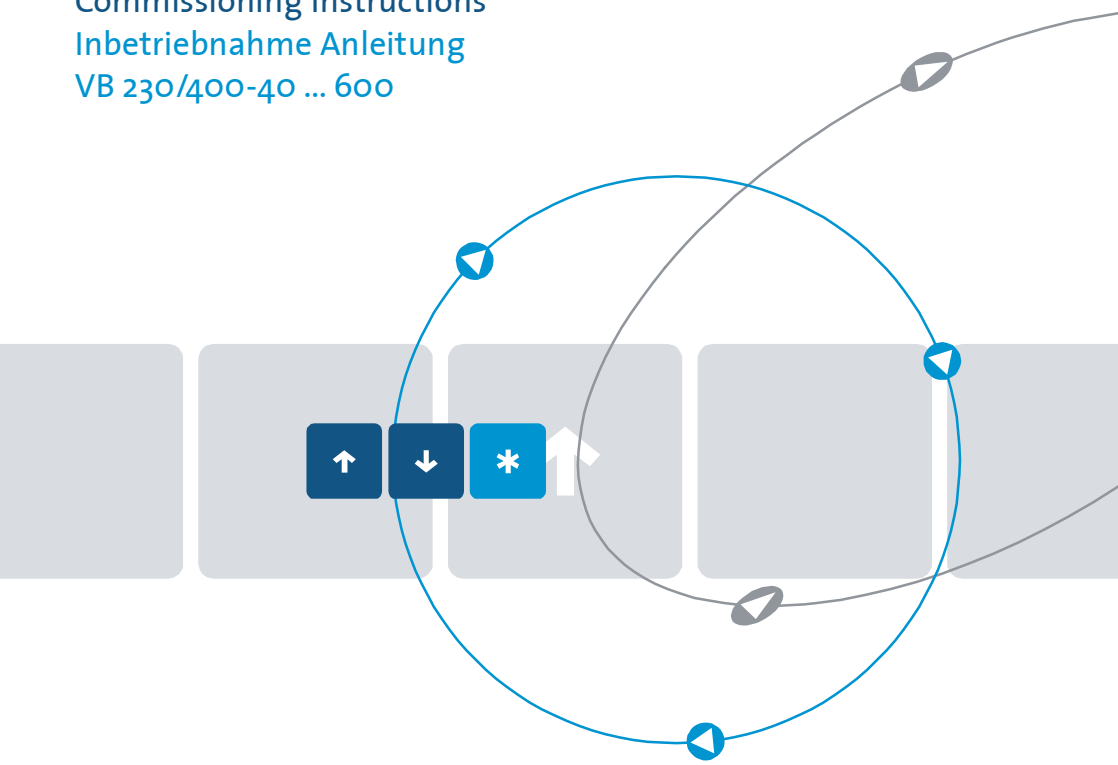


Commissioning Instructions
Inbetriebnahme Anleitung
VB 230/400-40 ... 600



as per 03/07 19700.10001

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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.

1. Safety notes

The described devices are electrical equipment for the application 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 de-energized.

Make sure that all the drive components are properly earthed.

Please read these commissioning instructions carefully before putting the electronic braking 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, VDE 0160 and VDE 0113, plus the appropriate regulations of the TÜV (Technical Inspectorate) and the employers' liability insurance associations / trade associations apply in Germany.

The user must make sure 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..

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

2. Declaration of 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 to ensure that the user's design and construction comply with the applicable legal provisions.

The commissioning is strictly forbidden as long as the conformity of the final product with the guidelines 89/392/EC (machinery directive) and 73/23/EC (low voltage directive) is not proved.

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 a.c. motors. With due regard to the installation guidelines they meet the following requirements:

Emitted interference: Continuous duty	EN 50081-1
Brakes	EN 60947-4
Immunity to interference:	EN 50082-2

CE

Dr. Thomas Stiller
Managing Director



3. General description

The electronic braking devices of the VersiBrake... type enable 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.

Depending on the setting chosen by the user, the braking current is switched off either when the adjusted braking time is over or when the integrated standstill detection signals that the motor has come to a standstill. In the case of standstill-dependent braking a potential-free signalling contact signals if the motor has not come to a standstill within the maximum braking time.

The braking current is regulated to the adjusted value (maximum: rated device current). The device option featuring „current display“ shows the braking current setpoint value and, during braking, the braking current actual value.

