

Braking Devices
VB 230/400 - 36
Assembly- and Commissioning Instructions



as per 09/14 11900.10006

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These commissioning instructions were prepared with great care. Nevertheless, PETER electronic GmbH & Co. KG does not assume liability for damage resulting from mistakes possibly contained in this manual. Technical changes that serve to improve the product are subject to change without notice.

Notes and symbols used in these instructions

Note: Notes explain the advantages of certain adjustments or settings and help you to make use of the device in the best possible way.



Warning notices: Read them carefully and follow them strictly!

Warning notices are indicated in order to protect you against danger or to help you to prevent the device from being damaged.



Caution: Danger to life through electric shock!

When you see this sign, always make sure that the device is de-energized and secured against unintentional energizing.

1. Safety notes



The described devices are electrical equipment for use in industrial electrical power installations. An impermissible removal of the covers during operation can cause serious damage to your health, since these devices contain live parts with high voltages.

Adjustment work may only be performed by trained staff observing the safety regulations. Assembly and mounting work may only be carried out with the equipment deenergized.

Make sure that all drive components are properly earthed.

Please read these commissioning instructions carefully before putting the device into operation.

Besides, the user must ensure that the devices and associated components are fitted and connected in accordance with the applicable local, legal and technical regulations. The VDE-regulations VDE 0100, VDE 0110 (EN 60664), VDE 0160 (EN 50178) , VDE 0113 (EN 60204, EN 61310), VDE 0660 (EN 50274) plus the appropriate regulations of the TÜV (Technical Control Association) and the trade associations apply in Germany.

The user must ensure that the drive turns into a safe operating state following a device failure, in the event of maloperation, or if the control unit has failed etc..

Caution: Even if the motor is at rest, it is **not** physically separated from the mains.

2. Conformity

In industrial linguistic usage the electronic brakes of the type series VersiBrake... are called "devices", however, in the sense of the "device-safety-law", the "EMC-law" or the "EC machinery directive" they are not devices or machines ready for use or connection but they are components. It is only possible to define their final function, when these components are integrated into the design and construction of the user.

To be able to use the devices to their intended purpose, it requires power supply networks according to DIN EN 50160 (IEC38).

The user takes the responsibility that the user's design and construction comply with the applicable legal provision.

The commissioning is strictly forbidden as long as the conformity of the final product with the guidelines 2006/42/EC (Machinery directive) and 2006/95/EC (Low voltage directive) is not proved.

3. General description

The electronic braking devices of the VersiBrake type enable a non-wearing braking of three-phase and a.c. asynchronous motors. The braking devices are used for drives that due to safety and functional reasons have to be reliably slowed down. After the motor has come to a standstill, an integrated standstill detection switches the braking current off. A potential-free relay contact indicates if the motor has not come to a standstill within the maximum braking time.

Special features

- controlled by microcontroller
- wear-resistant and maintenance-free
- retrofitting into existing plants possible
- also available for special voltages
- for all asynchronous motors
- automatic remanence time optimization
- overcurrent detection
- start-delta starting control with option „D“
- wide-voltage-range-capable with option „B“

4. Usage to the intended purpose

The devices of the VersiBrake series are electrical equipment that is used in industrial electrical power installations. They are designed for the application in machines, in order to slow down rotating masses on drives with three-phase induction motors.

Typical applications

- sawing machines
 - centrifuges
 - wood working machines
 - conveying machines
 - textile machinery
-

5. EC Declaration of Conformity

EC Declaration of Conformity 

The manufacturer / company placing the product on the market
(authorized representatives of the manufacturer / companies placing the product on the market
that are established within the Community)

Name / Address: Peter Electronic GmbH & Co.KG
Bruckäcker 9
92348 Berg

hereby declares that the following product (device, component, unit) in the version as supplied

Product designation: Braking device
Series / type designation: VB ... - 36 ..
Article number: 219..., 252..., 298...
Year of manufacture: 2002

complies with the provisions of the following EC-directives:

- 2004/108/EC** Electromagnetic compatibility
- 2006/95/EC** Electrical equipment designed for use within certain voltage limits
- 2011/65/EC** The restriction of the use of certain hazardous substances in electrical and electronic equipment

