Bewegung durch Perfektion | Movement by Perfection

ZIEHL-ABEGG

Die Königsklasse
The Royal League

Die Königsklasse in Lufttechnik, Regeltechnik und **Antriebstechnik** | **The Royal League** in ventilation, control and **drive technology**

ZA dyn4C MRL
Frequency inverter

Original operating instructions
Store for future use!

Content

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1   General information

Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, start-up, maintenance, repair, cleaning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and limb of users and third parties.

Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications.

1.1   Validity

This instruction manual applies to:
frequency inverter from the series:ZAdyn4C MRL
from software version 4.42

1.2   Structure of the operating instructions

These Operating Instructions are a Quick Start Guide with additional information. They are only valid in connection with the following Operating Instructions.

• R-TBA12_01 (ZAdyn4C)

Please notice and follow the below described informations:

• Safety instructions
• Product overview
• Mechanical installation
• Electrical Installation
• Service & Maintenance
• Transport
• Storage duration:
• Disposal & recycling

Before installation and start-up, read this manual carefully to ensure correct use!

1.3   Target group

The operating instructions address persons entrusted with planning, installation, commissioning and maintenance and servicing and who have the corresponding qualifications and skills for their job.

1.4   Exclusion of liability

It has been established that the content of these operating instructions is concurrent with the frequency inverter hardware and software described.

It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. The contents of this manual are put through periodic reviews. Necessary modifications are incorporated into the next version.

ZIEHL-ABEGG SEis not liable for damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

2   Safety instructions

The safety instructions described in chapter 2 of the operating instructions R-TBA12_01 (ZAdyn4C) must be observed!

3 Product overview

3.1 Application

The ZAdyn4C MRL is a field-oriented frequency inverter for speed control of three-phase motors developed for use in elevator machines.

They are based on the ZAdyn4C, whereby a brake control, a device switch, a brake resistance (except ZAdyn4C MRL BE) and room for additional components (only ZAdyn4C MRL AI) have been additionally integrated.

The inverter is equipped with a microprocessing control. This drives the motor based on time and travel-dependent programs, which can be selected through the superordinate elevator controls. The use of IGBT modules and a pulse width modulation in which the clock frequencies can be modified enable low-noise motor operation. The user interface specifically matched to elevator technology, interfaces and software enable simple installation and commissioning of the device.

The frequency inverter is designed for elevator installations for passenger and freight transport with a high demand on travel comfort and positioning accuracy.

The frequency inverter has been developed for operating synchronous motors.

4 Mechanical installation

4.1 General notes

The ZAdyn4C MRL frequency inverter is a closed compact device that is designed for mounting on the machine frame carrier. Wall mounting is also possible but adequate cooling must be ensured in this case (see chapter "Wall mounting").

Danger!
The following points must be complied with during the mechanical installation to avoid causing a defect in the device due to assembly errors or environmental influences:

Before installation
- Remove the device from the packing and check for any possible shipping damage
- Carry out installation only on a clean, level and stable foundation
- Assemble the device outside of the traffic area

During installation
- Mount the device in a torsion free conditions
- Installation position: vertical; no lying installation
- Mount the device in a torsion free conditions
- Avoid that drilling chips, screws and other foreign bodies reach the interior of the device
- Maintain the stated minimum clearances to ensure unobstructed cooling- air feed as well as unobstructed outgoing air discharge (see fig. "Minimum clearances")

Ambient conditions
- Prevent humidity
- Avoid aggressive and conductive materials in the environment

4.1.1   Switch cabinet installation

CAUTION!

Attention!
The device is designed for installation on the machine carrier in the lift shaft. An adequate cooling must be ensured for assembly in the switch cabinet. The power loss of the device (see chapter "Technical Data") must be taken into account here.
The specified installation position and the minimum distances must be observed when assembling in the switch cabinet.

4.1.2   Wall installation

CAUTION!

Attention!
The minimum distances and the installation position must be observed for wall mounting (see chapter "Dimensions / minimum distances").

4.1.3   Fixation
The ZAdyn4C MRL has a fastening variant which matches the special installation situation of the device.

4.1.3.1   Procedure
▷ Fix the fastening plate (6) to the machine carrier with 4 fastening screws (2).
▷ for ZAdyn4C MRL AI: Feed the cables through the opening (5) in the centre of the fastening plate.
▷ Push the housing (1) of the ZAdyn4C MRL into the hooks (4) of the fastening plate (6).
▷ Screw together both parts with 2 fastening screws (3).
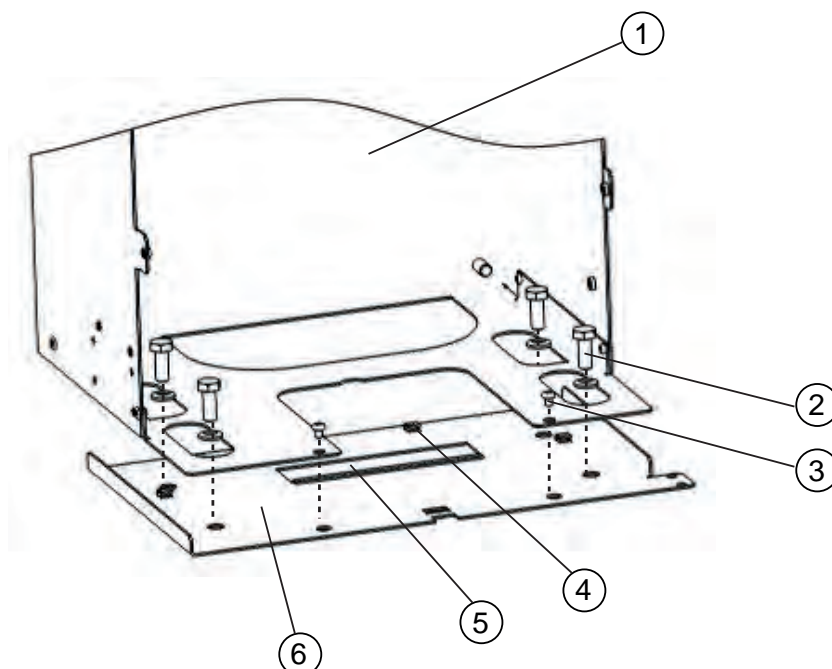
4.2 Dimensions / minimum clearances
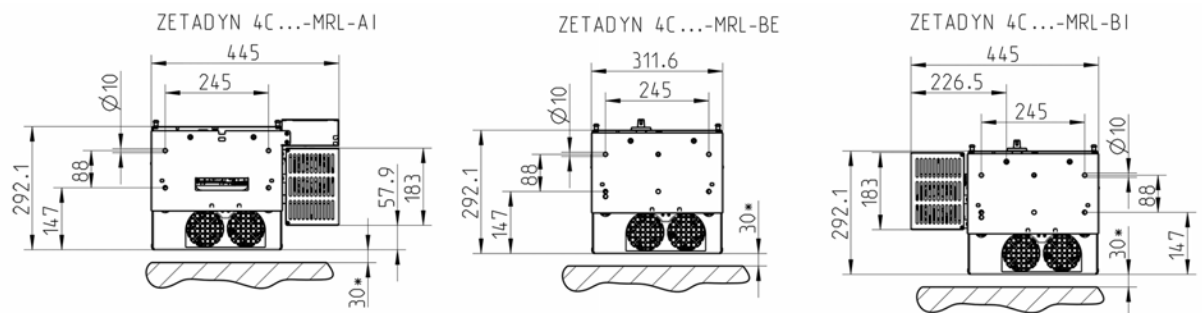
Dimensions / minimum distances ZAdyn4C MRL in mm
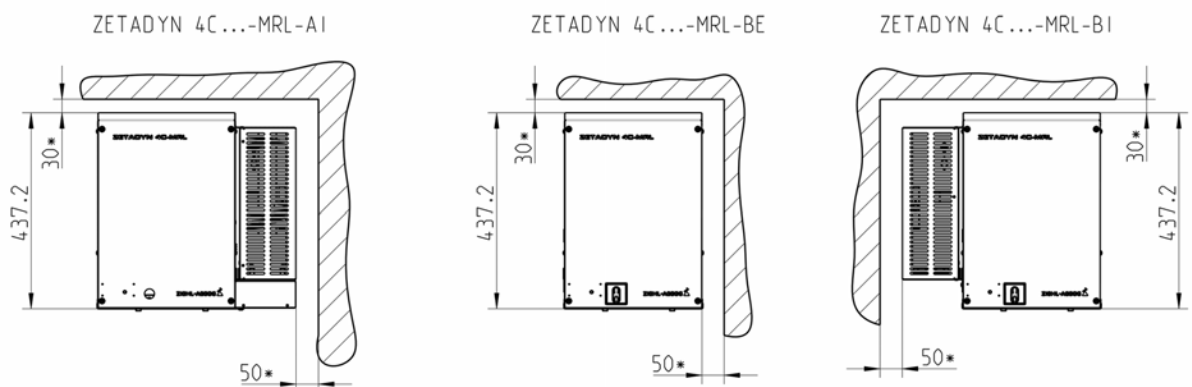
Dimensions / minimum distances ZAdyn4C MRL in mm

ZD4C10M0

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5   Electrical installation

The safety instructions described in chapter "Electrical installation" of the operating instructions R-TBA12_01 (ZAdyn4C) must be observed!

5.1   EMC-compatible installation

When correctly installed (see below), the device corresponds to the following standards:
- EN 12015 Electromagnetic compatibility – product series standard for lifts, escalators, moving pavements – spurious emission
- EN 12016 Electromagnetic compatibility – product series standard for lifts, escalators, moving pavements – interference immunity

The following points must be observed if the above mentioned standards are to be adhered to:
- Use only shielded cables for motor and brake chopper or brake resister connections.
- Max. motor line length is 25 m
- Wind unshielded cables of brake resistor type BR11-A around the toroidal core provided (see figure)
- If an interruption in the shield is necessary, the shield must then be continued with as low an HF impedance as possible
- Use only shielded control cables
- The shielding of control cables (inputs and outputs, rotary encoder cable, etc.) must be connected to earth potential on the inverter side
- The shielding of control cables (inputs and outputs, rotary encoder cable, etc.) must be connected to earth potential on the inverter side
- Use shielded lines in the switching cabinet also
- Do not twist shielding for connections; use a suitable shield connection system
- Run the control cables and the encoder cables separate from the power cables
- Provide connected inductances (brakes, motor contactors) with suppressors
- Feed the voltage supply of the motor contactors through the mains filter of the elevator control

Toroidal core BR11-A

5.1.1   ZAdyn4C MRL AI

5.1.1.1   Motor cable

Cable length
The maximum line length is 25 m.
When lines over > 25 m are used, compliance with **DIN EN 12015** (electromagnetic compatibility – electrical interference) and **DIN EN 12016** (electromagnetic compatibility – noise immunity) is no longer guaranteed.

Contacting the shielding of the motor line on the ZAdyn4C MRL AI
On the ZAdyn4C MRL AI, the shielding of the motor line must be connected with earth potential with the clip provided (see fig.).

Remove the sheath

1   *Cable tie for strain relief*
2   *Clip*

Contacting the shielding on the motor

Connect the shielding on the motor side to the PE junction that is located directly on the motor housing.

For prefabricated motor lines from ZIEHL-ABEGG SE, the shielding connection is provided with a ring cable eye for the corresponding thread size.

When using non-prefabricated lines, implement the shielding connection by using a suitable shielding connection system.