Special features

- controlled by microcontroller
- wear-resistant and maintenance-free
- retrofitting into existing plants possible
- for all asynchronous motors
- integrated braking contactor (devices up to 60A)
- automatic remanence time optimization
- braking current control
- thermal overload monitoring
- braking current display
- wide-voltage range 200-690V
- plug-in control terminals
- motor PTC monitoring
- star-delta starting control
- standstill signalling relay
- braking current monitoring

Typical applications

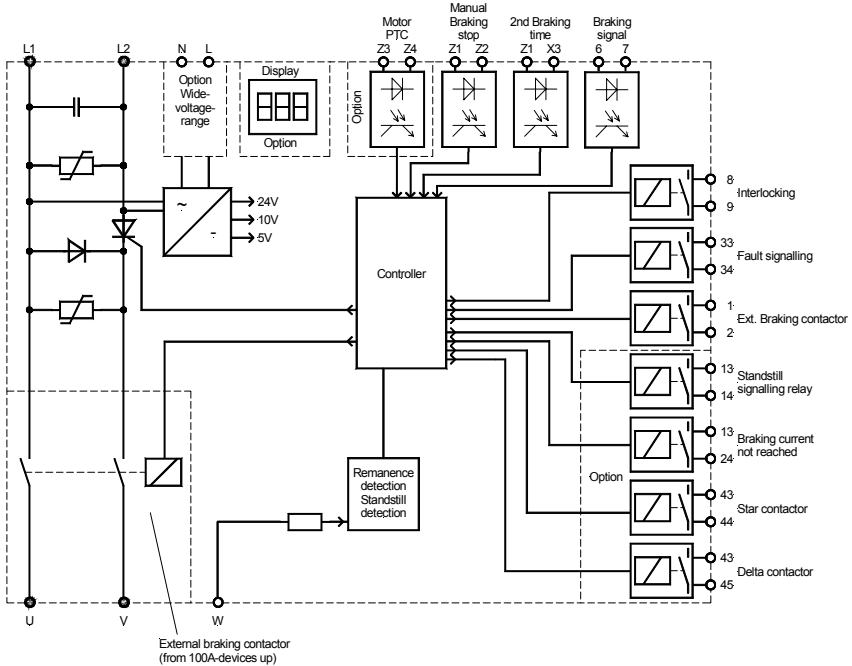
- sawing machines
- centrifuges
- wood working machines
- conveying systems
- textile machinery

with option „A“
 with option „B“
 with option „C“
 with option „P“
 with option „P“
 with option „P“
 with option „P“

Warning note:

Prior to using the standstill signaling contact for safety-directed purposes, it is necessary to subject the application to a risk assessment according to EN 1050 (ISO 14121).

4. Block diagram



5. Functional description (see connection diagram)

After switching on the operating voltage on L1 and L2 (in the case of option „B“: on N and L) the main contactor interlock (terminals 8 and 9) and the fault signalling contact (terminals 33 and 34) close. The motor can be started.

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

The fully automatic run of the braking interval starts with the switch-off of the motor contactor which closes the terminals 6, 7. 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 6 and 7, 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 6 and 7. During braking, the main contactor is interlocked via the contacts 8, 9. After a delay time which, dependent on the amount of the remanent voltage of the motor, optimizes itself, the internal braking relay (devices up to 60A) and in the case of devices from 100A up the control contact for the external braking contactor on the terminals 1 and 2 closes.

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 suppressor circuits protect the power semiconductors against overvoltage. With the potentiometer "I" the braking torque can be adjusted within a wide range. Experience shows that a braking current 2.5 times as high as the rated motor current has a good braking effect.

By means of plug-in jumpers the user can choose time-dependent or standstill-dependent braking.

In the case of standstill-dependent braking, the integrated standstill detection switches the braking current off (approx. 1.5s after the motor standstill has been detected). If during the maximum braking time (selectable via plug-in jumpers: 10s, 20s or 40s) no standstill of the motor is detected, the fault signalling contact on the terminals 33, 34 opens. This state will be reset when the motor is restarted.

In the case of time-dependent braking it is possible via plug-in jumpers to select time intervals from 0.5...15s, 0.5...40s or 2...320s.

Note!

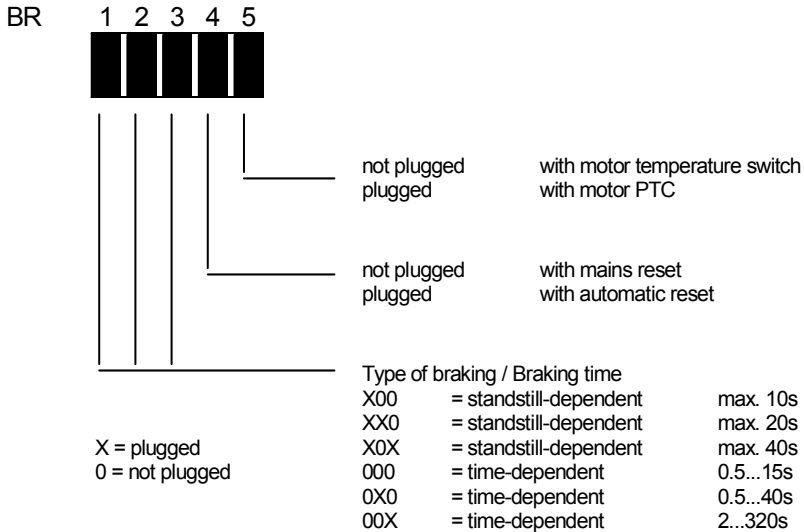
In the case of braking times exceeding 40s, the braking current is to be reduced according to table 2, page 13, and, at any rate, the motor temperature should be monitored. As in such cases it may happen that the braking device becomes thermally overloaded, braking has to be stopped when a fault signal occurs due to overtemperature.