The following harmonized standards have been applied:

- EN 60947-1:2007+A1:2012** Low-voltage switchgear and controlgear General rules
- EN 60947-4-2:2012** Low-voltage switchgear and controlgear
Contactors and motor-starters - AC semiconductor motor
controllers and starters

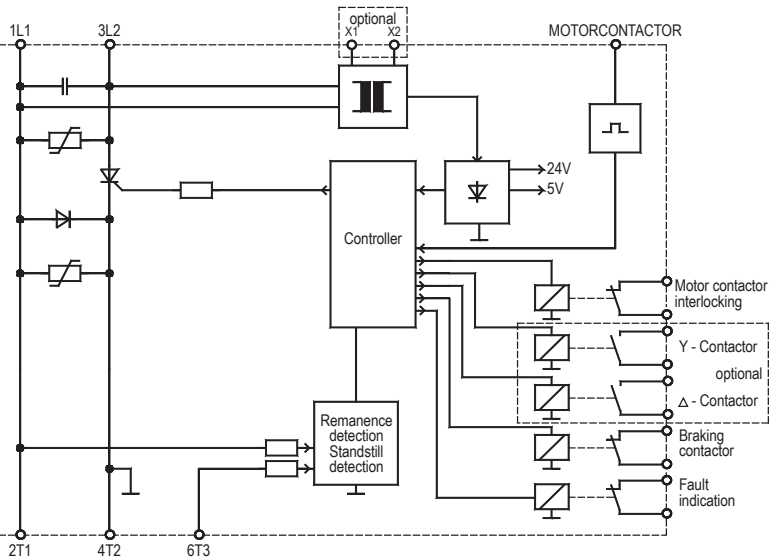
This EC Declaration of Conformity is no longer valid, if the product is modified or changed
without our agreement.

This declaration is issued under the sole responsibility of the signatory.

Berg, 18.07.2013 Dr. Thomas Stiller, Managing director
(place, date) (signatory and function of the signatory)


(signature)

6. Block diagram



7. Functional description (see connection diagram)

After switching on the operating voltage on 1L1 and 3L2, the main contactor interlock X5, X6 (lock) and the fault signaling contact X7, X8 (alarm) close. The motor can be started.

A starting logic makes sure that braking is not yet initiated when the plant is switched on with the master switch while the motor is still switched off.

The fully automatic run of the braking interval starts with the switch-off of the motor contactor which at the same time closes the contact X3, X4 (start). In the case of very dirty or corroded control contacts, it may happen that the current of 10mA required for starting cannot flow via the contacts X3 and X4, as a result of which a braking operation is not started either. In such cases, it is necessary either to change the control contact or to connect a relay as a link between the control contact of the motor contactor and the starting contacts X3 and X4. During braking, the main contactor is interlocked via the contact X5, X6 (lock). After a delay time which, dependent on the amount of the remanent voltage of the motor, optimizes itself, the braking relay pulls in. Then an adjustable d.c. voltage is applied to the motor winding. The magnetic field resulting from this has a braking effect on the still rotating rotor. The d.c. voltage is generated by a thyristor phase control. Special circuits protect the power semiconductors against overvoltage. With the potentiometer "I" the braking torque can be adjusted in wide ranges. Experience shows that a braking current 2.5 times as high as the rated motor current has a good braking effect.

Adjustments exceeding the rated motor current are indicated by a flashing „ready“-LED.

Approx. 1.5s after a motor standstill has been detected, the integrated standstill detection function switches the braking current off.

If during the maximum braking time (15s in the case of standard devices) no motor standstill is detected, the fault signaling contact on the terminals X7, X8 (alarm) opens. When restarting the motor, the signaling contact will be reset.



Warning note:

In the case of some motor types no standstill will be detected if the braking current exceeds four times the amount of the rated motor current. In this case it is possible that a very high braking current flows over the maximum braking time. Therefore, in order to protect the motor and the braking electronics, it is absolutely necessary to check the braking current with a true r.s.m. measuring instrument when putting the device into operation. In this case, simple multimeters and clamp-on probes give wrong measurements, since they are only suitable for pure sine-wave forms and not for phase control.

