digital output	
3	Out2	Digital output 2	$I_{max} = 100 \text{ mA}$
4	0V	Reference potential for digital output	
5	Out3	Digital output 3	$I_{max} = 100 \text{ mA}$
6	0V	Reference potential for digital output	
7	Out4	Digital output 4	$I_{max} = 100 \text{ mA}$
8	0V	Reference potential for digital output	
9	I1	Digital input 1	
10	24V	Voltage output for the control of the inputs	+24 Vdc*
11	I2	Digital input 2	
12	24V	Voltage output for the control of the inputs	+24 Vdc*
13	I3	Digital input 3	
14	24V	Voltage output for the control of the inputs	+24 Vdc*
15	I4	Digital input 4	
16	24V	Voltage output for the control of the inputs	+24 Vdc*
17	I5	Digital input 5	
18	24V	Voltage output for the control of the inputs	+24 Vdc*
19	I6	Digital input 6	
20	24V	Voltage output for the control of the inputs	+24 Vdc*
21	I7	Digital input 7	
22	24V	Voltage output for the control of the inputs	+24 Vdc*
23	I8	Digital input 8	
24	24V	Voltage output for the control of the inputs	+24 Vdc*
25	24Vin	Voltage input for external supply	24 Vdc $\pm$ 25 %
26	0V	Reference potential for 24Vin	
27	CRF	10V Reference voltage for analog inputs	10 Vdc / $I_{max} = 4 \text{ mA}$
28	AGND	Analog mass (do not connect to 0V)	
*)	Total current of all 24 Vdc outputs: 100 mA		

# Control

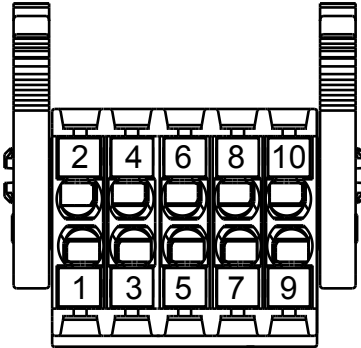
## 2.4.1 Connection of the digital inputs



## 2.4.2 Connection of the digital outputs



## 2.5 Assignment of the STO terminal strip X2B

X2B	PIN	Name	I/O
	1	STO1+	Input STO channel 1
	2	STO1+	
	3	STO1-	
	4	STO1-	
	5	STO2+	Input STO channel 2
	6	STO2+	
	7	STO2-	
	8	STO2-	
	9	STO-OUT	Output STO
	10	STO-OUT	

The individual channels are designed potential-free, so 24V and 0V can be connected. The inputs are designed by way that safety switchgear units with test pulses (OSSD signals) can be connected. The signals are not evaluated, they are only filtered. The OSSD test interval is limited to 10 ms.  
The reference potential for output STO-OUT (terminals X2B/9 and 10) is the mass of the control 0V (terminal X2A/26).

### 2.5.1 Inputs

#### 2.5.1.1 Specification of the STO inputs

STO Inputs	Status 0		Status 1	
	UL [V]	IL [mA]	UH [V]	IH [mA]
max.	5	25	30	25
min.	-3	not defined	15	5

The maximum short-term starting current of the input is limited to 300 mA.

#### 2.5.1.2 STO with OSSD signals

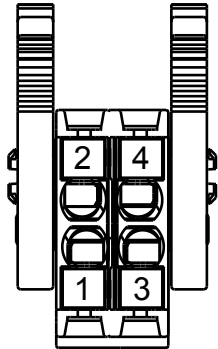
The filter time depends on the minimum input voltage and can be specified as follows:

Input voltage [V]	OSSD pulse width [ms]
15	0.1
18	0.8
20	1.1
24	1.5
30	1.8

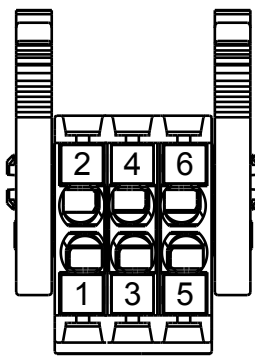
### 2.5.2 Output STO

The short-circuit proof, digital output is specified in accordance with IEC61131-2. The output rated current is 100 mA at 24Vdc. The output is 24Vdc if the inputs STO1 and STO2 are set.

2.6 Assignment of the CAN terminal strip X2C

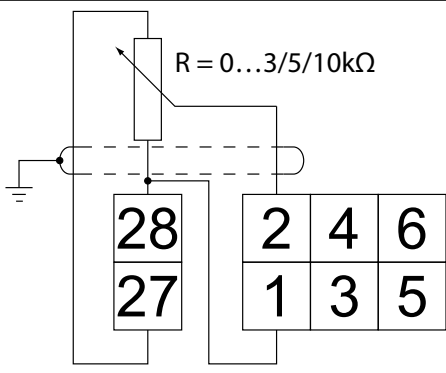
X2C	PIN	Name	Notes
	1	CAN low	internally bridged
	2	CAN low	
	3	CAN high	internally bridged
	4	CAN high	

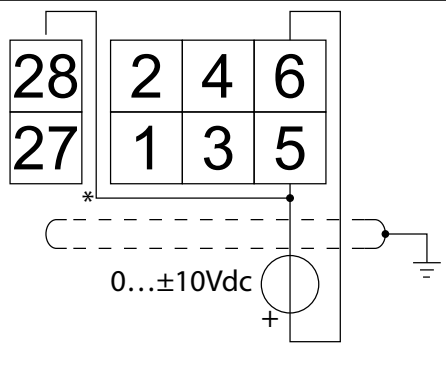
2.7 Assignment of the terminal strip for analog inputs X2D