6. Control inputs

Control terminals	Designation	Description
6, 7	Starting contact	Connection of a break contact of the motor contactor
Z1, Z2	Manual braking stop	Bridging of Z1-Z2 causes an instant termination of braking. Prior to restarting the motor, the bridging has to be removed, as braking will not be effected with a closed bridging.
Z1, X3	2nd Braking time	If Z1-X3 are bridged, the braking time, which can be adjusted with „t2“ (0 –40s), is active. This 2nd braking time is not available with option „P“ in the case of which „t2“ can be used to adjust the pull-in time of the star contactor.
Z3, Z4	Motor PTC	see option 10.3

7. Adjustments / Device configuration

With the plug-in jumpers BR1 to BR5 on the braking device it is possible to adjust the type of braking, the braking time, the type of reset and in the case of the „Motor PTC“ option the type of the temperature detector.



Attention!

In the case of braking times exceeding 40s, the braking current has to be reduced according to table 2, page 13.

Behaviour of the fault signal with the corresponding type of reset:

Fault	Mains Reset	Automatic Reset
Overtemperature	Fault will be reset after cooling down and a short-time disconnection from the supply mains (at least 5s).	Fault will be reset after cooling down
Braking current not reached	Fault will be reset after a short-time disconnection from the supply mains (at least 5s)	Fault will be reset at motor restart.
No standstill during monitoring time	Fault will be reset at motor restart.	Fault will be reset at motor restart.

8. Potentiometers

With the potentiometers on the front panel of the VersiBrake-devices the following parameters can be adjusted.

- „I“ Adjusting the braking current setpoint value.
The braking current can be adjusted within a range from 0 – 100% of the rated device current. The adjustment is linear.
In the case of devices featuring display the braking current is indicated.
In the case of devices without display it is possible to infer the amount of the braking current from the position of the potentiometer.
In this connection, a graduation mark corresponds with 10% of the rated device current.
- „t1“ Adjusting the braking time.
In the case of time-dependent braking the braking time can be adjusted in the ranges defined with the jumpers BR2 and BR3. The adjustment is linear.
- „n0“ Adapting the standstill threshold in the case of standstill-dependent braking.
If in special applications the motor standstill is not properly detected, this potentiometer can be used in order to re-adjust the standstill threshold in a small range.
- „t2“ Adjusting the 2nd braking time or the star contactor pull-in time (with option „P“).
If the 2nd braking time is selected via the control terminals Z1, X3, this potentiometer can be used in order to adjust it in the range from 0.5...40s. The adjustment is linear.
In the case of devices featuring option „P“, the star contactor pull-in time can be adjusted in a range from 3 ... 15s. With option „P“, however, a 2nd braking time is not available.

9. Display / LED Indicators

Without LCD-display	With LCD-display	
LED 2 illuminated	Current setpoint value is displayed	Supply mains is applied / ready for operation
LED 1 illuminated LED 2 and LED 3 alternately illuminated	Current actual value is displayed *DP1 and DP2 are alternately illuminated	Braking current is flowing
LED 3 illuminated		Standstill-dependent braking selected
LED 2 and LED 3 permanently flashing	*DP1 and DP2 permanently flashing	No standstill during monitoring time
LED 2 and LED 3 flashing 2x	*DP1 and DP2 flashing 2x	Overtemperature (motor or heat sink)
LED 2 and LED 3 flashing 4x	*DP1 and DP2 flashing 4x	Braking current setpoint value not reached

* DP1 and DP2 are the decimal points of the LCD-display

10. Options

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

The following is available:

Braking current display	- Option „A“
Wide-voltage range 200-690V	- Option „B“
Plug-in control terminals	- Option „C“

The following functions are only available as a package in the form of - Option „P“

- Motor PTC monitoring
- Star-delta starting control
- Standstill signalling relay
- Signalling relay for braking current monitoring

Attention!

In the case of option „P“, it is not possible to select a 2nd braking time by bridging Z1-X3.

10.1 Braking current display, Option „A“

In the case of this option the braking current setpoint value and the braking current actual value are displayed via a 3-digit LCD-display (height of digits: 13mm).

If mains voltage is applied to the VersiBrake, the braking current setpoint value adjusted on „I“ is displayed.