Note: If, due to the fact that heavy rotating masses are to be slowed down, the braking time at rated device current is still too long, a device of the next higher performance category is to be used.

7.1 LED indicators

LED – ready - illuminated - flashing	Mains voltage is applied, braking device is ready. Braking current is higher than rated device current.
LED – I - illuminated	Braking current flows.

7.2 Fault signaling relay

The following states on the fault signaling contact (terminal X7, X8) are possible:

No voltage applied to VersiBrake	Contact X7, X8 open
Voltage applied to VersiBrake, no fault	Contact X7, X8 closed
Overtemperature	Contact X7, X8 open
No standstill during monitoring time	Contact X7, X8 open ¹⁾

¹⁾ Contact closes at motor restart.

8. Control inputs and outputs

8.1 Control inputs

Control terminals	Designation	Description
X3, X4	Starting contact	Connection of a break contact of the motor contactor



Caution: Danger to life through electric shock!

The terminals X3 and X4 carry mains potential. If a switch or contactor is connected to these terminals, it must have a test voltage of 2.5kV.

8.2 Control outputs

Control terminals	Designation	Description
X5, X6	Interlock	The interlock prevents the motor from being switched on during braking. Loop the normally closed contact into the branch of the motor contactor.
X7, X8	Fault signal	In the case of a fault this fault signaling contact opens. For closer details on the tripping characteristics please see chapter 5., page 6.
X16, X17	Braking contactor control	The VB ...-36 requires a braking contactor. As for the connection of this contact, please refer to the connection diagram, chapter 13.1 or 13.2.

8.3 Control outputs – optional

Control terminals	Designation	Description
X12, X11	Y - contactor	Control contact for the star contactor. For closer details please refer to chapter 8.2.
X12, X13	Δ - contactor	Control contact for the delta contactor. For closer details please refer to chapter 8.2.

9. Potentiometers

„I“ **Adjusting the braking current.**

10. Options

For special applications there are various options in order to extend the functionality of Versi-Brake-devices.

The following is available: Wide-voltage range 200-575V (480V) - Option „B“
 Star-delta starting control - Option „D“

10.1 Option „B“ – Wide-voltage-range-capable

With this option it is possible to use the VersiBrake–devices within a mains voltage range from 200 to 575V (UL-certificated devices: 200...480V).

This requires a AC-control voltage that is to be connected to the terminals X1, X2. The height of the control voltage is on the nameplate and on the terminals (24VAC, 110VAC, 230VAC).

Note! In the case of standard devices these options are not available, even if the terminals are there.

The required options have to be expressly ordered.

10.2 Option „D“ – Star-delta starting

If start-delta starting is requested, it is possible with this option to control the power contactors.

In this case, a normally closed contact of the mains contactor is connected to X3, X4 (start) (see connection diagram with options).

The closing of the mains contactor starts the following sequence:

1. The potential-free contact X11, X12 will be closed (control of the star contactor).
2. After a period of 6s X11, X12 will be opened
3. After a delay of 60ms the potential-free contact X12, X13 will be closed (control of the delta contactor).

The opening of the mains contactor starts the following sequence:

1. The contact X12, X13 will be opened (delta contactor will be switched off).
2. After the drop of the remanent voltage, X11, X12 will be closed (control of the star contactor).
3. When the contact bounce time is over, the braking current will flow for approx. 1.5s after the motor standstill.

Note: To ensure that, in the case of external star.delta control, the starting operation is not influenced by the VersiBrake, a break contact of the motor contactor K1 has to be connected in series before the terminals X11 and X12.