5.1.2   ZAdyn4C MRL Bx

5.1.2.1   Power cable / motor cable / control cables

Contacting of the power cable to the ZAdyn4C MRL Bx

The shield of the power cable must be connected to earth potential at the bolt for the earth connection on the ZAdyn4C MRL Bx.
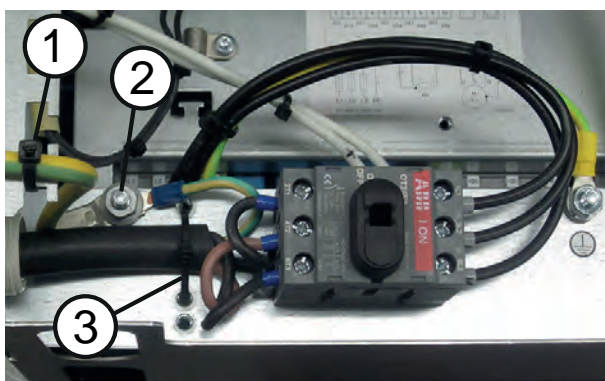
1.3   *Cable tie for strain relief*
2   *Bolt for the earth connection*

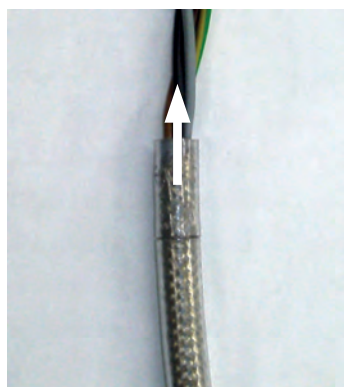### Contacting the shielding of the motor line on the ZAdyn4C MRL Bx
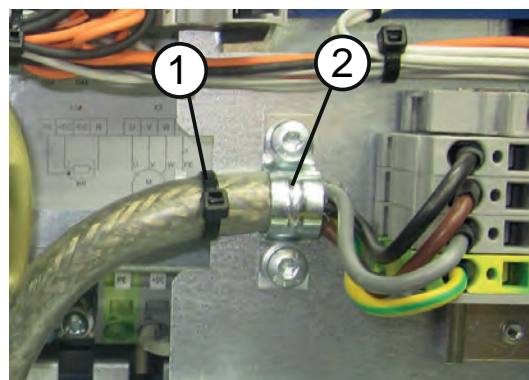
Cable length

The maximum line length is 25 m.

When lines over > 25 m are used, compliance with **DIN EN 12015** (electromagnetic compatibility – electrical interference) and **DIN EN 12016** (electromagnetic compatibility – noise immunity) is no longer guaranteed.

On the ZAdyn4C MRL Bx, the shielding of the motor line must be connected with earth potential with the clip provided (see fig.).

Remove the sheath

1   Cable tie for strain relief
2   Clip

Contacting the shielding on the motor

Connect the shielding on the motor side to the PE junction that is located directly on the motor housing.

For prefabricated motor lines from ZIEHL-ABEGG SE, the shielding connection is provided with a ring cable eye for the corresponding thread size.

When using non-prefabricated lines, implement the shielding connection by using a suitable shielding connection system.

Control cables

The shields of the control cables (digital inputs and outputs) must be connected to earth potential on the inverter side. Earthing clips are provided in the ZAdyn4C MRL Bx for this (see fig.).
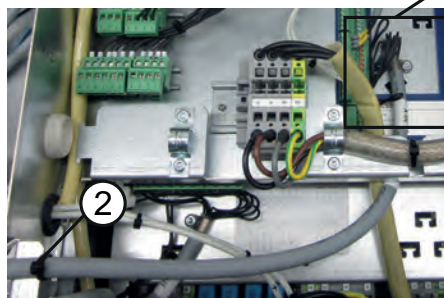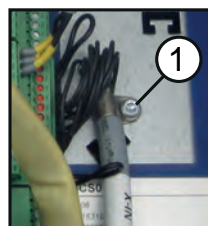
Shielding digital inputs line
1   Earthing clip
2   Strain relief by cable ties

Shielding digital outputs line
1   Strain relief by cable ties
2   Earthing clip

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5.2   Device set-up / Terminal positions
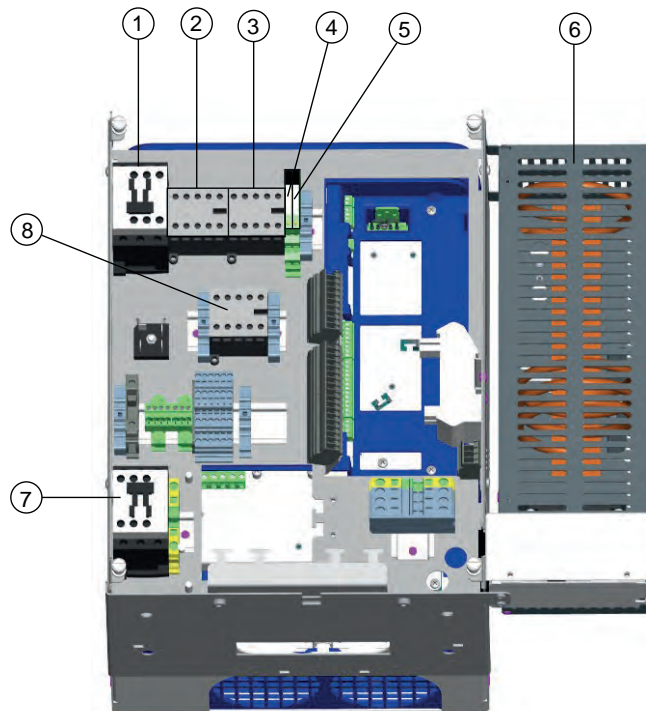
Device set-up ZAdyn4C MRL AI
1   *K7.1 brake contactor*
2   *K141 manual brake release*
3   *K140 manual brake release*
4   *K1 coupling relay for STO activation*
5   *Coupling relay for STO activation*
6   *Brake resistor*
7   *K0 main contactor*
8   *K7 brake contactor*
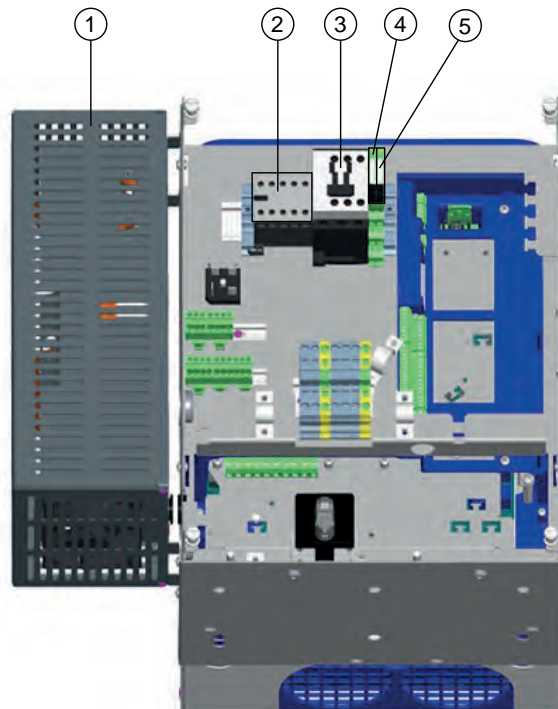
Device set-up ZAdyn4C MRL Bx
1   *Brake resistance (only for ZAdyn4C MRL BI)*
2   *K3 brake contactor*
3   *K4 brake contactor*
4   *K1 coupling relay for STO activation*
5   *Coupling relay for STO activation*
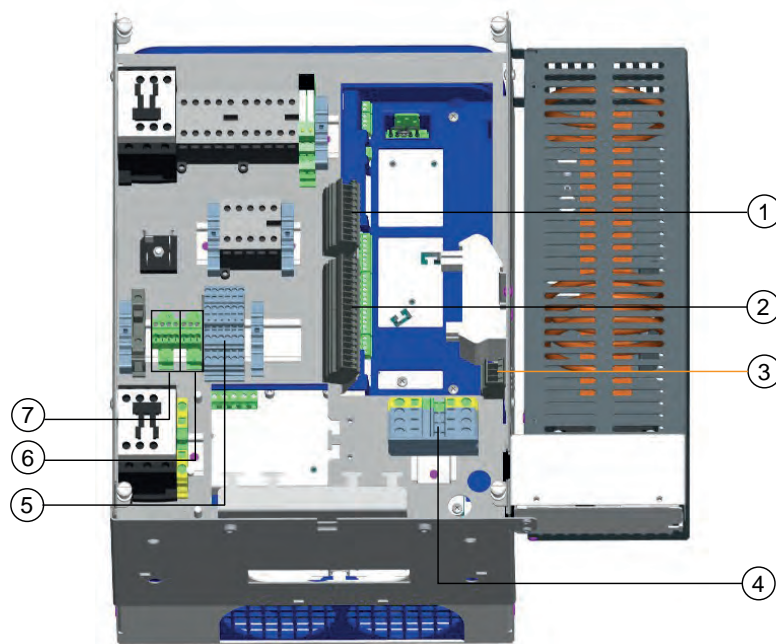
Terminal positions ZAdyn4C MRL AI
1   *X400 manual brake release, monitoring brake contactors, X-OUT O41-O44*
2   *X300 supply brake, remote switch-off, emergency feed brake release, X-OUT O11-O14*
3   *X600 connection device switch*
4   *X2 motor*
5   *X-70 feeding of UPS, supply of UPS*
6   *X-SC activation of STO relays safety circuit*
7   *X3 brakes*
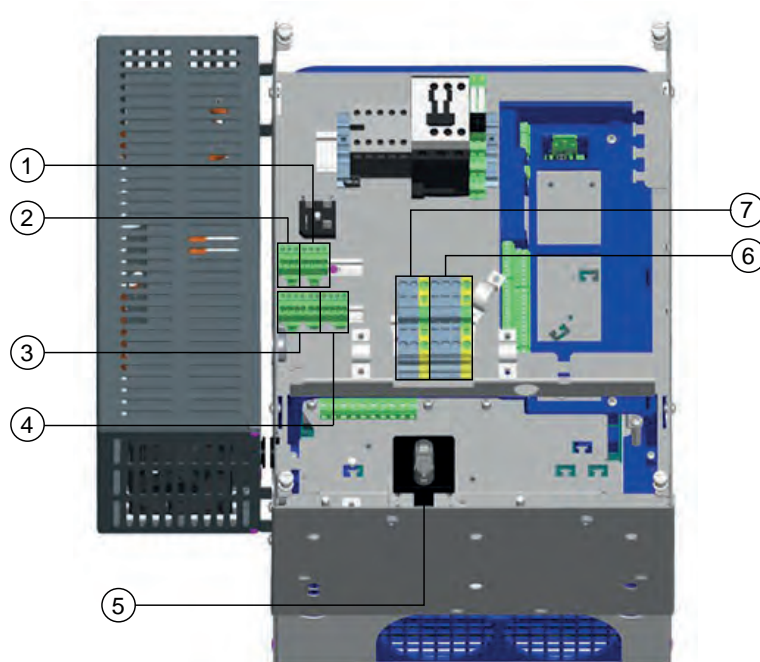
Terminal positions ZAdyn4C MRL Bx
1   *X-BA brakes*
2   *X-SC activation of STO relays safety circuit*
3   *X-K2 connection button for emergency mode and two-circuit test*
4   *X-K1 monitoring of brake contactors*
5   *Switch Q1, mains connection*
6   *X3 motor*
7   *X2 Brake resistance (only for ZAdyn4C MRL BE)*

5.3 Wiring

The device is fitted with openings and recesses to feed the different cables into the ZAdyn4C MRL. The figures below show their arrangement and position.