During the braking operation the braking current actual value is displayed. The active braking operation is displayed by alternating flashing of the decimal points (DP1 and DP2).

The decimal points indicate various fault conditions by different flashing frequencies.

10.2 Wide-voltage range, Option „B“

With this option it is possible to use the VersiBrake-devices in a mains-voltage range from 200...690V.

This requires a control voltage of 230V AC that is to be connected to the terminals N and L.

10.3 Plug-in control terminals, Option „C“

This option features plug-in control terminals (Combicon).

10.4 Motor PTC monitoring, Option „P“

This option enables monitoring of the motor temperature. It is possible to evaluate up to 6 series-connected PTC thermistors (with BR5 plugged-in) or temperature switches (with BR5 not plugged-in). When using switches, the contacts must open in case of overtemperature.

The fault signal on the terminals 33, 34 shows when the shutdown temperature is reached. If BR4 (plug-in jumper for "Automatic Reset") is plugged in, the fault will be reset after cooling. If "Mains Reset" has been chosen (BR4 not plugged-in) the fault will be reset after cooling and a short-time disconnection from the supply mains (at least 5s).

When using PTC thermistors, overtemperature, line breaks and short circuits are detected.

If no motor PTC or temperature switch is connected to devices featuring option „P“, the terminals Z3 + Z4 have to be bridged and BR5 (see page 7) is to be removed.

10.5 Star-delta starting control, Option „P“

If star-delta starting is requested, it is with this option possible to control the power contactors. In this case, a break contact of the mains contactor is to be connected to the terminals 6, 7 (see connection diagram with options).

Closing of the mains contactor starts the following sequence:

- The potential-free contact on terminals 43, 44 is closed. (Control of the star contactor)
- After an adjustable time has elapsed, the potential-free contact on the terminals 43, 44 is opened.
- After a changeover delay of 60ms the potential-free contact on the terminals 43, 45 is closed (control of the delta contactor)

Opening of the mains contactor starts the following sequence:

- The potential-free contact on the terminals 43, 45 is opened (delta contactor is switched off).
- After the remanent voltage has dropped, the potential-free contact on the terminals 43, 44 is closed (control of the star contactor)
- After the contact bounce time has been waited out the braking operation is started.

The star contactor pull-in time can be adjusted with potentiometer „t2“ in the range from 3...15s.

In the case of star-delta starting, even if it is not implemented via the VersiBrake-device, the star contactor should be controlled via the contact on the terminals 43 and 44 (option „P“), in order to effect braking. Thus, the motor windings are interconnected in time prior to the actual braking operation.

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 43 and 44.

10.6 Standstill signalling relay, Option „P“

This option provides the motor standstill signal to a potential-free contact on the terminals 13, 14.

Attention: only in the case of standstill-dependent braking (plugged-in BR1)

Possible states of the potential-free contact on the terminals 13, 14:

Voltage is not applied to VersiBrake	Contact 13, 14 open
Voltage is applied to VersiBrake	Contact 13, 14 closed
Motor contactor K1 pulled in (6, 7 open) Motor runs	Contact 13, 14 open
Motor contactor K1 dropped out (6, 7 closed) Motor brakes	Contact 13, 14 open
Motor contactor K1 dropped out (6, 7 closed) Motor stands still	Contact 13, 14 closed

Warning note:

Prior to using the standstill signaling contact for safety-directed purposes, it is necessary to subject the application to a risk assessment according to EN 1050 (ISO 14121).

10.7 Signalling relay for braking current monitoring, Option „P“

Via a potential-free contact on the terminals 13, 24 this option signals if the braking current adjusted with „I“ is not reached.

In its normal position, and if the device is in proper condition, the contact is open. It closes if the braking current is not reached.

Note!

Standard devices do not provide these options, even if corresponding terminals are available.

When placing your order, please indicate the options you require.

11. Technical data

Type designation VB ...	230-40 400-40	230-60 400-60	230-100 400-100	230-200 400-200	230-400 400-400	230-600 400-600
Mains voltage according to DIN EN 50160 (IEC 38)	220/240V ±10% 50/60Hz (standard) 380/415V ±10% 50/60Hz (standard) 200 - 690V ±10% 50/60Hz (wide-voltage range)					
Power draw of electronics	6 VA					
max. Motor rating at 380/415V	7.5kW	15kW	22kW	55kW	110kW	160kW
Rated device current	40A	60A	100A	200A	400A	600A
c.d.f. at max. braking current	20%					
Ext. semiconductor fuse „high-speed“	40A	60A	100A	200A	400A	600A
Braking voltage	0 ... 130VDC at 220/240V (standard) 0 ... 220VDC at 380/415V (standard) 0...380VDC (wide-voltage range) (690V)					
max. Braking time	40s with standstill-dependent braking 320s with time-dependent braking					
Contact rating of output relays	3A/250V AC 3A/30V DC					
Delay time for reduction of residual e.m.f.	self-optimizing (200 ... 3100ms)		self-optimizing (1600 ... 3100ms)			
min. Cross-sectional area / connecting cable	2.5mm ²	4mm ²	10mm ²	35mm ²	Screw M12	