11. Technical data

Type designation VB	230-36 400-36
Mains voltage according to DIN EN 50160 (IEC 38)	220/240V $\pm 10\%$ 50/60Hz (standard) 380/415V $\pm 10\%$ 50/60Hz (standard) 200 - 575V $\pm 10\%$ 50/60Hz (wide-voltage range)
Power draw of the electronics	6 VA
Recommended for rated motor currents up to	15A
Rated device current	36A
c.d.f. at max. braking current	5%
I ² t - Value power semiconductor	1050 A ² s
Braking voltage	0 ... 130VDC at 220/240V (standard) 0 ... 220VDC at 380/415V (standard) 0 ... 310VDC (wide-voltage range) (575V)
max. Braking time	15s (other times upon request)
Contact rating of the output relays	6A/250V AC
Delay time for reduction of residual e.m.f.	self-optimizing (100 ... 2500ms)
max. Cross-sectional area / connecting cable	2 x 2,5mm ² per terminal
Tightening torque	max. 0.8Nm

11.1 Ambient conditions

Storage temperature	-25 ... 75°C
Operating temperature	0 ... 45°C
Degree of protection	IP 20
Environment	Overvoltage category III, pollution degree 2

12. Commissioning

The device is to be put into operation in 3 steps:

1. Mounting
2. Connection and
3. Parameter setting

12.1 Mounting instructions



Caution: Danger to life through electric shock!

The following conditions are to be complied with in order to ensure a safe and reliable operation of the VersiBrake:

1. The device series VersiBrake is to be used under overvoltage conditions of the category III.
2. Make sure that pollution degree 2 or better, in accordance with IEC664, is complied with.
3. The device is to be installed into a housing (min. degree of protection: IP54).
4. The device must be operated without being exposed to contamination by water, oil, carbon deposits, dust, etc.
5. Insert in North America, UL and CSA-listed.
- 5.1 „Suitable For Use On A Circuit Capable Of Delivering Not More Than 5kA rms Symmetrical Amperes, 480 Volts Maximum.“
- 5.2 „Use Copper Conductors 60/75°C or 75°C only.“



Warning:

Make sure that a minimum distance to adjoining devices is kept. Above and underneath the housing a minimum distance of 50mm is to be kept.

12.2 Connection

The braking device is to be installed according to the attached connection diagram. For other connections please consult Peter electronic GmbH & Co. KG.

Note: Further connection proposals for special circuit arrangements are available via our homepage at www.peter-electronic.com.

Note: Prior to putting the motor brake into operation, the wiring has to be checked.

To ensure a reliable functioning it is important to keep to the interlocking conditions:

1. To initiate braking, a potential-free normally closed contact of the main contactor is necessary, i.e., when the motor contactor is dropped out, the terminals X3, X4 (start) of the braking device are connected.
 2. The interlocking contact of the braking device (terminals X5, X6 (lock)) has to be looped into the control circuit of the motor contactor, so that the motor contactor **cannot** pull in during braking.
 3. The braking contactor and the motor contactor are to be interlocked against each other (electrical interlock with normally closed contact)
-

12.3 Parameter settings

Sequence of commissioning:

1. Disconnect the plant from the supply mains.
2. Connect the current measuring instrument between the braking device, terminal „2T1“, and the motor terminal „U“.
3. Turn the potentiometer "I" to a position in the first third of the adjustment range (factory setting). (Please see chapter 7, page 8.)
4. Switch on the plant.
5. Initiate braking by switching the motor contactor ON and OFF.

Note: The adjustment of the braking current requires a moving-iron instrument. Clamp-on probes or digital multimeters may only be used if they can measure the true r.m.s..

Adjusting the braking current

The braking current is to be adjusted to a value as small as possible, in order to avoid unnecessary heating of the power semiconductors and the motor. This is especially important in the case of frequent operation. We recommend to limit the maximum braking current to 2.5 times the rated motor current.

The requested braking torque is to be adjusted with the potentiometer "I". It is important that the braking current does not exceed the rated device current which is indicated on the nameplate of the device.

A braking current higher than the rated device current causes a flashing „ready“-LED. In this case, the potentiometer „I“ has to be turned back to a position where the flashing goes over into a steady light.



Attention:

When the „ready“-LED is flashing, the current flowing in the device is approx. 1.3 times as high as the rated device current. Operating the device with the LED flashing and utilizing the permissible braking frequency will cause that the braking device is overloaded and consequently destroyed.

Adjusting the braking time

An adjustment is not necessary, since 1.5s after the motor has come to a standstill the braking current will be automatically switched off.