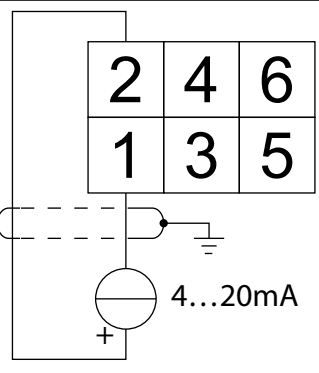
X2D	PIN	Name	Notes	Specification
	1	AN1-	non-floating differential input 1	±10Vdc or 4...20 mA 0...±20 mA
	2	AN1+		
	3	AN2-	non-floating differential input 2	±10Vdc or 4...20 mA 0...±20 mA
	4	AN2+		
	5	AN3-	non-floating differential input 3	±10Vdc
	6	AN3+		


2.7.1 Connection of the analog inputs

Examples for the connection of the analog setpoint input










\*) Connect potential equalizing line only if a potential difference of >30V exists between the controls. The internal resistance is reduced to 30 kΩ.

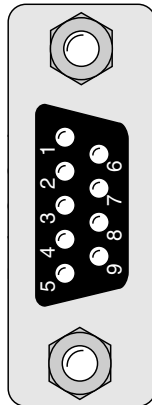
### 2.7.2 Diagnosis/visualisation

The integrated RS232/485 interface serves for the connection of service tools (e.g. COM-BIVIS) and displays. Telegram DIN66019II is used as communication protocol.

	The correct configuration and language file must be loaded for the operation with COMBIVIS. The download can be done via the KEB website.
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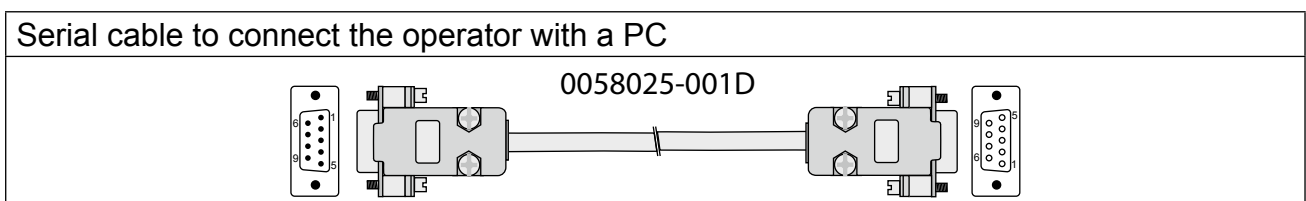
Interface	Standard	Connecting cable
RS485	TIA/EIA-485 and ISO 8482	
RS232	ANSI TIA/EIA-232	0058025-001D
RS232/USB		0058060-0020

#### 2.7.2.1 Assignment of the interface X4A


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


#### 2.7.2.2 Connection of the RS232 interface

A RS232-cable is needed to connect the interface operator with the PC.



#### 2.7.2.3 Connection of the RS485 interface

	<p>The following instructions must be observed in order to prevent interferences at the RS485 interface:</p> <ul style="list-style-type: none"> <li>• use CAT5 cable (in pairs, twisted and shielded cable)</li> <li>• ground at one side (prior at interference-free side)</li> <li>• Connect terminating resistors (120Ω) at both ends on pair of wires of the communication bus</li> </ul>
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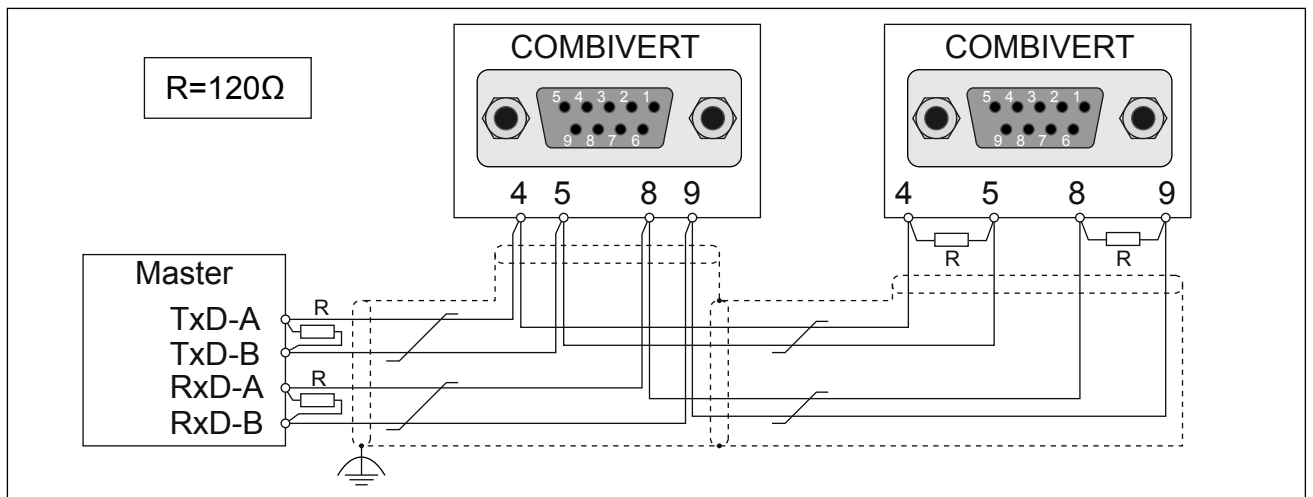
	If CAT 7 cable is used (by way of derogation from our recommendation) lay the interior shield each to the transmitter.
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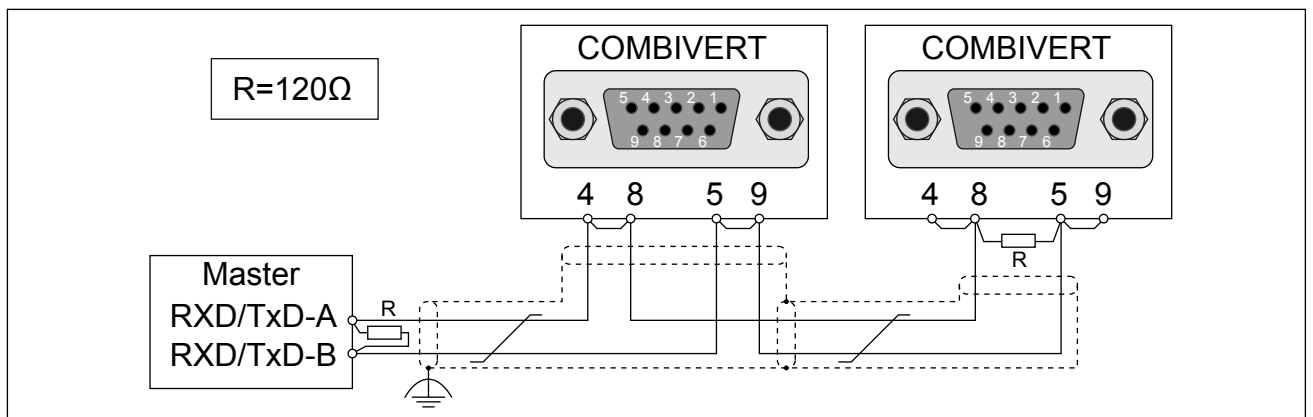