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. Connection

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

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

To ensure reliable functioning, it is important to comply with the interlocking conditions:

- To initiate braking, a potential-free break contact of the main contactor is necessary, i.e., when the motor contactor is dropped out, the terminals 6, 7 of the braking device are connected.
- The interlocking contact of the braking device (terminal 8, 9) has to be looped into the control circuit of the motor contactor so that the motor contactor cannot pull in during braking.
- In the case of braking devices equipped with a separate braking contactor (devices with rated currents from 100A up) the braking contactor and the motor contactor are to be interlocked against each other (electrical interlock with break contact)

13. Commissioning

Sequence of commissioning:

- Disconnect the plant from the supply mains
- Adjust potentiometer "I" to requested braking current (see 8.1)
- Switch on the plant
- Initiate braking by ON and OFF-actuation of the motor contactor

Note: When putting the device into operation for the first time, the braking current should be checked with a true r.m.s. measuring instrument.

14. Adjusting the braking current

The braking current is to be adjusted to a value as small a 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 can be adjusted with the potentiometer "I".

If the motor, despite braking with rated device current, does not come to a standstill within the requested time, a braking device of the next higher rating class is to be used.

Note: In the case of devices featuring the option „braking current display“, the braking current is displayed during braking.

15. Adjusting the braking time

In the case of time-dependent braking, the time in which the braking current flows, can be adjusted with the potentiometers „t1“ and „t2“.

The time should be adjusted so that the braking current is switched off approx. 2s after the motor has come to a standstill.

The adjustments are to be checked and possibly re-adjusted when the motor has normal operating temperature.

16. Adjusting the standstill threshold

The potentiometer „n0“ can be used if, in the case of standstill-dependent braking, no motor standstill is detected or the braking current is switched off before the motor has come to a standstill.

How to proceed:

If no motor standstill is detected, turn the potentiometer slightly clockwise. By carrying out several braking operations a setting is to be found which switches the braking current off approx. 1.5s after the motor has come to a standstill.

If the braking current switches off too early, turn the potentiometer slightly counter-clockwise. By carrying out several braking operations a setting is to be found which switches the braking current off approx. 1.5s after the motor has come to a standstill.

Attention! When carrying out several braking operations in succession, the motor can overheat.

Normally, re-adjustments with this potentiometer are not necessary.

17. Permissible braking frequency

The braking frequency depends on the adjusted braking current.

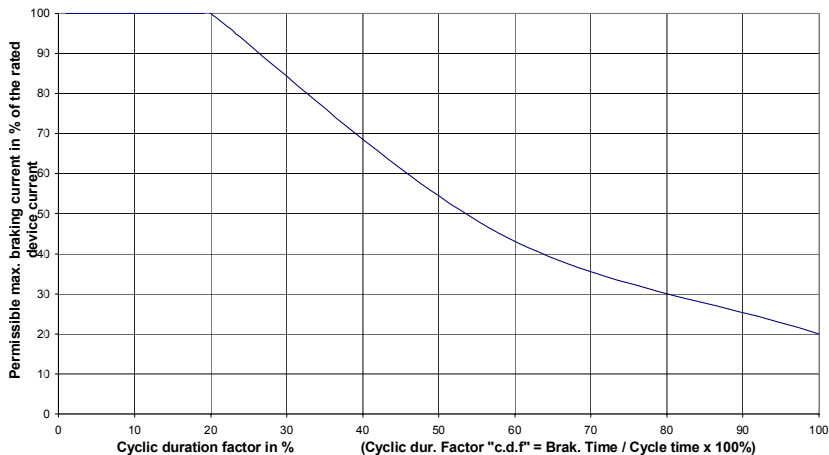
The braking devices of the VB 230/400-40...600A type are designed for a cyclic duration factor (c.d.f.) of 20% and allow the following braking frequencies:

Braking current	Braking time	Braking frequency
rated device current	5s	1 braking oper. per 25s
rated device current	15s	1 braking oper. per 75s
rated device current	40s	1 braking oper. per 200s
75% rated device current	5s	1 braking oper. per 20s
75% rated device current	15s	1 braking oper. per 60s
75% rated device current	40s	1 braking oper. per 150s
50% rated device current	5s	1 braking oper. per 13s
50% rated device current	15s	1 braking oper. per 38s
50% rated device current	40s	1 braking oper. per 100s

For intermediate values please refer to the load curve (table 1, page 13).