If during the maximum braking time (15s in the case of standard devices) no standstill is detected, the braking current will be switched off after this time. This case will be indicated by an opening of the potential-free contact (X7, X8).

Note! All data sheets and commissioning instructions are available on our homepage at www.peter-electronic.com.

13. Dimensioning rules

13.1 Dimensioning of braking contactors

The braking contactor is switched on or off via a control contact of the braking device (no-load switching).

When selecting the braking contactor, it must be ensured that the contacts are able to carry the maximally occurring braking current (nominal/rated device current). Therefore, the value „conventional thermal current“ (I_{th}) is decisive when selecting the braking contactor.

If this value is not indicated, the rated operational current for AC1-operation may be used instead.

Tip: By connecting contacts in parallel it is often possible to use a lower-priced contactor of a smaller design.

13.2 Dimensioning of pre-fuses

Basically, two types of fuse protection are available for the user.

1. Fusing according to allocation type „1“, DIN EN 60947-4-2.
After a short circuit, the braking device is allowed to be inoperative.
2. Fusing according to allocation type „2“, DIN EN 60947-4-2.
After a short circuit, the braking device must be suitable for further use. However, there is the danger that the contacts of the braking relay (braking contactor) weld. Therefore, if possible, these contacts are to be checked prior to applying again mains voltage to the device. If this check cannot be carried out by the user, the device has to be returned to the producer in order to have it checked.

The following dimensioning information refers to the below operating conditions:

- Use of standard asynchronous motors
 - Braking time not exceeding 20s, for braking devices up to 36A.
 - Braking time not exceeding 40s, for braking devices from 40A up.
 - Braking current not exceeding $2,5 \times I_{NOM}$ of the motor.
 - Cyclic duration factor (c.d.f.) not exceeding the value indicated in the data sheet.
-

Fusing according to allocation type „1“:

As pre-fuses, we recommend to use line protection fuses (utilization category gL) or automatic circuit breakers with tripping characteristic B, C, D or K.

Taking into account the maximum braking currents that occur (normally the rated device current), we recommend fuses according to table 2, column 3.

Note: Wiring cross-sectional area according to DIN VDE 0100-430,
DIN EN 57100-430.

Fusing according to allocation type „2“:

The power semiconductors are to be protected by fuses of the utilization category gR (semiconductor fuses, high-speed fuses). However, since these fuses do not ensure line protection, it is necessary to use additionally line protection fuses (utilization category gL).

As for the dimensioning of the line protection fuse (gL), please refer to table 2, column 3.

To protect the semiconductors it is necessary to select gR-fuses featuring cutoff- I^2t -values of the ranges indicated in table 2, column 4. In this connection, the fuse rating of the selected fuse should not be smaller than the braking current to be expected (rated device current).

Note 1: On the basis of the recommended I^2t -value, braking current, and possibly the c.d.f., the fuse supplier is able to select a suitable type. Due to the great variety of producers, sizes, and types, PETER electronic does not recommend any particular fuses.

Note 2: If the fuse or cutoff- I^2t -value is selected too small, it may happen that the semiconductor fuse reacts during braking.

Column 1	Column 2	Column 3	Column 4
max. Braking current / Rated device current	Device type	Fuse value allocation type „1“	Recommended range for cutoff- I^2t -value of semiconductor protection fuses allocation type „2“
36A	VB ...-36	25A	700... 1000 A ² s

Table 2

13.3 Permissible braking frequency

The braking frequency depends on the adjusted braking current.

Please find below some typical values for braking devices of the VersiBrake type:

Braking current	Braking time	Braking frequency
36A	5s	1 braking per 100s
	15s	1 braking per 300s
25A	5s	1 braking per 60s
	15s	1 braking per 180s
20A	5s	1 braking per 40s
	15s	1 braking per 120s
15A	5s	1 braking per 25s
	15s	1 braking per 70s
10A	5s	1 braking per 17s
	15s	1 braking per 50s

For intermediate values please refer to the load curve below.