A biasing can be used if there are still interferences. However, this should be done only once at the communication bus (preferably at the master).

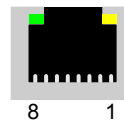
## 2.7.2.4 Wiring RS485 full duplex



## 2.7.2.5 Wiring RS485 half duplex



## 2.8 Socket X4C EtherCAT IN and X4B EtherCAT OUT

Description of the LEDs		Name	Description
Bus speed (yellow)		X4B	EtherCAT IN
Link/Activity (green)			
Bus speed (yellow)		X4C	EtherCAT OUT
Link/Activity (green)			

LED bus speed (yellow)	Function
off	Transmission error
on	EtherCAT ready for operation with 100 MBit

LED Link/Activity (green)	Function
off	Port closed; no data transfer
on	Port opened; no data transfer
flicker	Port opened with data transfer

## 2.9 Encoder Parameter


The control contains two encoder interfaces. The assignment of the pin connectors is identical.


The following limitations are valid when operating with two encoders:

- The voltage supplies 5V and 8V are generated with **one** programmable voltage source. Only encoders with 5V **or** 8V supply are possible (e.g. BiSS and HIPERFACE are not possible).
- There is only one Endat core on the encoder interface, therefore operation of a digital EnDat 2.2 encoder together with a EnDat analog encoder is not possible.




### 3. Safety Function STO

	<p><b>Only qualified Staff</b></p>	<p>Uncontrolled start is possible by improper installation of the safety technology. This may cause death, serious bodily injuries or substantial damage to property. Therefore the safety function may only be installed and put into operation by qualified personnel which are trained in safety technology.</p>
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	<p><b>Observe all costs</b></p>	<p>The COMBIVERT F6 with safety function must not be started until it is determined that the installation complies with 2006/42/EC (machine directive) as well as the EMC directive (2004/108/EC)(note EN60204). The COMBIVERT F6 with safety function meets the requirements of the Low-Voltage Directive 2006/95/EC. The harmonized standard of the series EN 61800-5-1 (VDE 0160) is used. This is a product of limited availability in accordance with IEC 61800-3. This product may cause radio interference in residential areas. In this case the operator may need to take corresponding measures.</p>
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With electronic protection devices the safety function is integrated in the drive control in order to minimize or eliminate danger by malfunctions in machines. The integrated safety function replace the complex installation of external safety components. The safety function can be requested or released by an error.

	<p><b>Regular checks</b></p>	<p>In order to ensure permanent security, the function must be checked in regular intervals according to the results of the risk analysis.</p>
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Installation work or troubleshooting can be necessary in hazard areas, whereby protective devices such as line- or motor contactors shall not be activated. The safety function STO can be used there. Depending on the application the use of line or motor contactors can be void by using STO.

In case of error or request, the power semiconductor of the drive module are switched off and the drive is not supplied, which causes a rotation or torque (in case of a linear drive movement or force). The unit can be safe switched off and/or remain if an error occurs.

	<p><b>Electric Shock</b></p>	<p>Continue mains voltage with active STO function.</p>
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Compared to the disconnection by line contactors or motor contactors the integrated safety function enables a simple integration of drives to functional groups of a system. Thereby safe torque off can be limited to certain systems. A further advantage is that the recharge and discharge time of the inverter DC link must not be considered. Thus the unit is faster again ready for operation after an interruption.

Regular electromechanical equipment are liable to abrasion. Loss of these equipment occurs by using the STO function and the maintenance costs are reduced.

# Safety Function STO

## Characteristic data for „Safe torque off“

- Power supply for the rotation direction of the motor is interrupted (free-wheeling motor)
- Used when monitoring of standstill is not necessary
- Unintentional starting of the motor is prevented
- No galvanic isolation of the motor from the inverter DC link

What is realized by the STO function related to EN 60204 ?

Emergency stop can be realized by the STO function, since the mains voltage may remain effective.


Emergency stop can be realized only in connection with a line contactor, which disconnects the mains voltage!