5.3.1 ZAdyn4C MRL AI

Wiring
1   *Cable brakes,*
    cable X-DCP,
    cable X-CAN,
    cable X-MON,
    cable X-ENC15,
    cable X-ENC8,
    cable X-SC,
    cable X300,
    cable X400
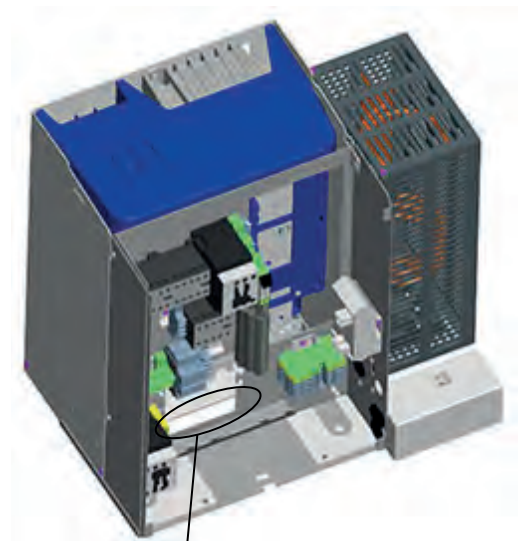
Wiring
1   *Motor cable*
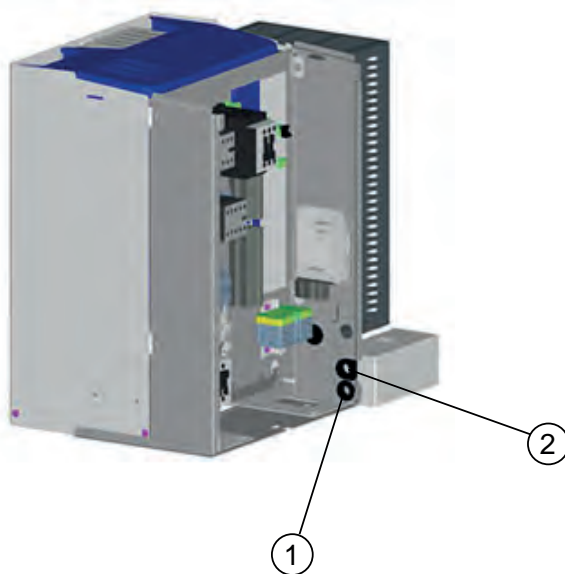
Wiring
1   *Power line*
2   *Cable X600*

5.3.2   ZAdyn4C MRL Bx
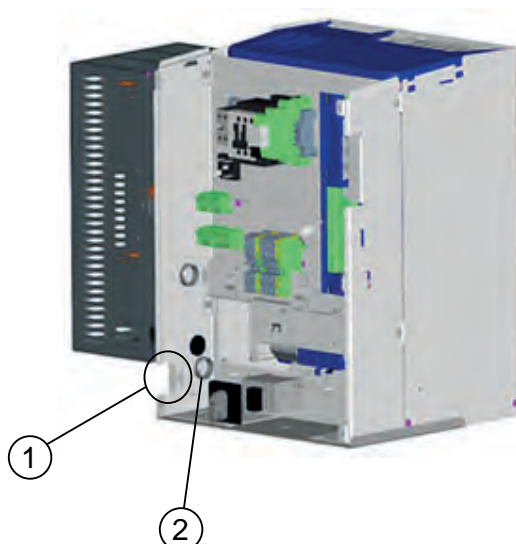
Wiring
1   Cables X-IN, X-OUT, cable protective earth connection
2   Power line

Wiring
1   Cable brakes, cable brake resistance, cable motor temper-
    ature monitoring, cables X-ENC15, X-ENC8, X-MON

5.4   Strain relief by cable ties

A cable tie must be attached to all lines for strain relief (see fig.).
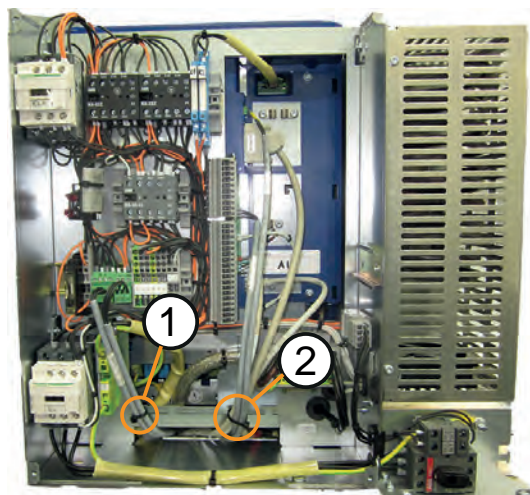
Strain relief by cable tie on the ZAdyn4C MRL AI
1.2   Strain relief by cable ties
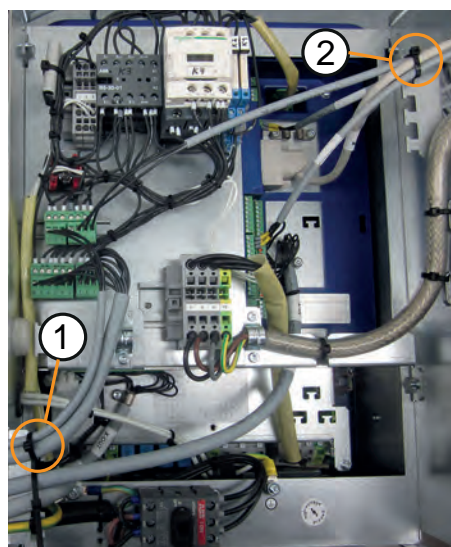
Strain relief by cable tie on the ZAdyn4C MRL Bx
1.2   Strain relief by cable ties

5.5   Protective ground connection

In accordance with the defined networks in DIN EN 60990 the device has a leakage current > 3.5 mA
and must therefore be permanently connected. In accordance with EN 50178 item 5.2.11 and 5.3.2.1,
the PE conductor connection must have a cross-section of at least 10 mm². In the case of PE
conductors < 10 mm², an additional PE conductor must be connected. The cross-section must
correspond at least to the cross-section of the PE conductor on the connecting lead. M6 threaded
bolts are available on the ZAdyn4C MRL for connecting the PE conductors (see fig.).
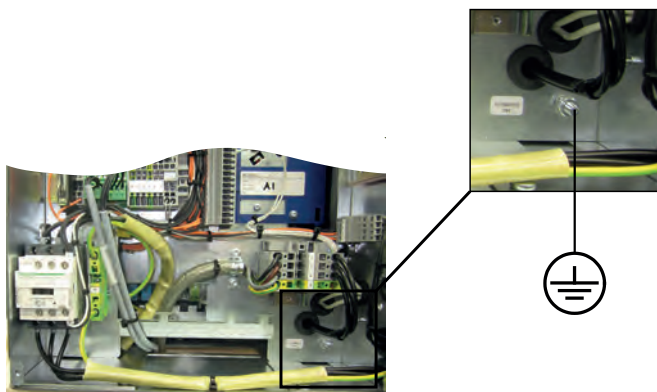
Protective earth connection ZAdyn4C MRL AI
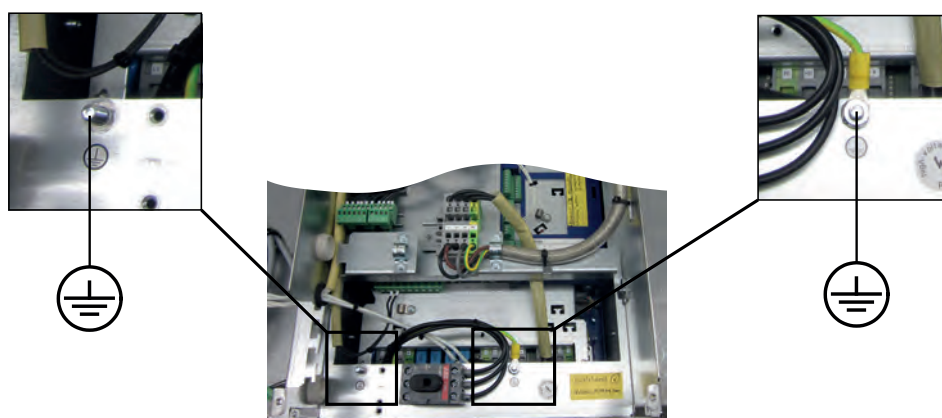
Protective earth connection ZAdyn4C MRL Bx

5.6   Mains connection (X1)

Danger!
Before connecting to the mains, check if the technical data on the rating plate of the ZAdyn4C MRL correspond to the required connection values.

5.6.1   Network form
The mains filter and ZAdyn4C MRL are designed for use in an earthed power supply system.
Permissible mains forms are:
• TN network
• TT network

Information
The mains filter and ZAdyn4C MRL are unsuitable for use in the IT network!

5.6.2   Cable cross section
The line cross-section must be specified dependent on the motor's rated current and the ambient conditions (e.g. temperature, wiring method) in accordance with DIN VDE 0100.

5.6.3   Mains fuse
The fuse protection is implemented in accordance with the line cross-section used.

5.6.4   Type of cable
Both rigid and flexible lines can be utilized. The use of wire-end sleeves is recommended for flexible lines.
The mains line does not have to be shielded.

5.6.5   Connection ZAdyn4C MRL AI
The power cable is connected to the main contactor of the ZAdyn4C MRL AI. The mains connection is designed with screw contact terminals.
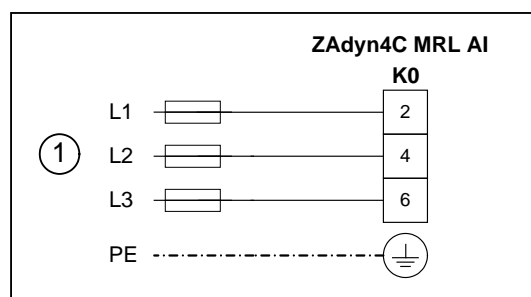
Mains connection ZAdyn4C MRL AI
1   Mains 3~ 400V/PE/50Hz

5.6.6   Connection ZAdyn4C MRL Bx
The power cable is connected to the device switch of the ZAdyn4C MRL Bx.
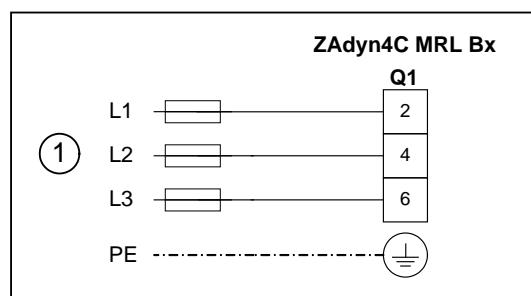
Mains connection ZAdyn4C MRL Bx
1   Mains 3~ 400V/PE/50Hz

5.7   Motor connection (X3)

5.7.1   Cable cross section
The line cross-section must be specified dependent on the motor´s current and the ambient conditions (e.g. temperature, wiring method) in accordance with DIN VDE 0298-4.

5.7.2   Type of cable
Always use shielded cables for the motor connections! Both rigid and flexible lines can be installed. The use of wire-end sleeves is recommended for flexible lines.
Rated voltage U0 / U: 450 / 750 VAC

5.7.3   Cable length
The maximum line length is 25 m. With a motor power line **> 25 m** compliance with DIN EN 12015 (electromagnetic compatibility – spurious emission and DIN EN 12016 (electromagnetic compatibility – interference immunity) can no longer be guaranteed.

5.7.4   Connection

Danger!
Always switch off the mains voltage when connecting the motor line. The STO function (operation without contactors) does not electrically isolate the output stage of the inverter from the motor line terminal!

The motor connection is designed with spring contact terminals. To avoid damage to the connection terminals and to ensure a safe contact, a suitable screwdriver must be inserted into the terminals as far as it will go to fully open them when connecting cables.

Danger!
When operating the motor with a rotary encoder, the line to the motor must be connected on the motor and inverter side phase-correct: U -> U / V -> V / W -> W.
Never swap the connection; not even if the rotary direction of the motor is false!! If the motor phases are swapped, motor control is generally not possible. This can lead to jerky movements or uncontrolled acceleration of the motor.
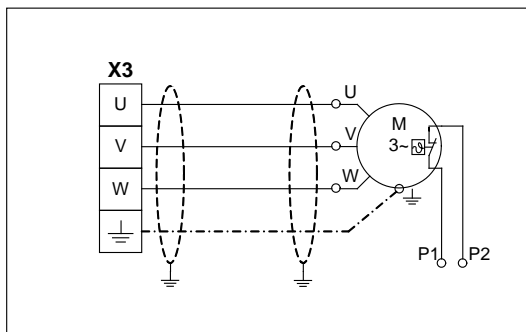
Synchronous motor connection

5.7.5   Electronic short-circuit

If emergency evacuation is performed by opening the brakes, the motor windings are short-circuited by a self-activating electronic short-circuit to prevent uncontrolled acceleration of the lift. The short-circuit generates a speed-dependent brake torque which is sufficient in most cases to limit the lift speed to a safe value.