Warning:

When setting up the machine or during commissioning it is possible to carry out 10 braking operations in succession with the rated device current at a braking time of 12s. After these operating conditions, however, the device needs a recovery time of 20 minutes

Reduction of the permissible max. braking current
in the case of braking times exceeding 20 second

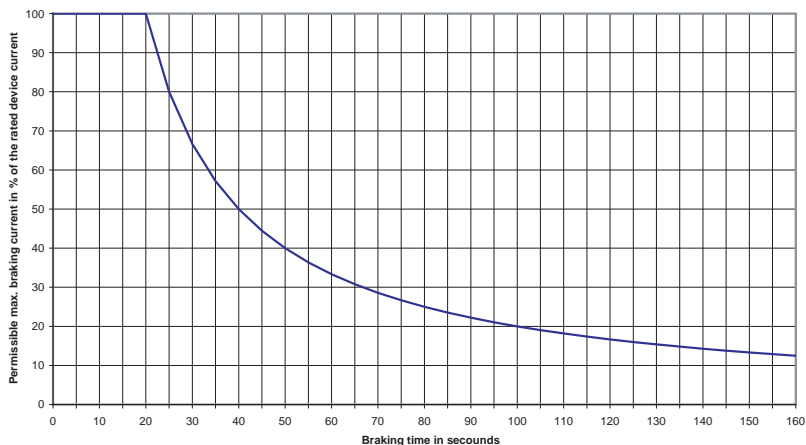
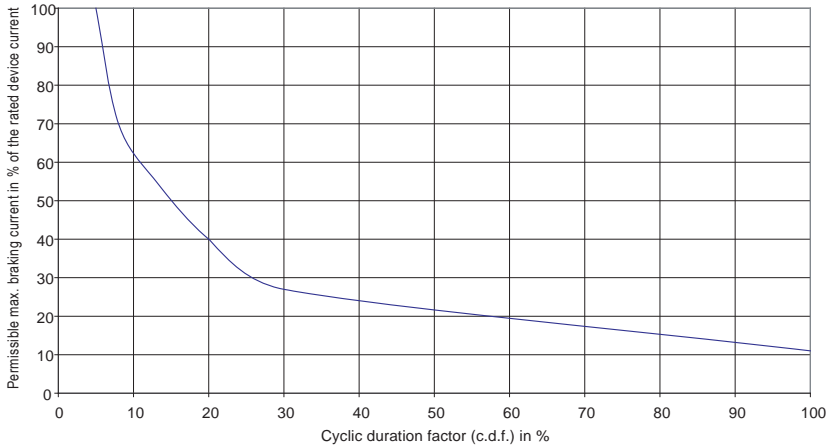


Table 3

Load curve for VB 400-36

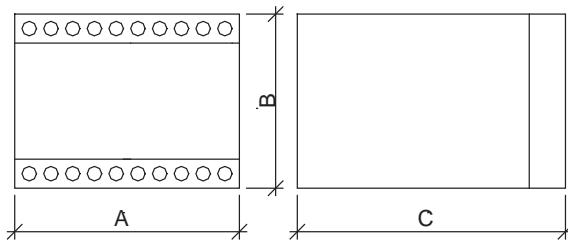


$$\text{Cyclic duration factor (c.d.f.)} = \frac{t_B}{\text{Cycle time}} \cdot 100$$