### 3.1 Emergency stop according EN 60204


By using suitable safety switchgear units, stop category 0 and 1 according to EN 60204 can be reached by the STO function in the system. Note chapter 6 for safety switchgear units.


Stop category 0	„uncontrolled stop“, i.e. stop by immediate removal of power to the actuators.
Stop category 1	„controlled stop“, i.e. power to the actuators is retained to apply braking until the stop is achieved. The energy is switched off at standstill.

Emergency stop to EN 60204 must be functional in all operating modes of the drive module. The reset of emergency stop may not lead to an uncontrolled start of the drive.

	<b>Restart only after confirmation</b>	The drive restarts if function STO is no longer released. In order to comply with EN 60204, it must be ensured by external measures that the drive restarts only after confirmation.
---	--	--

Without mechanical brake the drive leads to coast; motor is free-wheeling. Additional protective devices must be installed (e.g. locking systems) if damage to persons or property can occur.

	<b>Ensure coast of the motor</b>	If danger to persons occur after switching off the motor control by STO, the entrance to hazard areas must remain closed until the drive stops.
---	----------------------------------	---

	<b>Jerks in error case</b>	In case of double malfunction it can lead to unwanted jerk, the rotation angle is depending on the number of poles of the selected drive and the gear ratio.
---	----------------------------	--

Calculation of the jerk:

$\text{Rotation angle of the jerk } W_R [^\circ] = \frac{180^\circ}{\text{Pole-pair number } p \cdot \text{gear reduction ratio } g}$
---

This behaviour can occur either by a short circuit of the IGBTs or by interconnection (also short circuit) of the control drivers. The error should be regarded as critical, if the drive remains in STO status.

### 3.2 Classification of STO according IEC 61508

PFH	$2.6 \cdot 10^{-12}$ 1/h
PFD	$2.3 \cdot 10^{-7}$ on demand
Proof-Test-Interval T	20 years

For SIL classification in connection with the applications consider the failure rates of the external switch devices for final evaluation.


### 3.3 Classification of STO according EN ISO 13849

Category	4
MTTF <sub>D</sub>	>1000 years
DC	high

For the classification within a performance level in connection with the applications consider the failure rates of the external switch devices for final evaluation.

### 3.4 Additional instructions

- The unit must be isolated from mains by main switch when working on parts under voltage.
- Mechanical brakes must be installed additionally if external forces have effect to the drive axis, e.g. vertical axes (hanging loads) or rotary axes with asymmetrical weight distribution.
- For the protection against pollution (pollution degree 2) the installation of the units must be provided in environment with increased protection (e. g. control cabinet IP 54).
- Make sure that no small parts fall into the COMBIVERT during assembly and wiring. This also applies to mechanical components, which can lose small parts during operation.
- Check the safety functions and error responses and generate an acceptance report after installation.
- The start-up can be prevented with interruption of the STO signals. STO may not be released in case of danger according to EN 60204-1. Also note the instructions to the external safety switch devices.
- Dimension the safety application by way that the corresponding input current of the safety functions is available for the inputs (see chapter 2.5.1).

	<b>Selection of suitable voltage sources</b>	Use for the connection only suitable voltage sources with safe isolation (SELV / PELV) in accordance with VDE 0100 with nominal voltage of 24 Vdc ± 10%. Pay attention on a sufficient over-voltage category of the voltage supply.
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### 3.5 Functional Description

The COMBIVERT with integrated safety function meets the following function according to IEC 61800-5-2:

- „Safe torque off“ (Safe Torque Off – STO)