Information
- The electronic short-circuit is also active when there is no operating voltage on the ZAdyn4C.
- Please contact Ziehl-Abegg if you want to switch off the electronic short-circuit.

CAUTION! When operating synchronous motors from other manufacturers, make sure that they can be operated with the electronic short-circuit and that manual emergency evacuation with short-circuited motor windings is permissible.

5.8 Motor temperature monitoring (X-MT)

Information
The X-MT terminal is a standard part of the ZAdyn4C MRL frequency inverter.

Information
The detection of over temperature of the motor doesn't cause a drive interruption. The current drive will be completed.
If an over temperature of the motor will be detected at stop, there is no further drive possible.

The temperature monitoring is carried out according to IEC 61800-5-1:2003-02 (switching point at 3500 Ω)
The following sensor types can be used:
- PTC thermistor (PTC according to DIN 44082)
- Temperature sensor KTY84-130
- Thermal circuit breaker
The used sensor has to be parametrized in the menue**Monitoring/P1P2**!

```
Monitor
↳ P1P2    PTC
   ↳      PTC
Motor temp. monitor
```
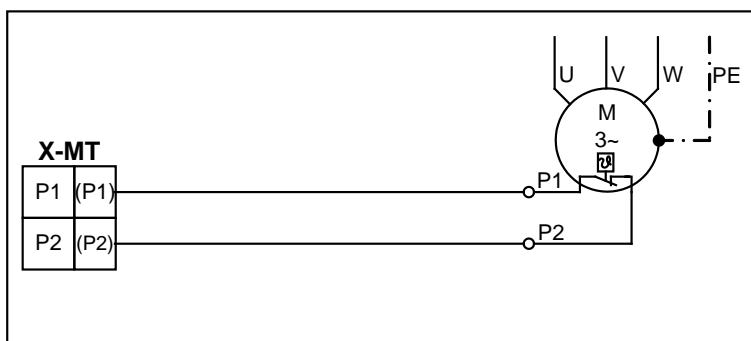

Temperature monitoring connection
() terminal designation of connector

Information
If the temperature monitor is not used, it must be switched off **(monitors/P1P2=Off)**). Short-circuiting of the inputs P1 and P2 is detected as an error by the ZAdyn4C MRL.

5.9   Brake resistor (X 2)

Information
The brake resistance is already integrated into the ZAdyn4C MRL AI and the ZAdyn4C MRL BI.

5.9.1   ZAdyn4C MRL BE

CAUTION!

Attention!
An existing temperature monitor absolutely must be connected to the ZAdyn4C MRL AI!
The device can burn out in case of a fault!

CAUTION!

Attention!
If the connection of a brake resistor (type BRxx) to the +DC and -DC terminals is faulty, it will emit a continuous power output and the device will become overheated. If a temperature monitor is not connected, the device will burn out!

CAUTION!

Attention!
The brake resistor or brake chopper used must be configured in the menu **Encoder & BC/BC_TYP**.

```
Encoder & BC
↳BC_TYP  BR25
   ↳      BR25
BR/BC - Typ
```

Cable length
The maximum line length is 5 m.
When lines over >5 m are used, compliance with **DIN EN 12015** (electromagnetic compatibility – electrical interference) and **DIN EN 12016** (electromagnetic compatibility – noise immunity) is no longer guaranteed.
If the11pre-fabricated5cable is not long enough in the brake resistor of the BR11-A type, this can be extended up to a length of 5 m.
A shielded, self-extinguising cable is required for this.

Brake-Resistor connection

Information
The brake resistor of the BR11-A type has no temperature monitor.
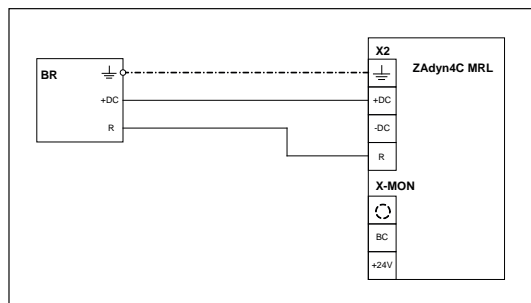
BR11-A connection
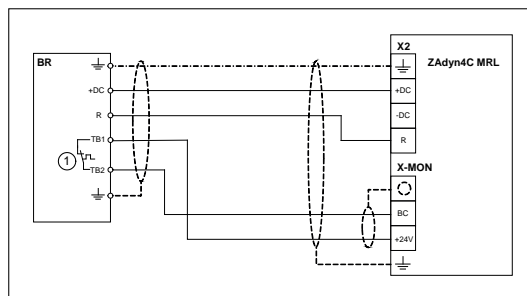
Installation position BR17 / BR25 / BR50 / BR100
1   Max. contact load: 5 A / 250 VAC

5.10   Digital inputs (X-IN)

5.10.1   Connection with external power supply
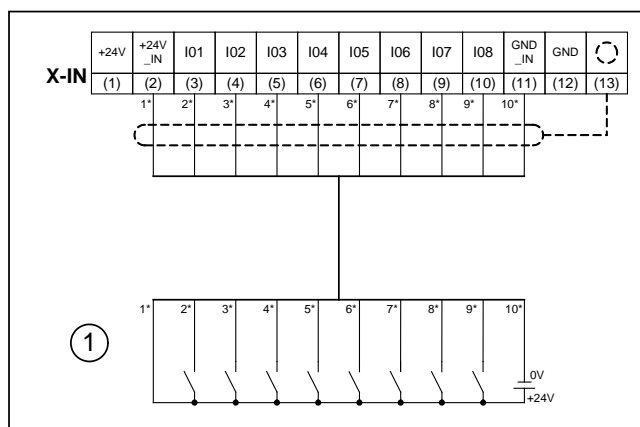
Connection of digital input with external power supply
1   Modulation
()   terminal designation of connector
*   Wire number of the pre-assembled connecting lead X-I

Information
When using the external power supply the bridges between the terminals +24V / +24V_IN and GND / GND_IN the pre-assembled control cable X-I are not required. These must be removed!

5.10.2   Connection with internal power supply
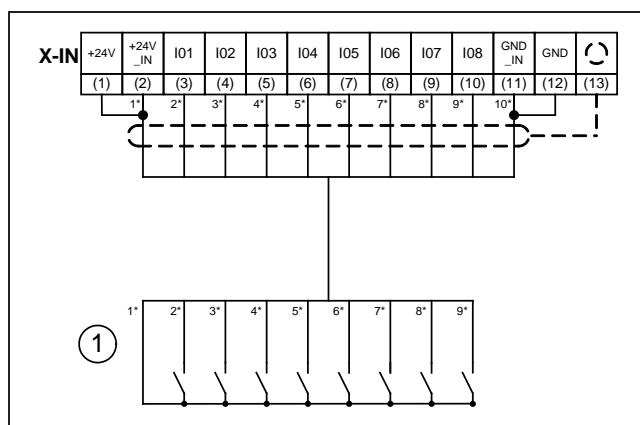
Connection of digital input with internal power supply
1   Modulation
()   terminal designation of connector
*   Wire number of the pre-assembled connecting lead X-I

Information
When using the internal power supply a bridge must be inserted between the terminals +24V / +24V_IN and between GND / GND_IN. These bridges are already integrated into the pre-assembled X-I cable.
The cable GND_IN (wire no.10) is not required. This must be removed from the connection terminal both on the converter side and the control side and insulated.

Attention!

CAUTION!

The internal 24 V power supply is provided solely for the digital inputs. Switching consumer load with this voltage is prohibited!

5.10.3   Terminal assignment X-IN

You can configure the inputs I1 … I8 assignments. The configuration can be implemented by:
- Presetting the used control system (assignment corresponding to the control requirements)
- Free configuration

Implement configuration of the digital inputs in the **Control system\CONFIG** menu.

The input assignments dependent on the configuration:

Configuration	Inputs							
	I01	I02	I03	I04	I05	I06	I07	I08
00:Free	RF*	V1*	V2*	V3*	VZ*	RV1 UP*	RV2 DOWN*	Free*
01:ZA_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	Free*
03:BP_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	Free*
08:KN_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	Free*
11:NL_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	Free*
13:SS_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	V4*
15:ZA_BIN	RF	DIR	BIN0	BIN1	BIN2	Free*	Free*	Free*
16:WL_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	Free*
21:ST_IO	RF	V1	V2	V3	VZ	RV1 UP	RV2 DOWN	Free*
24:CSILVA	RF	BIN0	BIN1	BIN2	Free*	RV2 DOWN	RV1 UP	Free*
25:S+S	SBIN2	SBIN1	SBIN0	RV1 UP	RV2 DOWN	Free*	Free*	RF
27:MAS_BIN	RF	DIR	MBIN0	MBIN1	MBIN2	BR1	BR2	Free*
30:KS_IO	RF	V1	V4	V2	VZ	RV1 UP	RV2 DOWN	V3*
31:KL_IO	V4	V1	V2	V3	VZ	RF+RV1	RF+ RV2	PA- RA2
32: S_SMART	RF	V1	LZ	V3	V5	RV1 UP	RV2 DOWN	Free*

*   *The function of the inputs can be changed*

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5.11   Digital outputs (X-OUT)

5.11.1   Digital outputs X-OUT
The connection terminal X-OUT is equipped with 5 digital outputs as zero potential relay contacts with normally open function. The functions of the outputs are pre-parameterised but can be assigned other functions by changing the parameters.

5.11.1.1   Connection X-OUT
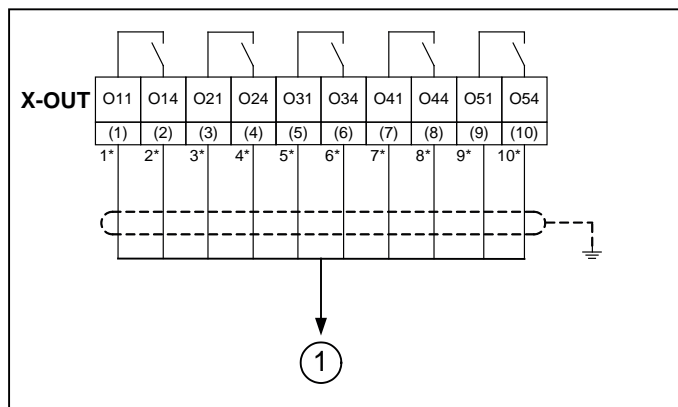
Connection of the digital outputs X-OUT
1   Modulation
()   terminal designation of connector
*   Wire number of the pre-assembled connecting lead X-O

5.11.2   Terminal assignment X-OUT
The output assignments can be configured. The configuration can be implemented by:
• Presetting the used control system (assignment corresponding to the control requirements)
• Free configuration
Implement configuration of the digital outputs in the **Control system\CONFIG** menu.
Please refer to the "Parameter list/Control menu" chapter for a description of the individual parameters

The output assignments dependent on the configuration:

Configura-tion	Outputs				
	O11 - O14	**O21 - O24**	**O31 -O34**	**O41 - O44**	**O51--54**
00:Free	Err*	MB_Brake*	MotContact*	V < V_G1*	STO-Info*
01:ZA_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
03:BP_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
08:KN_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
11:NL_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
13:SS_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
15:ZA_BIN	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
16:WL_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
21:ST_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
24:CSILVA	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
25:S+S	MotContact	MB_Brake	V=O	Fault	STO-Info
27:MAS_BIN	Fault	MB_Brake	MotContact	Off*	STO-Info
30:KS_IO	Fault	MB_Brake	MotContact	V < V_G1	STO-Info
31:KL_IO	Error	MB_Brake	MotContact	EVAC.DIR	STO-Info
32: S_SMART	Fault	MB_Brake	MotContact	SD	STO-Info

*   The function of the outputs can be changed

5.12 DCP / CAN interface (X-DCP, X-CAN)

Alternatively to the conventional wiring it is possible to activate the ZAdyn4C MRL by DCP or CANopenLift (see chapter "Serial communication").