t_B = Braking time, Cycle time = Braking time + Non-braking time

14. Dimensions

VB 230-36
VB 400-36

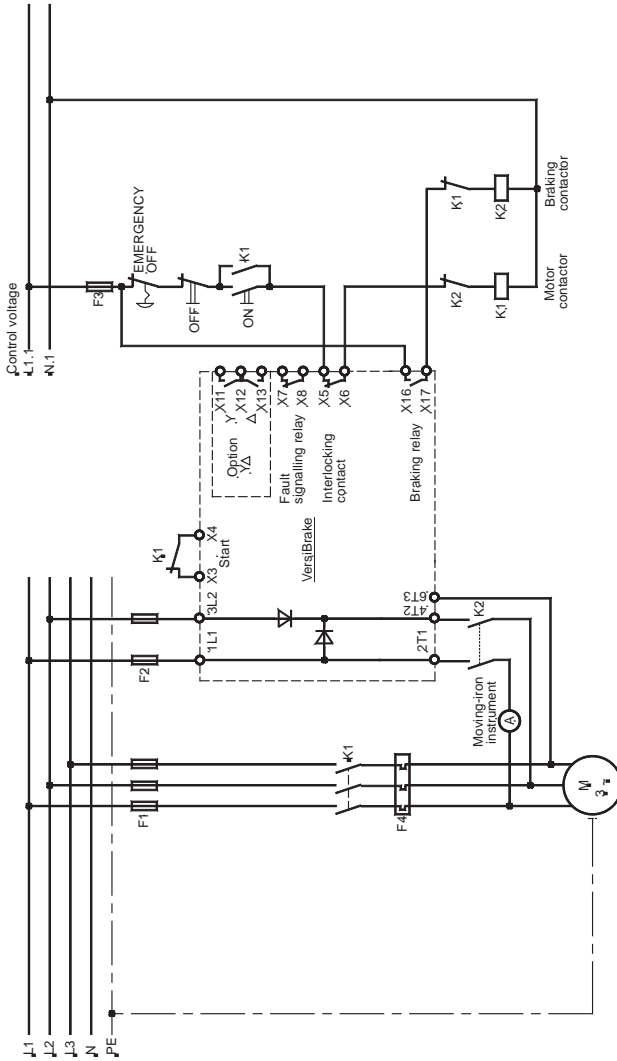


	A	B	C	D	E
VB ... - 36	100	73	120	-	-

Alle dimensions indicated in mm.

15. Typical connections

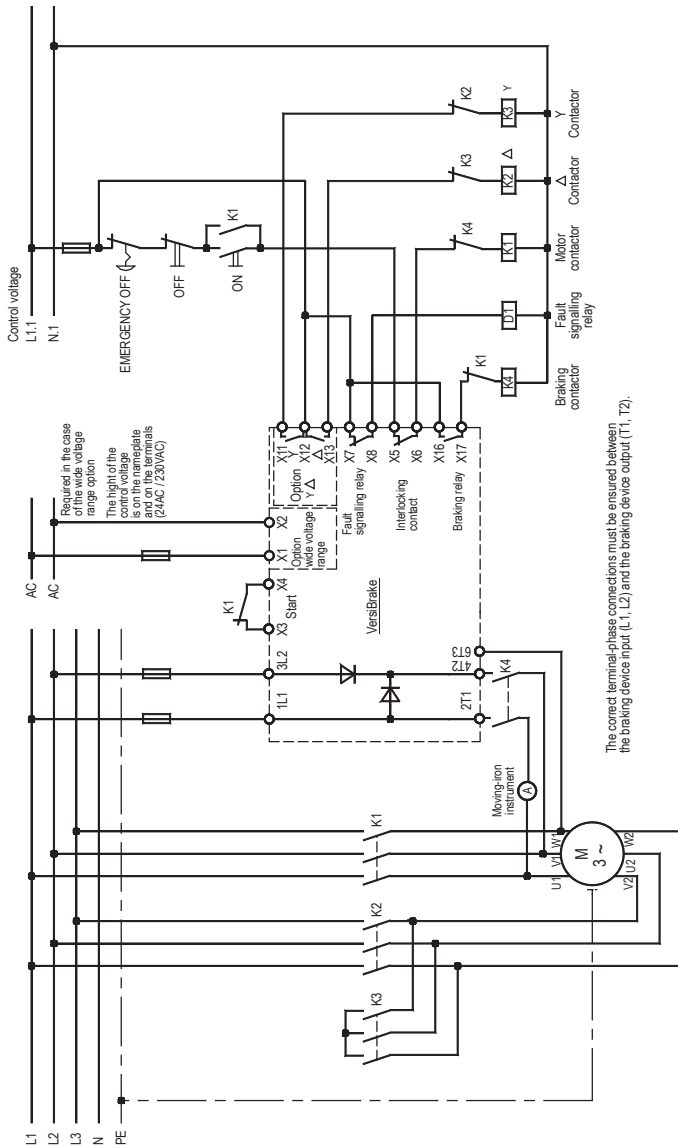
15.1 Connection diagram



EMC

The limit values for emitted according to the applicable device standards do not rule out the possibility that receivers and susceptible electronic devices within a radius of 10m are subjected to interference. If such interference, which is definitely to the operation of the braking devices "VB", occurs, the emitted interference can be reduced taking appropriate measures. Such measures are, e.g.: To connect reactors (3mH) or a suitable mains filter in series before the braking device, or to connect X-capacitors (0.15µ F) in parallel to the supply voltage terminals.