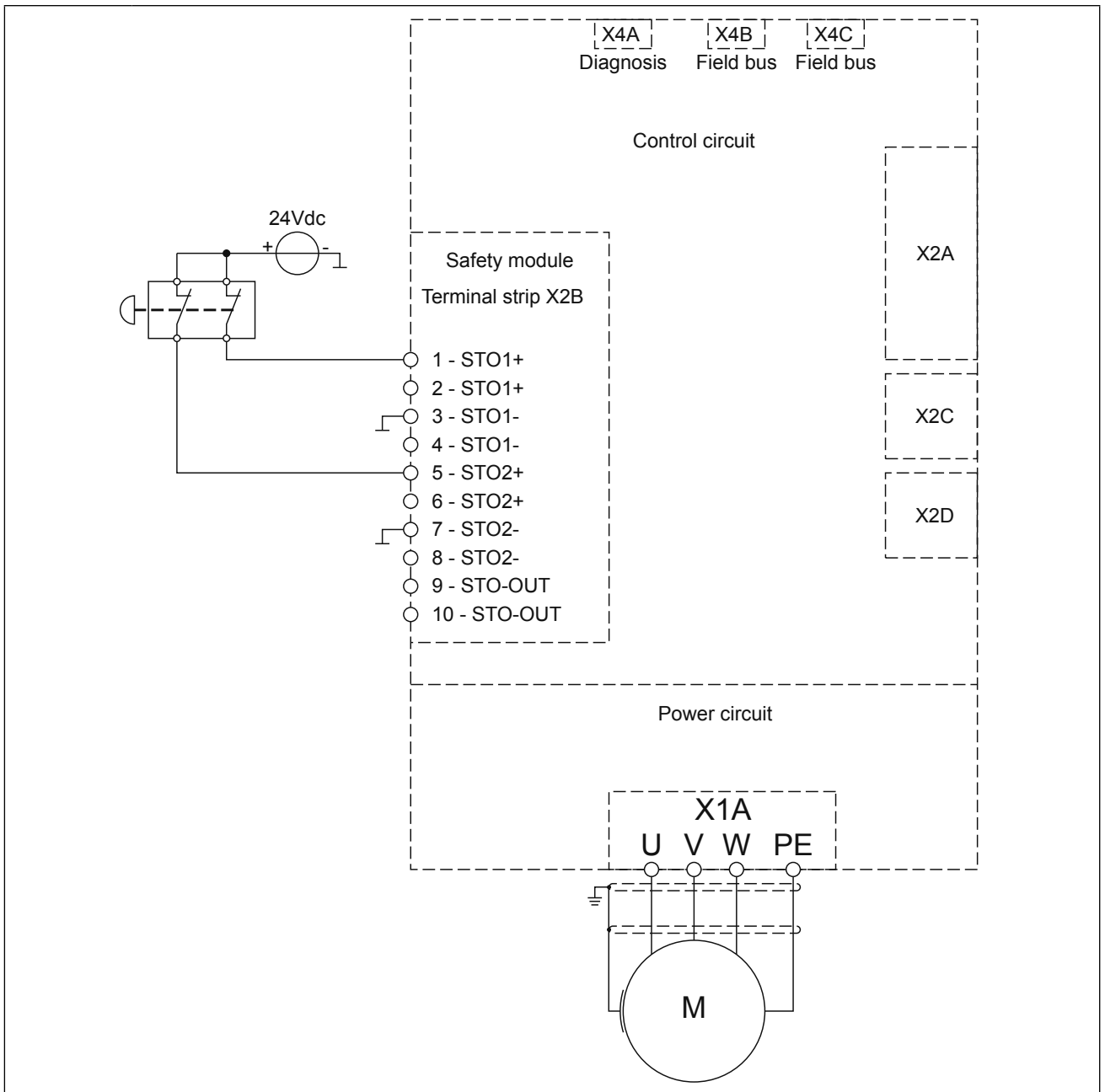
The safety-related disconnection according to STO is reached by a two-channel opto-coupler blockage. The supply of the opto-couplers, which are responsible for the commutation of the connected drive occurs via transformation coupling of the input voltage. This ensures at input voltage loss that no supply of the opto-couplers is possible. If the opto-couplers are not longer supplied, no IGBT can be controlled and thus no energy can be supplied to the drive.

The two channels are reached by way that input STO1 prevents the voltage supply (VTRO) of the upper opto-couplers of the inverter bridge and input STO2 the lower opto-couplers (VTRU).

Technical data of the STO function	
Maximum ON delay ( $U_{IN} = 15V$ )	7 ms
Maximum OFF delay ( $U_{IN}=30V$ ) at	
... active modulation	10 ms
... inactive modulation until safe state of the driver voltage is reached	50 ms

### 3.6 Wiring Examples

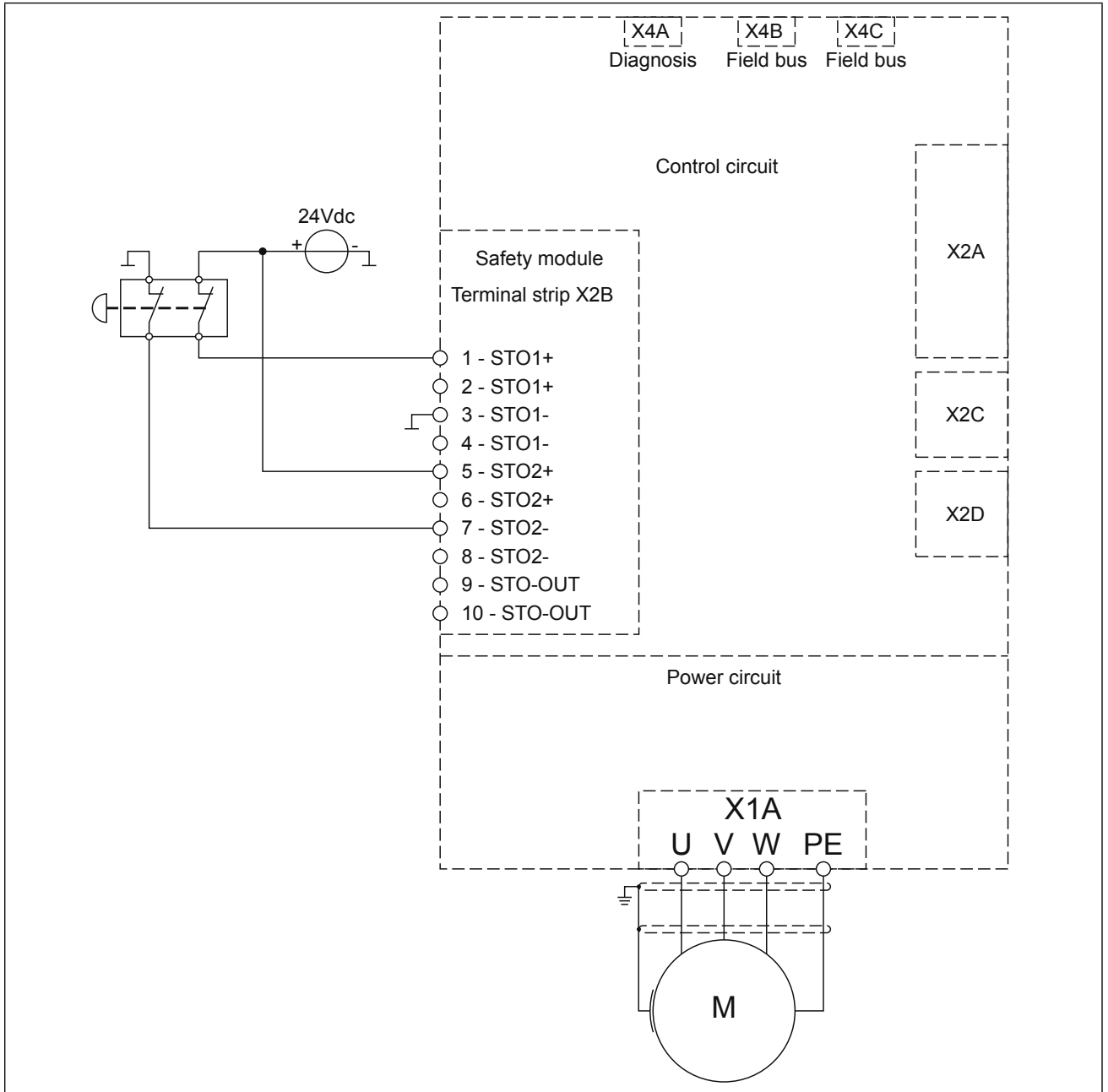
#### 3.6.1 Direct switching off with emergency stop switch