Information
The X-DCP and X-CAN terminals are standard parts of the ZAdyn4C MRL.

5.12.1 DCP

Information
- Use a shielded cable for the connection. The shielding must be grounded on the inverter side.
- Make the connection between ZAdyn4C MRL and the control without additional terminal points.
- The maximum line length is 50 m.
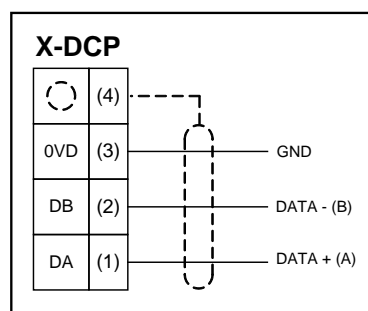
DCP connection
()   terminal designation of connector

5.13 Interface operation without contactors (X-SC)

The safety circuit must be evaluated for the "Safe Torque Off (STO)" function of the ZAdyn4C MRL. Relays K1 and K2 are activated depending on the safety circuit. The safety circuit is connected by cable L-SL-...-HX-BM/SBM-SC to terminal X-SC of the ZAdyn4C MRL.
ZIEHL-ABEGG SE offers the pre-assembled cable L-SL-...-HX-BM/SBM-SC.
See the chapter "Safe Torque Off (STO) function" in the ZAdyn4C operating instructions for further information about the STO function.

5.13.1 Terminal assignment X-SC

no.	Name	Function
3	NS	N-conductor
2	LS2	Phase safety circuit, activation K2
1	LS1	Phase safety circuit, activation K1

5.13.2 Technical data X-SC

Rated voltage	110 VAC	230 VAC
Operating voltage	94...138 VAC	184...264 VAC
Hold voltage	66 VAC	138 VAC
Drop voltage	44 VAC	72 VAC
Opening time	6 ms	

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5.13.3   Connection X-SC
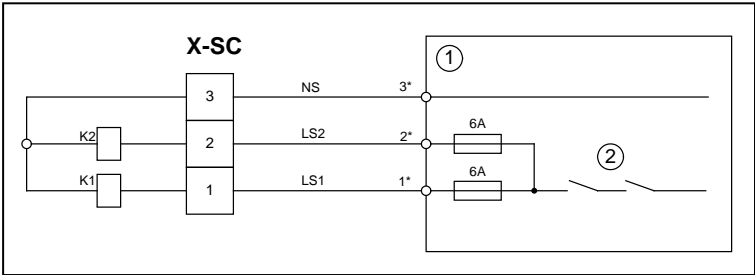
Connection X-SC
1   Modulation
2   Safety circuit
*   Wire designation of the pre-assembled cable L-SL-...-HX-BM/SBM-SC

5.14   Encoder connection synchronous motors (X-ENC15)

Information
At the X-ENC 15 connection, both incremental encoders for asynchronous motors and absolute encoders for synchronous motors can be connected.

CAUTION!

Attention!
The pin assignment of the SUB-D-socket X-ENC15 is not standardised. When using encoders from other manufacturers, make sure that these have the same contact assignment and an interface with identical specification.

CAUTION!

Attention!
Before the encoder is plugged on/connected, the encoder type and resolution used must be configured in the menus **"Encoder & BC/ENC_TYP"** and **"Encoder & BC/ENC_INC "** .

```
Encoder & BC
↳ENC_Typ TTL rect.
   ↳      TTL rect.
Encoder type
```

```
Encoder & BC
↳ENC_INC 2048
   ↳      2048
Encoder resolution
```

5.14.1   Technical data X-ENC15

Encoder types	Absolute value encoder with EnDat or SSI interface
	Absolute value encoder type ERN1387
Encoder resolution	512 ... 4096 pulse / revolution
Input resistor	120 Ω
Cut-off frequency	200 kHz
Sine differential signal (at 2.5 V off-set against GND)	0,6 Vss ... 1,2 Vss (typ. 1Vss)
Connection cable	Shielded twisted pair cable
Max. cable length	25 m

5.14.2   Pin assignment X-ENC15 for absolute value encoder with EnDat, SSI, ERN1387 and HIPER-FACE interface

1	DATA	Data line for communication with the absolute encoder
2	/DATA	Data line inverse
3	/D	Analog track D inverse
4	+5 V_E	+5/8V voltage supply (With missing encoder the power supply is switched off)
5	DGND	Ground power supply absolute encoder
6	/C	Analog track C inverse
7	B	Analog track B
8	C	Analog track C for transmitting position
9	/CLK	Clock signal invers
10	CLK	Clock signal for serial transfer
11	D	Analog track D for transmitting position
12	A	Analog track A
13	/A	Analog track A inverse
14	/B	Analog track B inverse
15	DGND	Ground power supply absolute encoder
Housing		Shielding

5.15   Artificial encoder (X-ENCO)

The encoder simulation transforms the signals of the encoder mounted on the motor into differential signals according to ANSI standard RS422 um and transmits them to the control. The resolution of the encoder simulations is identical with the resolution of the encoder.

Information
The X-ENCO connection is not a connection for the impulse encoder but an output for transsission of data to the control. The impulse encoder is connected to connections X-ENC8 or X-ENC15.

Information
As a result of the connection of an external 24 V voltage source to terminal X-EXT, the encoder simulation is active even when the ZAdyn4C MRL is switched off.

5.15.1   Connection X-ENCO
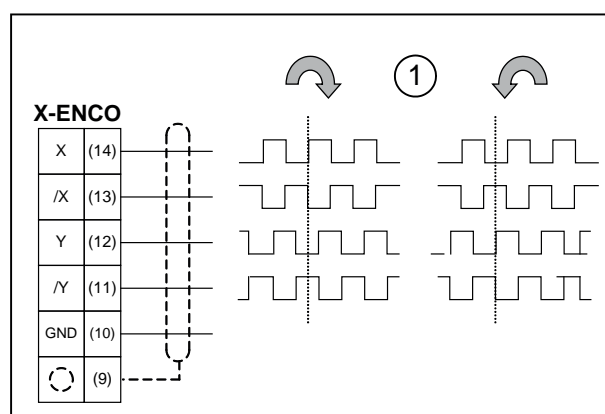
Artificial encoder connection
1   Signals depending on the rotating direction of the motor (with view to the power take-off side)
()   terminal designation of connector

5.16 External 24 V power supply (X-EXT)

By applying an external 24 V power supply to terminal X-EXT, the following functions are active even when the ZAdyn4C is switched off:

- Communication between control and ZAdyn4C MRL
- Artificial encoder
- ZETAPAD (parameter changes are possible)
- USB interface of the ZApad

5.16.1 Technical data

Voltage range	23 ... 26 V

5.16.2 Connection X-EXT

Connection external power supply
1   external power supply
()   terminal designation of connector

5.17 Brakes

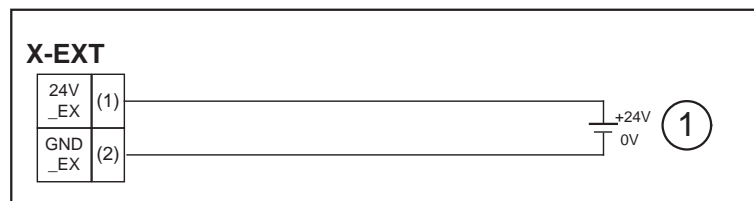#### 5.17.1 Brake release monitoring (X-BR)

Information

The brake release monitoring serves as monitoring for redundancy and the operation status of the brakes.
It is recommended to connect the brake air monitor to the ZAdyn4C MRL for optimum starting and stopping.
The monitoring conforms chapter 9.10 of EN81-1:2010 for brakes as protection for the upside traveling elevator car against overspeed.
With activated lock function the brake release monitoring fulfills the requirements for self monitoring according to chapter 9.11.3 of EN81-1:2010 for brake elements for protection against unintendend movement of the car.

Monitoring voltage	+24 VDC / 12 mA
Contact type	Normally open contact (NO) or normally closed contact (NC)
Number of inputs	4
Clamping range	max. 1,5 mm²

The contactor monitoring can be activated/deactivated in the menu **Monitoring**.

```
Monitoring
↳ BR      1*NC
  ↳       3*NC
Brake control (BR1..BR4)
```
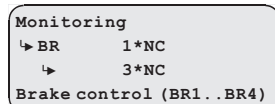
The lock function of the ZAdyn4C is engaged by activating the "LOCKBR=On" parameter in the menu **Monitoring**.

```
Monitoring
↳ LOCKBR  Off
  ↳        On
Lock inverter
```
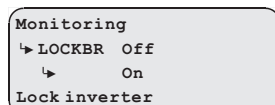
Activation of the parameter ensures that the ZAdyn4C locks upon detection of a faulty brake circuit.
The ZAdyn4C lock can only be released by setting the "Monitors / UNLOCK = On" parameter.

5.17.2 Connection X-BR
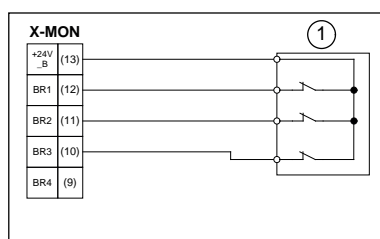
Brake release monitor connection
1   Monitoring contacts
()   terminal designation of connector

CAUTION!

Attention!
The internal 24 V power supply is provided solely for the brake release monitoring. Switching consumer load with this voltage is prohibited!

5.17.3 Triggering of the brakes
The integrated brake contactors are activated by the frequency inverter. The power supply of the brake contactors takes place on terminal X-300 (ZAdyn4C MRL AI) respectively X-K (ZAdyn4C MRL BI und ZAdyn4C MRL BE).
The signal to activate the brake contactors is switched by the digital output 021-024.

Information
To reduce noises when switching-off the brake, during normal operation the brake is switched on the alternating current side. The brakes are switched-off more slowly and thus quietly through the rectifier. To ensure instantaneous brake application in emergencies, during inspection drives and return rides, a second contactor, which disconnects the brake on the direct current side, is used.

Warning!
The power supply of the brake contactors has to be integrated in the safety circuit of the lift. If the safety circuit will be interrupted, also the power supply of the brake contactors has to be interrupted!

CAUTION!

Attention!
Brakes, which are connected to the direct current side, must be protected against excess voltage from the switching actions by using corresponding varistors! The varistor should be connected as close as possible to the brake (e.g. in the terminal box of the drive).
Due to the high operating current, master contactors must be used to switch the brakes!

5.17.3.1 Technical data brake contactors

	K3/K7* (ac side)		K4/K71* (dc side)		K140/K141* (manual brake release)
Operating voltage	88...121 VAC	220...240 VAC	92...127 VAC	184...253 VAC	20,4...26,4 VDC
Power consumption	≤ 5 W	≤ 5 W	max. 8 W	max. 8 W	max. 3,5 W
Opening time	40 ms	40 ms	19 ms	19 ms	-

* only with ZAdyn4C MRL AI

5.17.3.2 Emergency power suply

Information
If no voltage is available for opening the brake due to a fault in the power supply, an external power supply can be connected directly to terminal X-300 (ZAdyn4C MRL AI) respectively X-K (ZAdyn4C MRL BI und ZAdyn4C MRL BE) 5 for manual opening of the brakes.
This ensures fast rescue of trapped passengers in the event of a fault.