Table 1

Load curve for VB 400-40...600



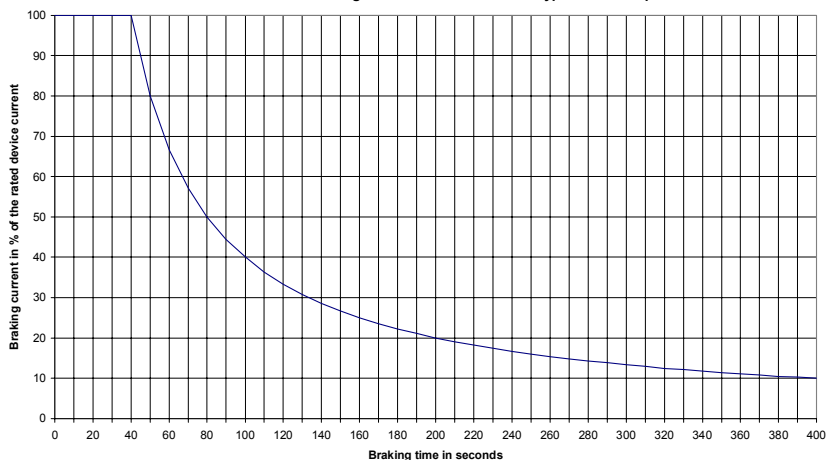
t_B = Braking time, Cycle time = Braking time + Non-braking time

If braking times exceeding 40s are required, it is absolutely necessary to reduce the permissible max. braking current according to the following table.

Attention! Non-observance can damage the braking device and motor!

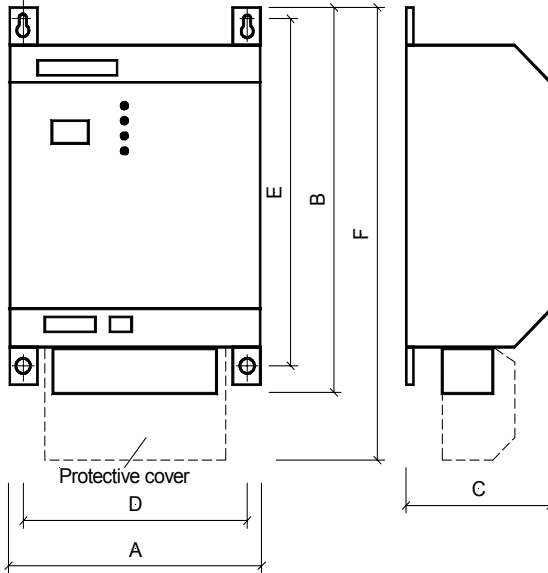
Table 2

Reduction of the permissible max. braking current in the case of braking times exceeding 40 seconds for braking devices of the VersiBrake type from 40A up



When setting up the machine or during commissioning it is possible to carry out 5 braking operations in succession with the rated device current at a braking time of 15s. After these operating conditions, however, the device needs a recovery time of 20 minutes.

18. Dimensions



	A	B	C	D	E	F
VB ... - 40	110	242	140	86	226	-
VB ... - 60	110	242	140	86	226	-
VB ... - 100	110	242	140	86	226	-
VB ... - 200	110	247	155	80	226	-
VB ... - 400	210	275	165	180	226	340
VB ... - 600	210	280	165	180	226	355

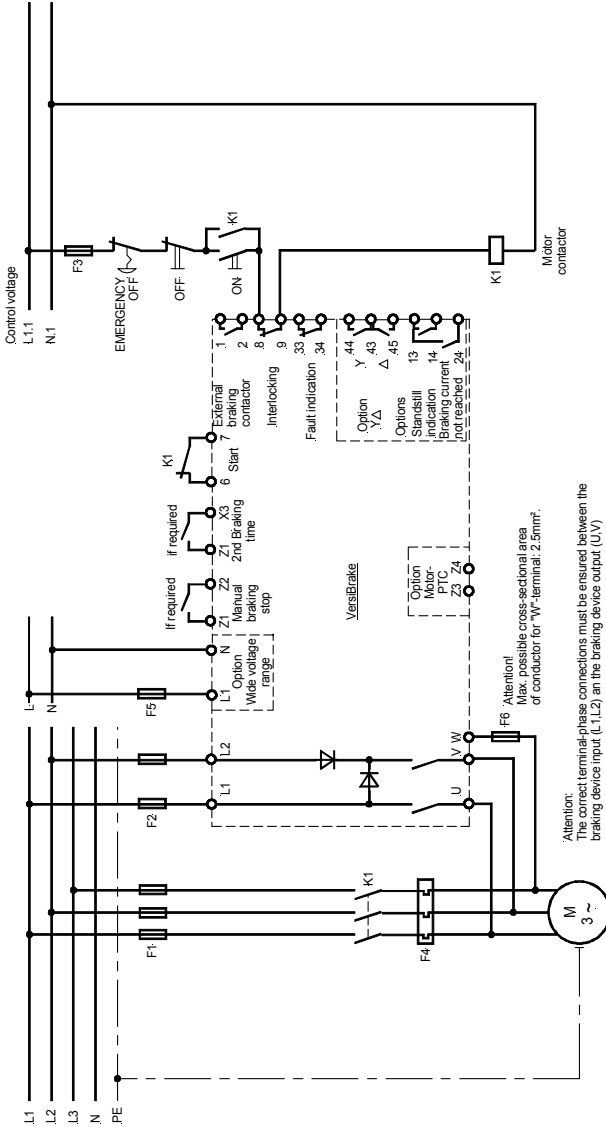
All dimensions in mm.