At operation of an emergency stop unit, when both contacts are connected together against a positive supply signal, make sure that there are no crossfaults. The wiring must be suitable arranged.



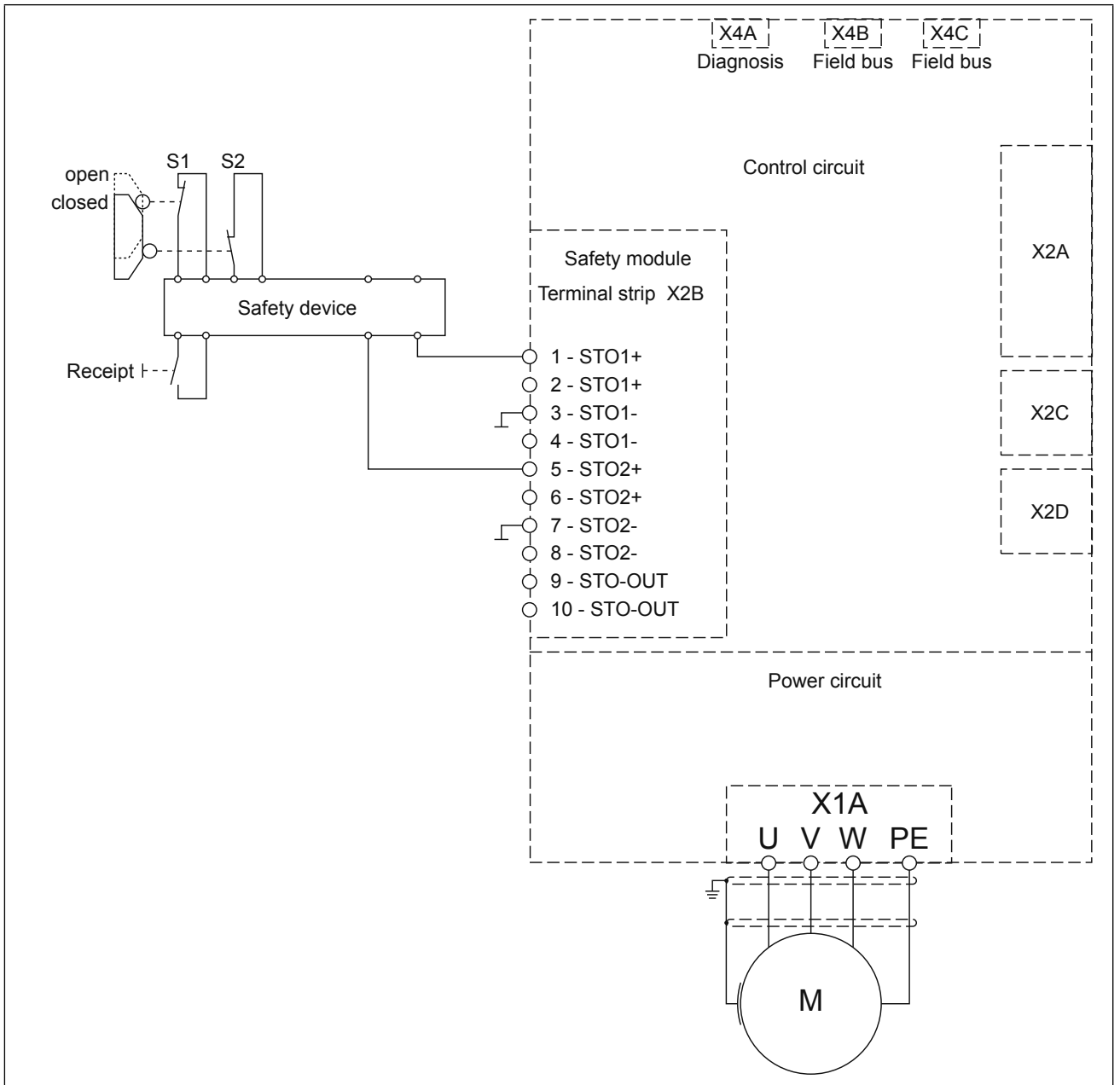
## 3.6.2 Direct switching off with emergency stop switch and monitoring of the wiring



The displayed circuit shows wiring errors in the area of the emergency stop unit and supply line. A possible short circuit on the primary side of the emergency stop switchgear (mass and 24 Vdc) and a short circuit on the secondary side of the unit or within the wiring leads either directly or with closed contacts to a short circuit of the supply, whereby a series-connected 24V fuse triggers.

Besides the two displayed applications with an emergency stop switchgear, other sensors (like door switches etc.) can be used similarly.