5.17.3.3 ZAdyn4C MRL AI
Activation for brakes without overexcitation
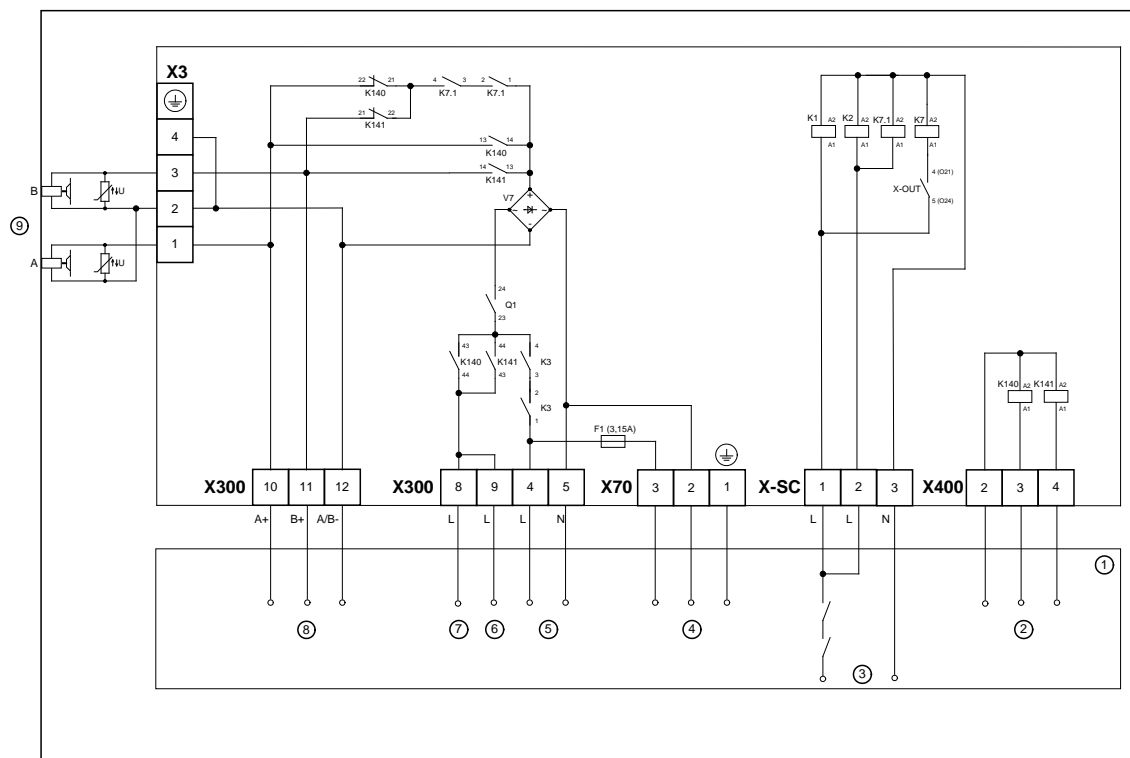
Activation for brakes ZAdyn4C MRL AI without overexcitation
1   Modulation
2   Manual brake release
3   End safety circuit
4   Input UPS
5   Power supply for the brakes with normal operation
6   Power supply for the brakes with evacuation
7   Power supply for the brakes with brake test
8   Emergency feed brake airing
9   Brake A/B

5.17.3.4 ZAdyn4C MRL BI and ZAdyn4C MRL BE
Activation for brakes without overexcitation

Activation for brakes ZAdyn4C MRL BI and ZAdyn4C MRL BE without overexcitation
1   Modulation
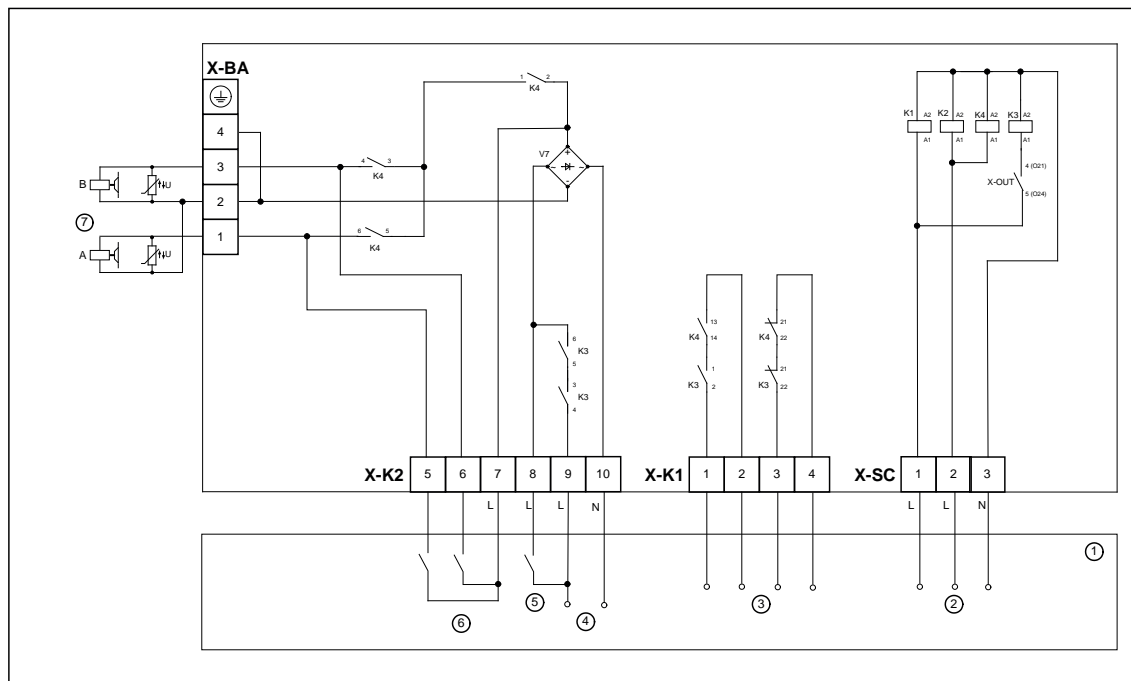2   Safety circuit
3   Monitoring brake contactors
4   Power supply brakes
5   Emergency operation two-circuit test
6   Manual release of brake A/B
7   Brake A/B

## 5.18 External monitoring functions

5.18.1 Brake contactors (ZAdyn4C MRL AI, ZAdyn4C MRL BI and ZAdyn4C MRL BE)

5.18.1.1 Technical data auxiliary contacts

Contact type	1x normally closed contact (NC)
	1x normally open contact (NO)
Min. switching capacity	5 mA / 17 VDC
Max. switching capacity	6 A / 230 VAC
	4 A / 24 VDC
Clamping range	max. 4,0 mm²

5.18.1.2 Assignment connection terminal X400 (ZAdyn4C MRL AI)
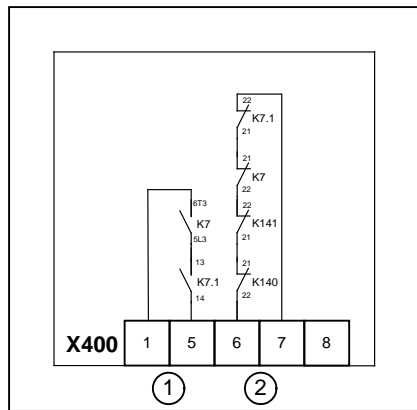
Connecting diagram contactor monitoring ZAdyn4C MRL AI
1   Monitoring brake contactors
K7   Brake contactor AC-side
K7.1   Brake contactor DC-side
2   Monitoring the standstill
K140   Contactor for manual brake release brake A
K141   Contactor for manual brake release brake B
K7   Brake contactor AC-side
K7.1   Brake contactor DC-side

5.18.1.3 Assignment connection terminal X-K (ZAdyn4C MRL Bx)
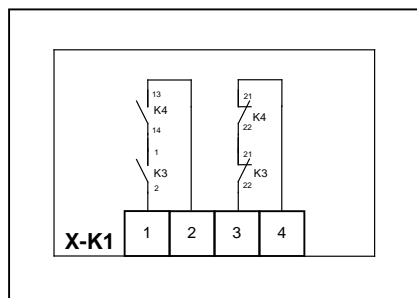
Connecting diagram contactor monitoring ZAdyn4C MRL Bx - **integrated brake contactor**
K3   Brake contactor AC-side
K4   Brake contactor DC-side

5.18.1.4 Fault and speed monitoring frequency inverter (only ZAdyn4C MRL AI)
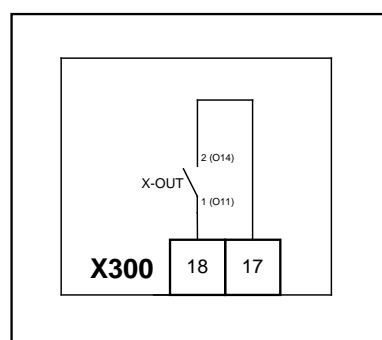
Connecting diagram fault monitoring
X-OUT   Output "Fault"
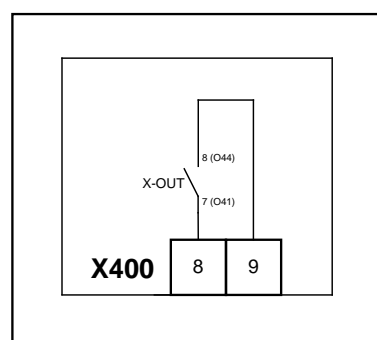
Connecting diagram speed monitoring
X-OUT   Output "V < V_G1"

5.19   Circuit suggestion for ZAdyn4CS MRL

Circuit suggestion for ZAdyn4C MRL AI

ZD4C10K1
Index 03, 11.06.18
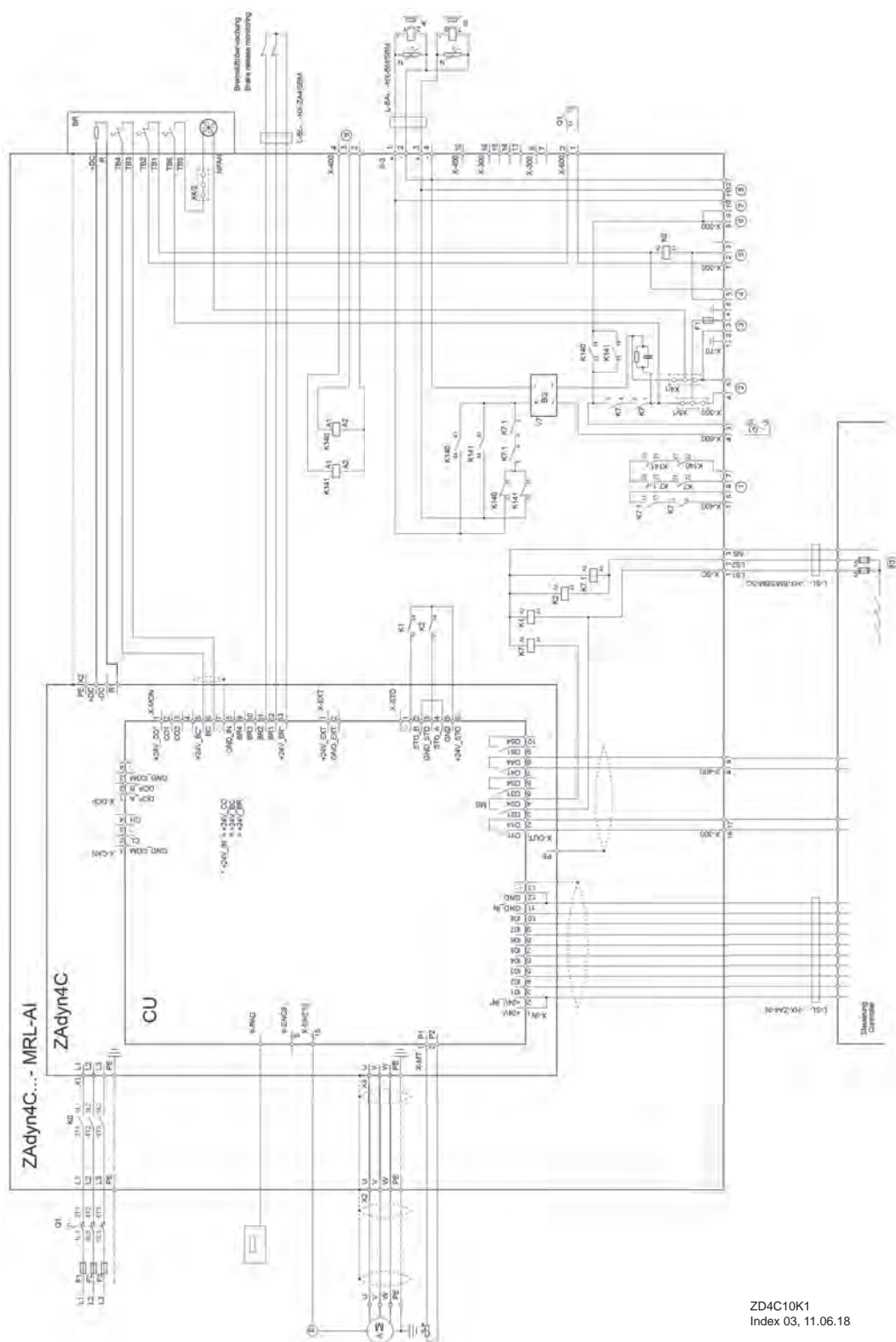
ZD4C10K1

1   Monitoring brake contactors
2   Power supply brakes
3   Power supply by UPS
4   Power supply by UPS
5   Remote
6   Power supply brake for brake test
7   Power supply brake for evacuation
8   Emergency feed brake airing
9   Manual brake release
10   Control STO-relay, end safety circuit