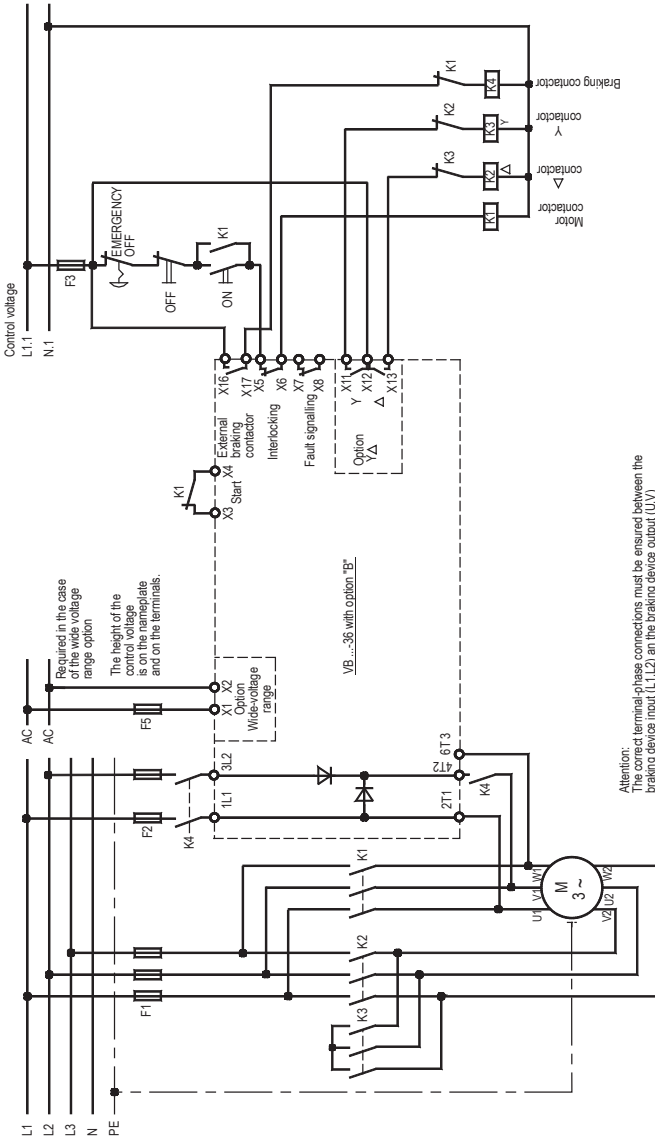
15.2 Connection diagram with all options



EMC

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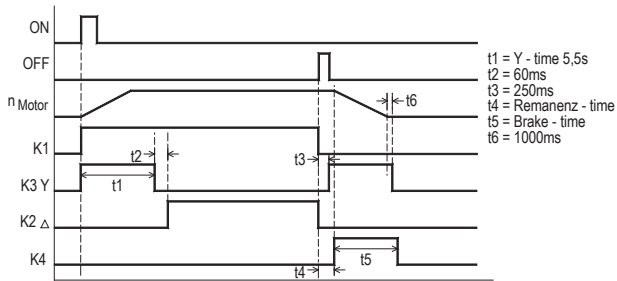
15.3 Connection diagram with option „B“, disconnect 1L1, 3L2



EMC

The limit values for emitted according to the applicable device standards do not rule out the possibility that receivers and susceptible electronic devices within a radius of 10m are subjected to interference. If such interference, which is definitely to the operation of the braking devices "VB", occurs, the emitted interference can be reduced taking appropriate measures. Such measures are, e.g.:
To connect reactors (3mH) or a suitable mains filter in series before the braking device, or to connect X-capacitors (0,15µF) in parallel to the supply voltage terminals.

Time diagram with Option "B", disconnect 1L1, 3L2







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