Layout of power terminals:

VB ... - 40 ... 100	PE	L1	U	L2	V	PE
VB ... - 200	PE	L1	U	L2	V	
VB ... - 400	PE	L1/U	L2	V		
VB ... - 600	L1/U	PE	V	L2		

19. Typical connections

19.1 Connection diagram VB 230/400-40...60

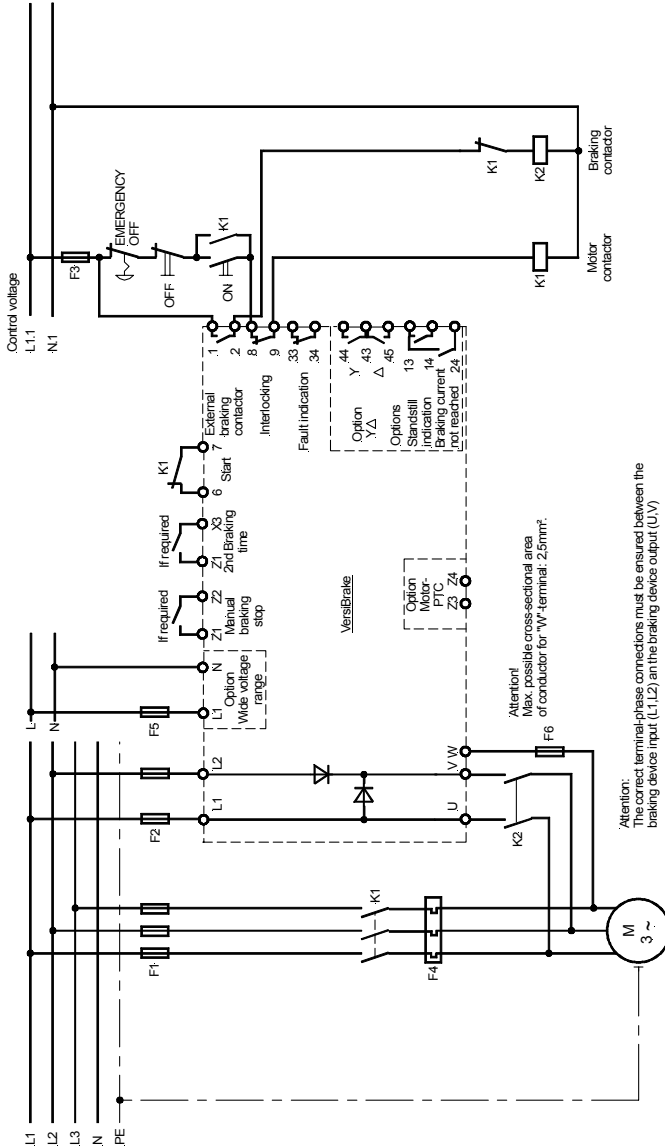


EMC

The limit values for emitted interference 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 attributable to the operation of the braking devices "VB", occurs, the emitted interference can be reduced by 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.