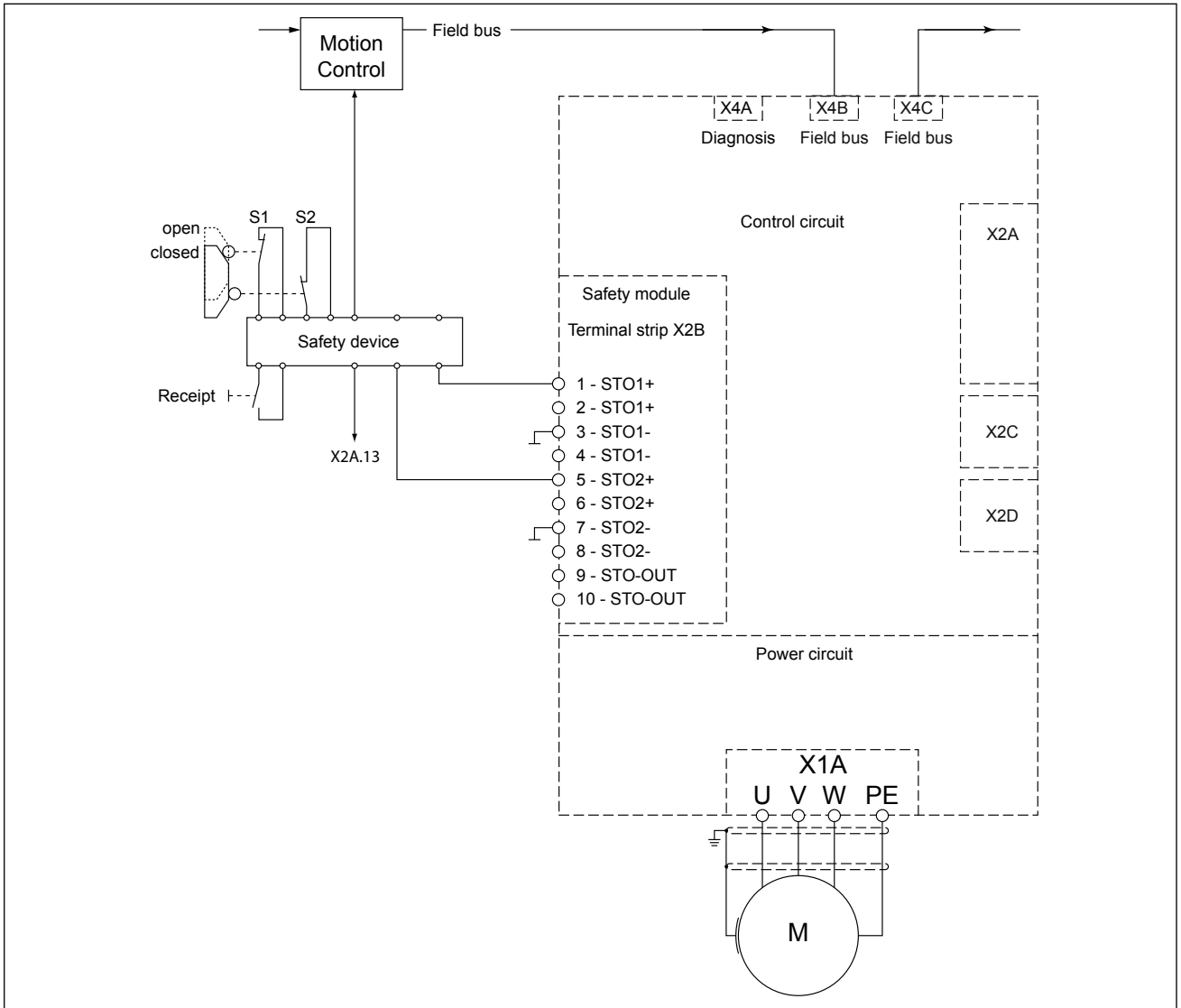
### 3.6.3 Direct switching off by safety module with test pulses



With operation of the emergency stop unit, e.g. by protection door, the release paths of the safety module are disconnected. This leads to the loss of the STO signals (X2B.1 and 5) and thus to energy disconnection of the drive. The safety module makes a consistency check of all signal paths via test signals (OSSD).

## 3.6.4 Wiring SS1

At tripping SS1 (Safe Stop 1) the drive is only disconnected from supply when it has reached a standstill [IEC 61800-5-2]. The stop mode is not directly requested, but the maximum time until reaching the standstill is estimated. This period is loaded in a safe time relay, which disconnects the drive finally from supply.



When pressing the emergency stop unit the drive is stopped with a deceleration ramp via input X2A.13 (I3).

Simultaneously the expiration of the safe time occurs in the safety module. After expiration of the safe period the control signals STO1+ und STO2+ (X2B.1 and 5) are removed and thus the energy supply of the drive is disconnected.

The following adjustments must be done in the drive module for the function „drive stop“:

Parameter	Adjustment
pn29 „prg. error stop. mode“ (Index 0x2A1D)	1: dec. ramp -> Fault
pn48-59 (0x2A30-0x2A3C)	Adjustment of the deceleration and jerk values for the adjusted error reaction
pn30 „prog. error source“ (Index 0x2A1E)	4: I3 (here in the example)

Function: If the selected input becomes active, the drive decelerates with the adjusted deceleration ramp and changes then into status 59 „Error prog. input“.

## 4. Certification

### 4.1 Annex to the declaration of conformity

Annex to the declaration of conformity EC for systems with functional safety:

Product designation:	Inverter - type series	xxF6Kxx-xxxx
	Dimension	07 - 36
	Voltage class	200 Vac; 400 Vac; 600 Vac

Herewith we declare that the safety module described above corresponds with all relevant regulations of the machinery safety directive 2006/42/EC.