Circuit suggestion ZAdyn4C MRL Bx with integrated brake activation with bridge rectifiers

ZD4C10K2
Index 03, 11.06.18
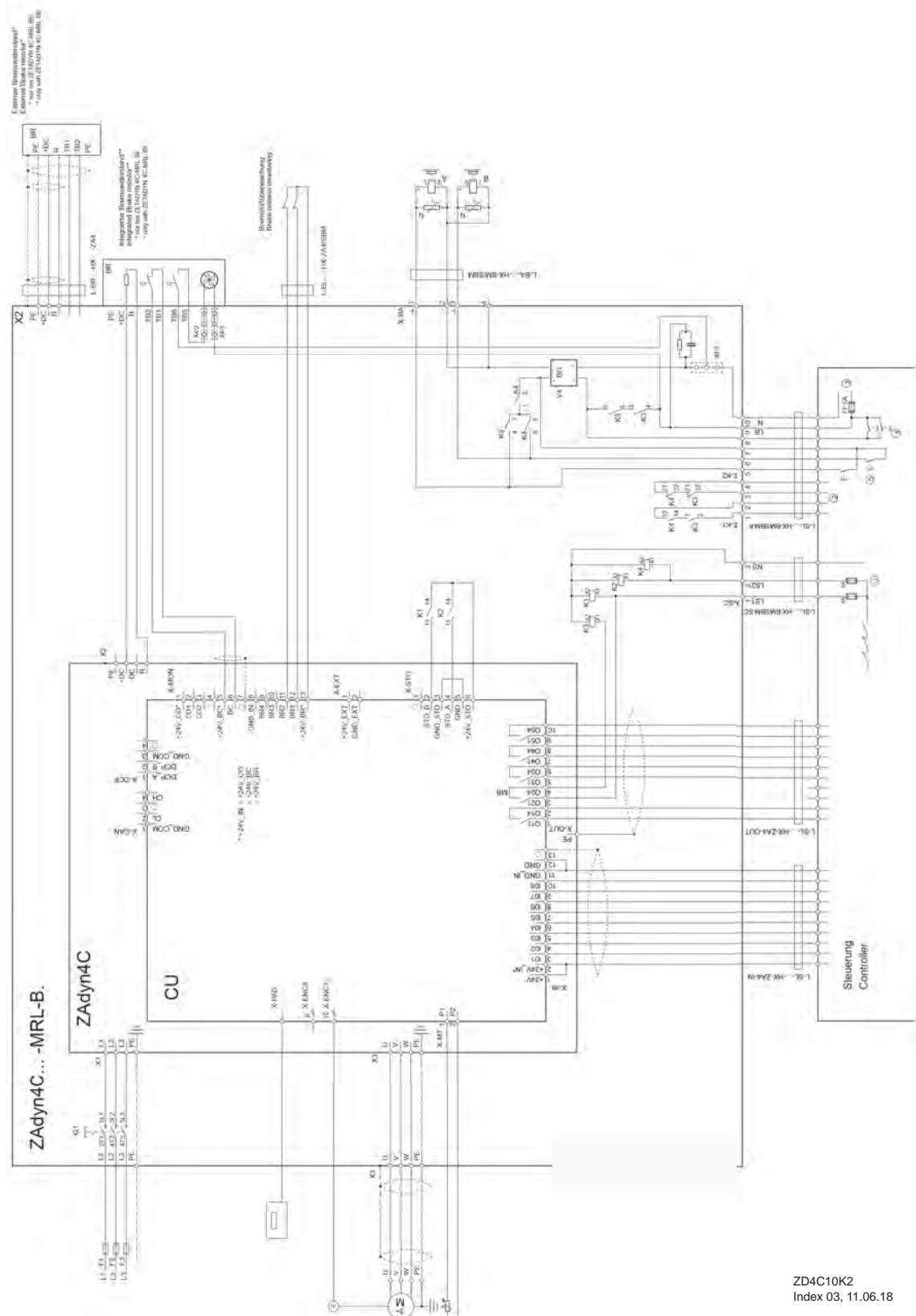
ZD4C10K2

1 Control STO-relay, end safety circuit
2 Monitoring brake contactors
3 Power supply brake
4 Pushbutton fort two-circuit test/emergency operation
5 Manual brake release

Circuit suggestion ZAdyn4C MRL Bx without integrated brake activation

ZD4C10K3
Index 03, 11.06.18
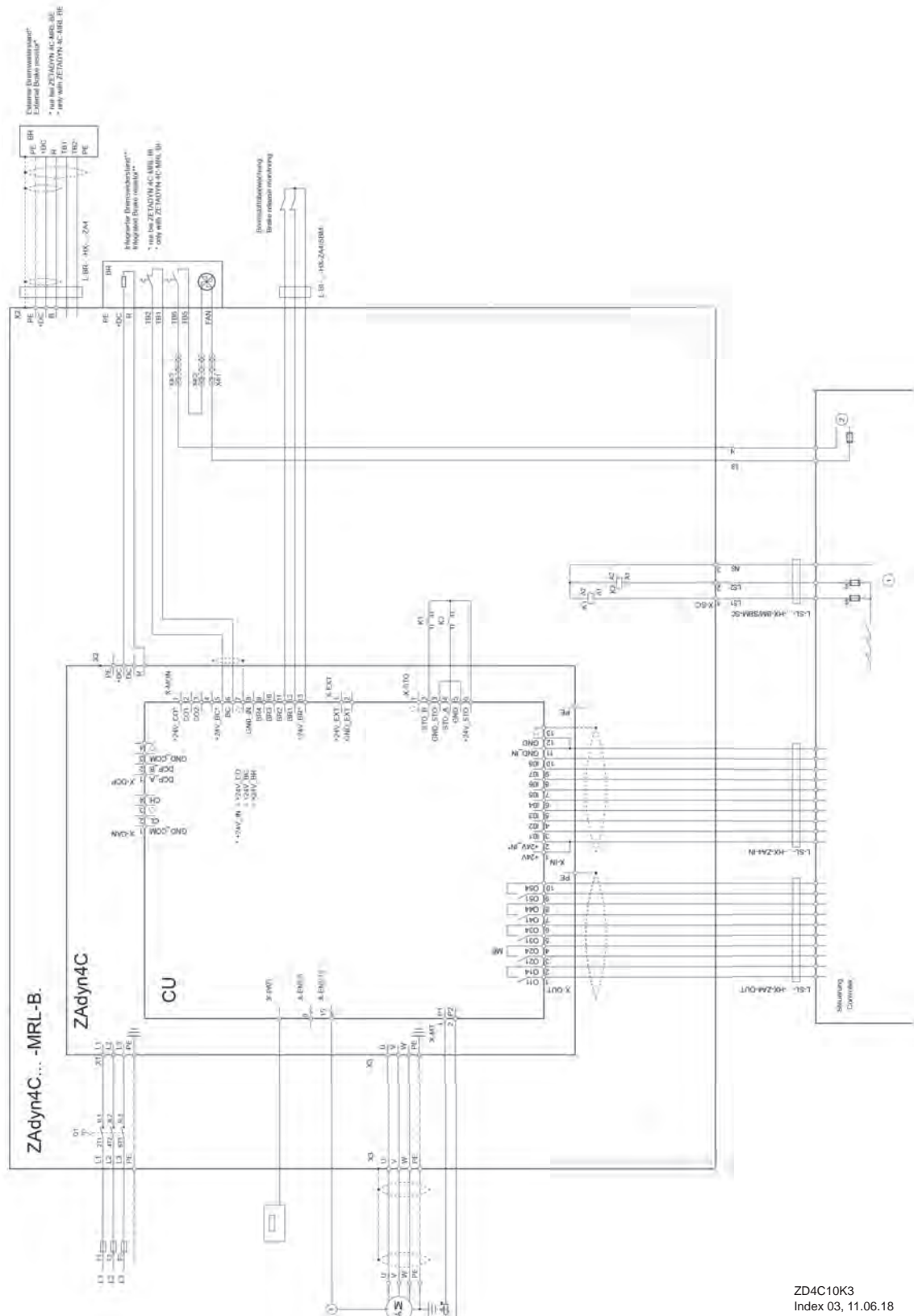
ZD4C10K3
1   *Control STO-relay, end safety circuit*
2   *Voltage supply Fan 230 VAC ***

* In the ZAdyn4C MRL without integrated brake activation, the power supply of the brake is not connected to the ZAdyn. Therefore, a separate power supply of the fan is necessary. Connect the power supply to the connection terminals X4/1 and X4/3.

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Circuit suggestion ZAdyn4C MRL Bx with integrated brake activation with fast acting rectifiers