19.2 Connection diagram VB 230/400-100...600

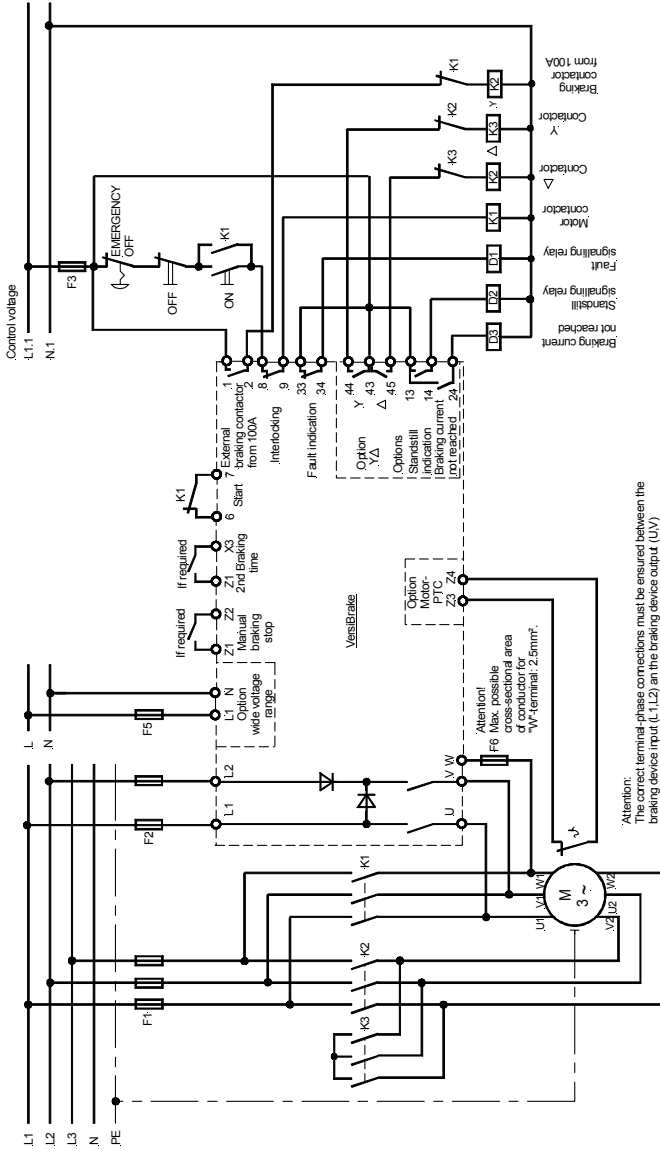


EMC

The limit values for emitted interference 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 attributable to the operation of the braking devices "VB", occurs, the emitted interference can be reduced by 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.

19.3 Connection diagram with all options VB ...-40...60

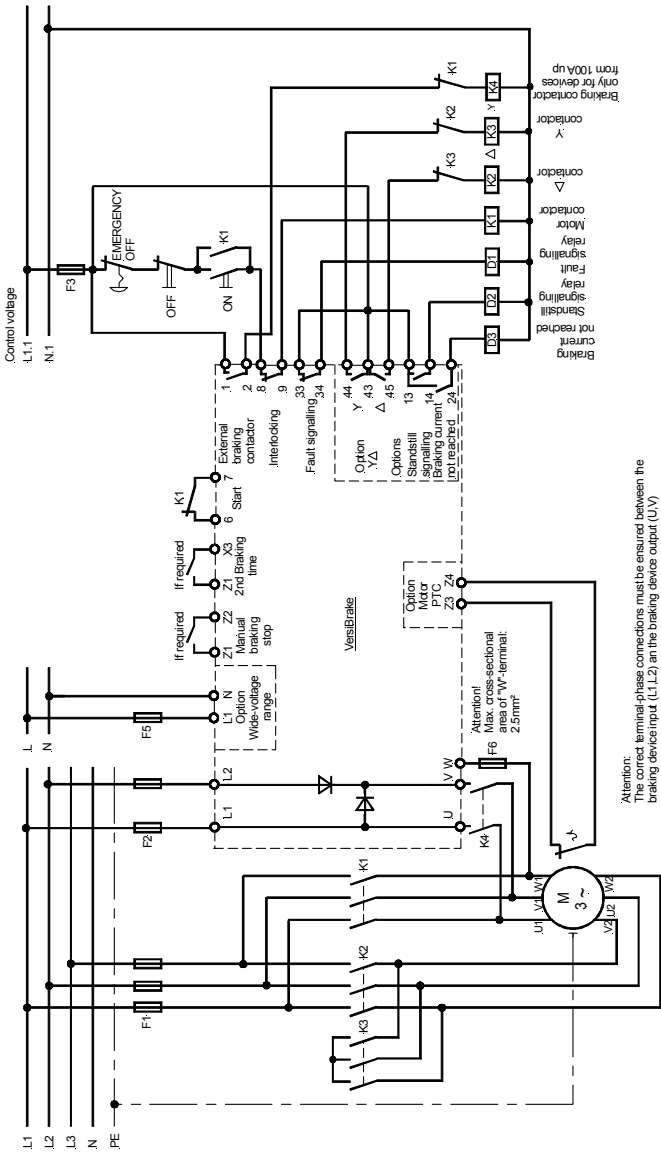


Attention: The correct terminal-phase connections must be ensured between the braking device input (L1, L2) and the braking device output (U, V).

EMC

The limit values for emitted interference 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 attributable to the operation of the braking devices "VB", occurs, the emitted interference can be reduced by 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.

19.4 Connection diagram with all options VB ...-100...600



Attention: Different terminal-phase connections must be ensured between the braking device input (U1, L2) and the braking device output (U, V).

EMC

The limit values for emitted interference 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 attributable to the operation of the braking devices "VB", occurs, the emitted interference can be reduced by 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.



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