The above mentioned safety module meets the requirements of the following guidelines and standards:

• Machinery safety directive	2006/42/EC
• EMC directive	2004/108/EC
• Low-Voltage Directive	2006/95/EC

EN standards	Output	Text	Reference	Output
EN 61800-5-1	09/2003	Electrical power drive systems with adjustable speed: security requirements	VDE 0160 Part 105	09/2003

informative:

EN 50178	1997	Installation of high voltage systems with electronic equipment	VDE 0160	04/1998
EN 60664-1	2007	Isolation coordinats for electrical equipment in low-voltage systems	VDE 0110	01/2008
EN 61800-2	10/1998	Basic determinations for AC inverter	VDE 0160 Part 102	08/1999

especially for systems with functional safety additionally:

EN 61800-5-2	2007	Electrical power drive systems with adjustable speed: functional safety requirements	VDE 0160 Part 105-2	04/2008
EN 61508-(1...7)		Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1 up to 7	VDE 0803	11/2002
EN 60204-1 +A1	2006 2009	Electrical equipment of machines; Part1: General requirements	VDE 0113-1 +A1	2007 10/2009
EN 62061		Safety of machinery functional security requirements	VDE 0113 Part 50	10/2005
EN 13849-(1, 2)		Safety of machinery	–	08/2008

The conformity was confirmed by the TÜV Rheinland with the EC type examination 01/205/5332/13.

The number/address of the indicated constitution:

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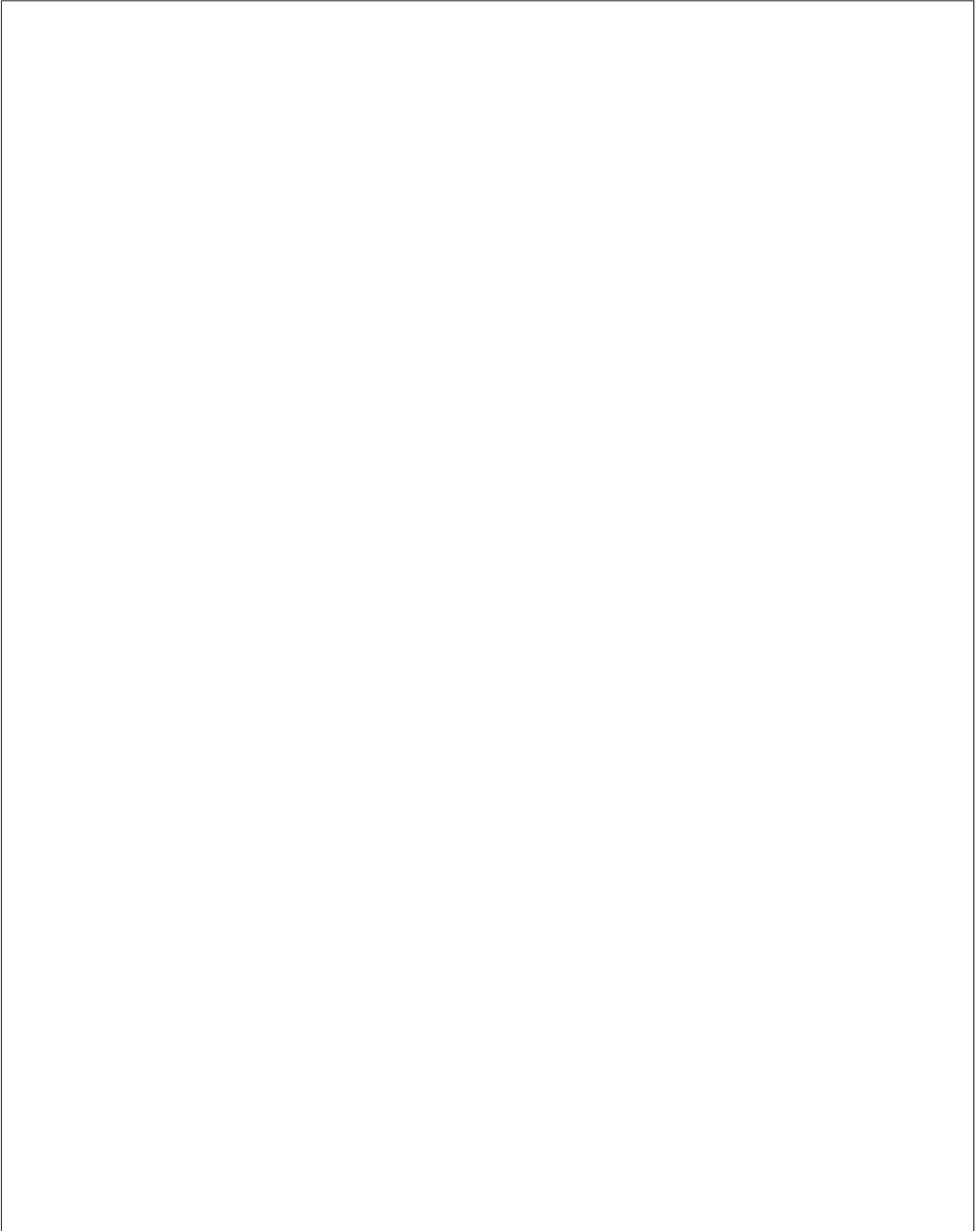
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## Revision history

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### 5. Revision history

Revision	Date	Description
Rev.1A	2013-01	First published version
Rev.1B	2013-04	Preface supplemented; common typos corrected; note to potential reference STO-Out inserted; EtherCAT IN and OUT exchanged (chap. 2.8)
Rev.1C	2013-08	Title corrected







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