ZD4C10K6
Index 03, 01.02.19
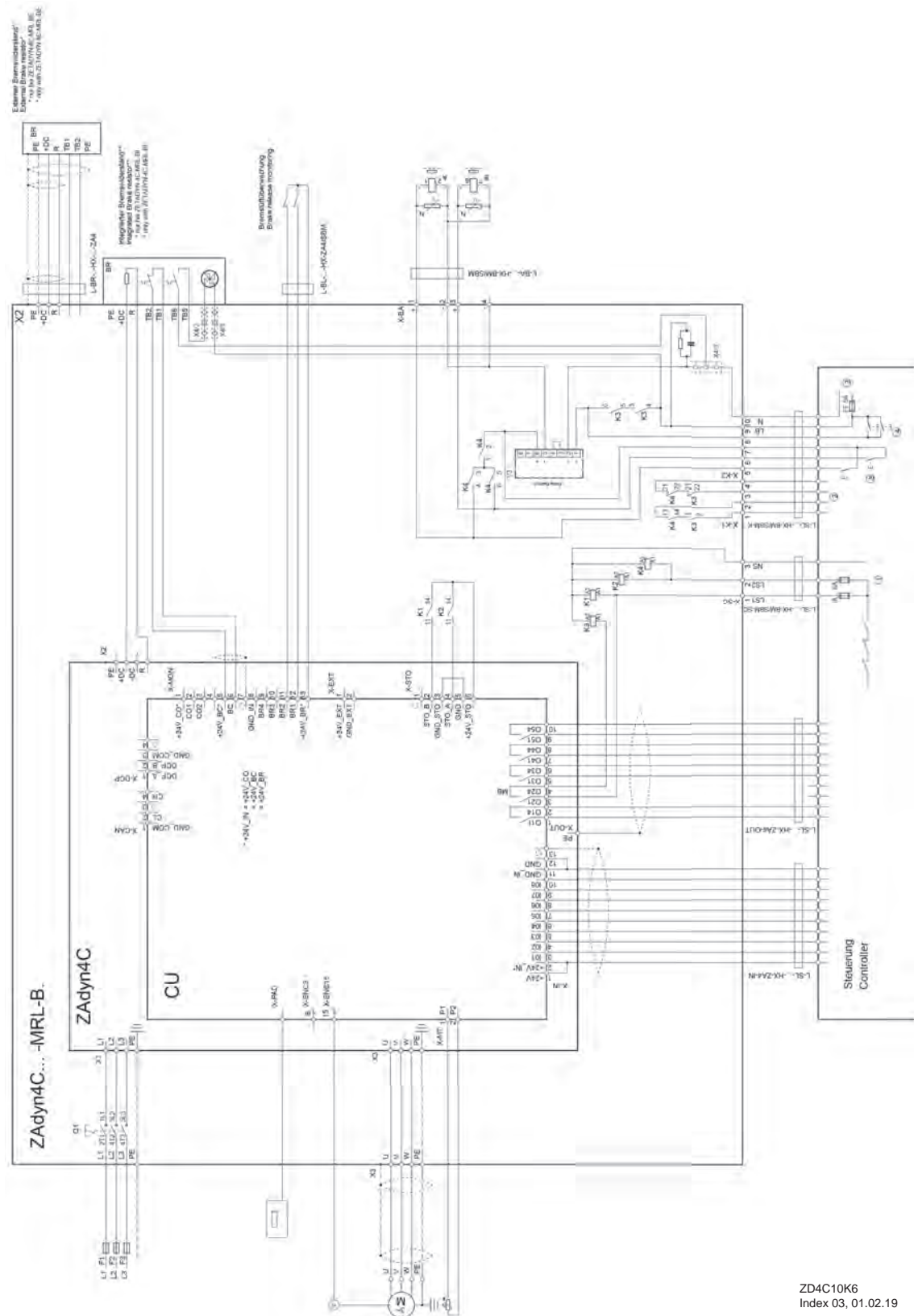
ZD4C10K6
1   *Control STO-relay, end safety circuit*
2   *Monitoring brake contactors*
3   *Power supply brake*
4   *Pushbutton fort two-circuit test/emergency operation*
5   *Manual brake release*

6 Device switch Q1 (only for ZAdyn4C MRL AI, optional)

6.1 Mechanical installation

▷ Remove the cover of the metal housing of the ZAdyn4C MRL. Loosen the four screws (1) on the front to do so.

▷ Remove the cover of the device switch Q1. Loosen the two screws to do so.
▷ Screw the device switch (4) onto the mounting surface (2) of the fastening plate with 2 fastening screws (3).
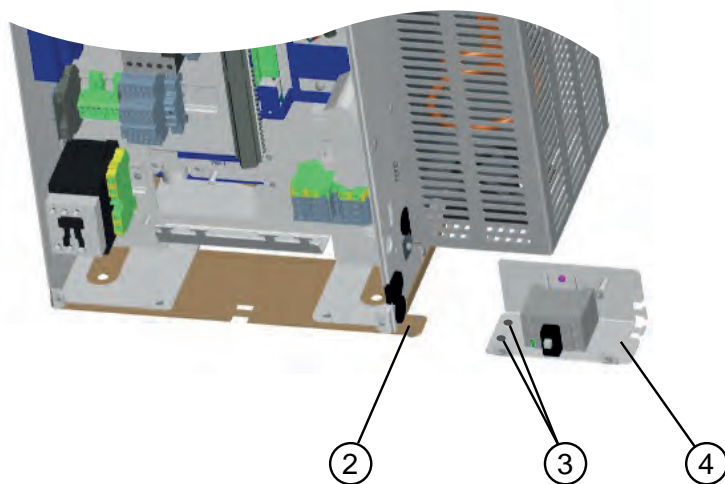
▷ Perform the electrical installation of the device switch (see chapter "Device switch Q1/Electrical installation").
▷ Refit and screw on the cover of the device switch.

6.2 Electrical installation
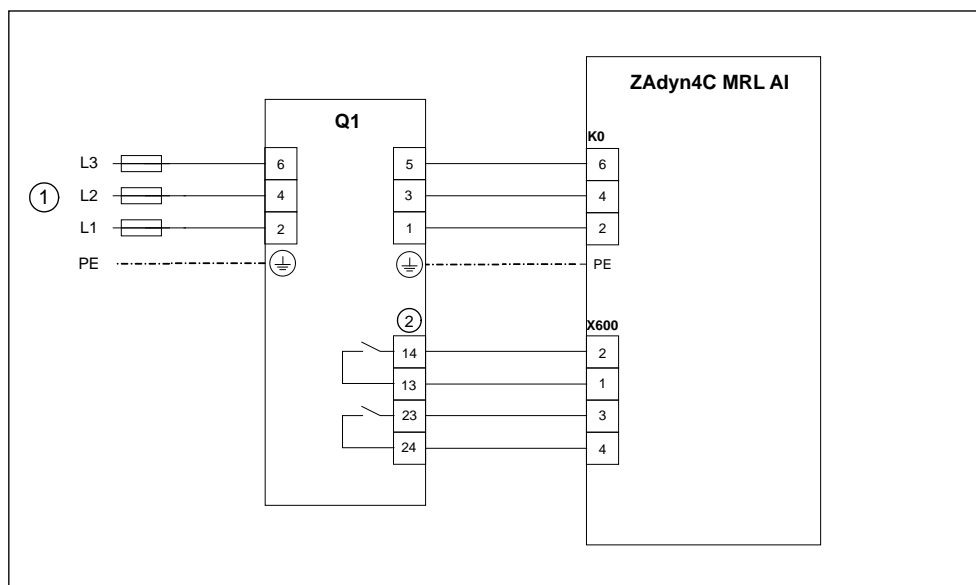
Device switch connection
1   Mains 3~ 400V/PE/50Hz
2   auxiliary contacts

7   Start-up

7.1 Testing the "Safe Torque Off (STO)" safety function
In the course of start-up and maintenance, the "Safe Torque Off (STO)" function must be tested as a safety function test.

Danger!
To prevent unintentional movement of the lift car, the fuse for the brakes supply must be removed for tests which are conducted with the drive at a standstill. In the MRL devices, the contactors for the brakes are activated by the STO coupling relay supply; the brakes could open unintentionally.

The procedure for testing the "Safe Torque Off (STO)" function is described in the chapter "Testing the "Safe Torque Off (STO)" function" of the ZAdyn4C operating instructions.

In the ZAdyn4C MRL the relay contacts of the coupling relay for STO activation are not accessible because the control unit is usually installed in the lift shaft. The coupling relays used for activation are activated separately. The described tests must be performed by suitable activation of the relays.

8 Enclosure

8.1 Technical data ZAdyn4C MRL

8.1.1 ZAdyn4C 011 - 032 MRL

		ZAdyn				
		4CS011-MRL-AI/BI/BE	4CS013-MRL-AI/BI/BE	4CS017-MRL-AI/BI/BE	4CS023-MRL-AI/BI/BE	4CS032-MRL-AI/BI/BE
Electrical data						
Mains connection voltage	[V]	3~180 ... 440 absolut				
Mains frequency	[Hz]	50 / 60 (±1,5 Hz)				
Typ. motor output (400 V)	[kW]	4.6	5.5	7.5	11	14
Duty cycle at rated current and clock frequency 8 kHz	[%]	60				
Rated current for 60% duty ratio and clock frequency 8 kHz fix	[A]	11	13	17	23	32
Nominal current for 60% switch-on duration and switching frequency 12 kHz fix[1]	[A]	9	11	15	20	27
Nominal current for 60% switch-on duration and switching frequency 16 kHz fix[1]	[A]	8	10	13	17	23
Max. operating current (for max. 3 s)	[A]	20	24	31	42	58
Power loss at rated current, clock frequency 8 kHz and duty ratio of 60 %	[W]	193	204	242	309	424
Power loss at rated current, clock frequency 16 kHz and duty ratio of 60%	[W]	298	326	373	475	612
Heat dissipation standstill 4CS	[W]	max. 12				
Heat dissipation stand-by 1 4CS	[W]	max. 12				
Heat dissipation stand-by 2 4CS	[W]	max. 12				
Switching frequency	[kHz]	4 ... 16				
Brake contactor power loss	[W]	max. 12				
Motor frequency	[Hz]	max. 200				
Max. terminal cross-section line/motor/brake chopper/brake resistor	[mm^2]	16				
Min. cable cross-section Brake-Chopper / Brake-Resistor	[mm^2]	11	11	11	11	14
Min. cable cross-section Motor	[mm^2]	11	11	11	11	14
Ambient conditions						
The user must ensure that the specified ambient conditions are observed.						
Protection rating		IP20				
Ambient temperature for operation	[°C]	0 ... 45, from 40 °C power reduction by1.66% per 1 k temperature increase				
Relative humidity	[%]	90 / condensation prohibited				
Installation height	[m über NN]	bis 2000, ab 1000 m Leistungsreduzierung um 1% pro 100 m				
Storage and shipping temperature	[°C]					
Degree of soiling (in acc. with DIN EN 61800-5-1)		2				
Physical data						
Weight ZAdyn4CS MRL AI	[kg]	23.9	24.7	25,1	26.2	28.5
Weight ZAdyn4CS MRL BI	[kg]	23.1	23.9	24.3	25.4	27.7
Weight ZAdyn4CS MRL BE	[kg]	20.9	21.7	22.1	23.2	25.5
Dimensions h x w x d	[mm]	429 x 300 x 191				

[1] *with a variable switching frequency (**power component/M_PWM=AUTO** menu), there is no reduction in power*

8.2 EC/EU declaration of conformity

<div style="text-align: right;">
- Translation -
(english)
A-KON16_06-GB
1741 Index 003
</div>

Manufacturer: **ZIEHL-ABEGG SE**
Heinz-Ziehl-Straße
74653 Künzelsau
Germany

        The manufacturer shall bear sole responsibility for issuing this EC/EU declaration of conformity.

Product description: Control devices ZAdyn/ZETADYN for elevator machines

        Frequency inverters with a safe torque off (STO) function according to
the Machinery directive 2006/42/EC, Annex IV, Nr. 21.

Type: ZAdyn4CA...
ZAdyn4CS...
ZETADYN 4CA...
ZETADYN 4CS...
ZAdynpro...

        (The type details contain further additions concerning the version, e.g. ZAdyn4CA 018 HY)

Serial number   from
30284129/0001

The above mentioned products of this declaration fulfil all relevant provisions of the following Directives of the Union:

        Machinery directive 2006/42/EC

        EMC Directive 2014/30/EU

Because of the accordance with the Machinery directive, the protection targets of the Low voltage directive 2014/35/EU are also fulfilled.

The following harmonised standards have been used:

EN 61800-5-1:2007	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

IEC 61800-5-2:2016	Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional
EN 62061:2005 + A1:2013	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
EN ISO 13849-1:2008 + AC:2009	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN ISO 13849-2:2012	Safety of machinery - Safety-related parts of control systems - Part 2: Validation
EN 61800-3:2004 + A1:2012	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
EN 12015:2014	Electromagnetic compatibility- Productfamily standard for lifts, escalators and moving walks - Emission
EN 12016:2013	Electromagnetic compatibility- Productfamily standard for lifts, escalators and moving walks - Immunity

The EG type-examination procedures referred to in the enclosure IX of the Machinery directive 2006/42/EC was carried out by TÜV Rheinland and certified by the type-examination certificate 01/205/5288.01/17

The identification number / address of the notified body is:
NB 0035
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This declaration relates exclusively to the product in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

The authorised representative for the assembly of the technical file is:
Mr. Roland Hoppenstedt (see above for address).

Künzelsau, 10.10.2017
(place and date of issue)

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