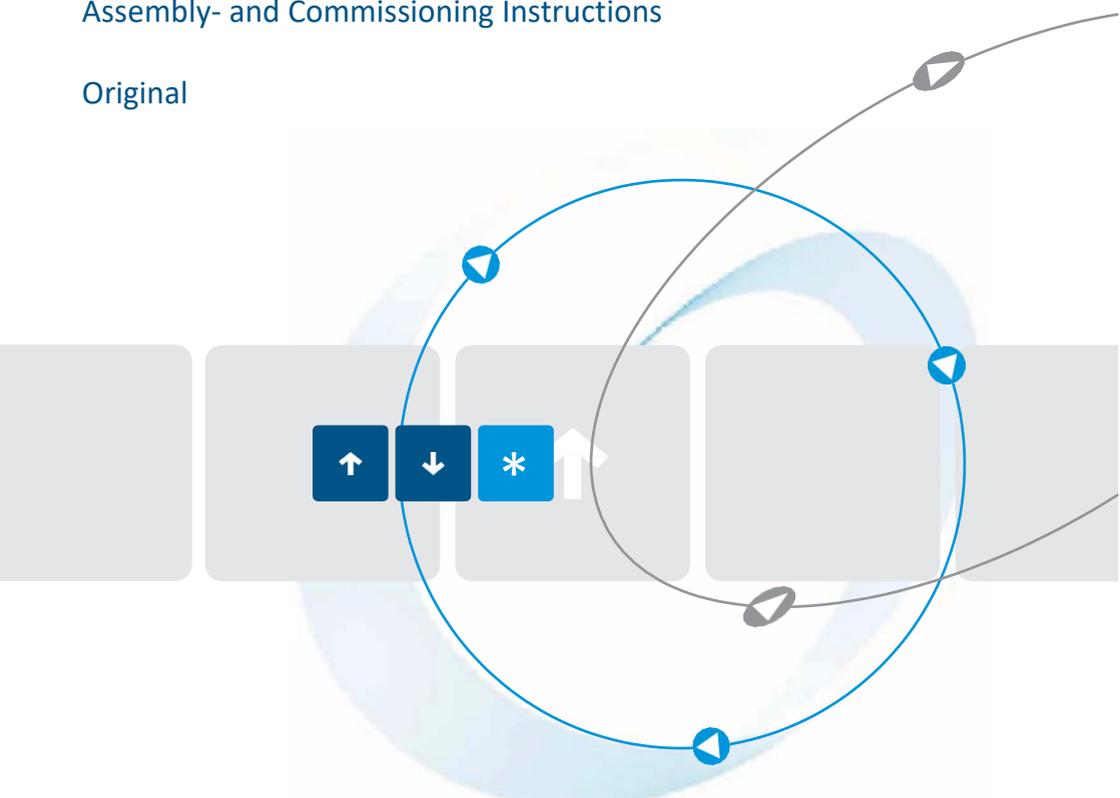


Braking Device
VersiBrake Safe
Assembly- and Commissioning Instructions

Original



Quality is our Drive.

As per 01/26 1B500.10001

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These instructions must be read and understood before installation, operation or servicing of the appliance muss.

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.



Installation notice

Electro-technical specialist knowledge is required for installation and commissioning.



Disposal Instructions

Equipment containing electrical components may not be disposed of together with domestic waste. It must be collected separately as electrical and electronic waste according to local and currently valid legislation.

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 information

1.1 Notes on safety

The appliance may only be used for the purposes stated in the applicable fitting and commissioning instructions. The notices in the accompanying documents must be followed. The permissible environmental conditions must be adhered to.

Fit the appliance in a switch cabinet with IP 54 or better. Dust and moisture could otherwise lead to negative effects on the function.



The described devices are operating resources which are used in industrial power installations. Inadmissible removal of coverings during operation can cause serious damage to health, since live parts with high voltages are present in these devices.

Installation, maintenance and adjustment work, as well as the operation, may be carried out only by instructed personnel in accordance with the safety regulations. Installation work may be implemented in the de-energised status only.

Note proper grounding of all drive components.

Before you put the device into operation, please read this start-up instruction carefully.

The user has to furthermore ensure that the devices and the relevant components are mounted and connected according to public, legal and technical specifications. The VDE Specifications VDE 0100, VDE 0110 (EN 60664), VDE 0160 (EN 50178), VDE 0113 (EN 60204, EN 61310) and VDE 0660 (EN 50274), as well as corresponding specifications of TUEV and Trades Social Insurance against Occupational Accidents, apply for Germany.

It must be ensured by the user that after a failure of the device, in case of faulty operation, in case of failure of the control unit and so forth, the drive is brought into a secure operating state.

1.2 Warning note



- The safety functions of the VB S (see point 3. General description) are only applicable in connection with further measures, e.g. protective door interlock
- In the case of an error it can not be excluded that the engine will start to turn. This must be observed especially when the safety door is open. This can be prevented if it is constructively ensured on the drive side that the motor does not start up with 2 mains phases (two-pole motor or heavy motor start).
- The unbraked run down of the motor to a standstill must not exceed 300s. Here the highest possible rotational speed and the largest possible centrifugal mass must be taken into account.
- The VB S complies with the safety-relevant EMC Regulations (see 14.2 EMC information). In the event of interference levels greater than the limits unsafe operating conditions may occur.
- Even if the motor is stopped and the motor standstill message indicates a motor standstill, the device terminals 2T1, 4T2 and 6T3 as well as all connected cables and motor terminals are not galvanically isolated from the mains voltage.
For all work on the motor circuit and on the associated wiring, the VB S must be disconnected from the mains voltage with a revision switch, motor protection switch or similar disconnecting elements.
- Strong electromagnetic fields can occur in the area near to machines and appliances in which these devices are installed. This could possible affect the operation of active implantations (e.g. heart pacemakers or defibrillators).

The PETER electronic company GmbH & Co. KG does not assume any responsibility for effects of the designated points.

2. Conformity

The described appliances were developed to take over safety functions as part of a whole installation or machine. A complete safety-related system generally contains several components and concepts for safe shutdowns. It is the responsibility of the manufacturer of a machine or appliance to ensure the correct overall function. PETER is not able to guarantee all characteristics of a complete appliance or machine not designed by PETER.

The agreement of the construction of the user with the existing legal provisions is in the area of responsibility of the user.

Operational start-up is prohibited until the conformity of the finished product with the Directives 2006/42/EG (Machine Directive) and 2006/95/EG (Low-Voltage Directive) has been determined.

3. General description

The appliances of the Type VersiBrake Safe (PL c) enable the shutdown of alternating current motors of efficiency classes IE1 to IE3 (IE4 in preparation). Appliances of the type VersiBrake Safe are used for drives that must be reliably shut down for safety-technical and/or economic reasons.

No additional brake protection is necessary if the VersiBrake Safe is used. After the start-up sequence is completed (bridged -> open -> bridged) at the start input of the braking device, the braking phase starts. It is not possible to switch on the motor protection on the VersiBrake safe during the braking phase due to the locking contact den. A regulated direct current is fed into the motor which generates a standing magnetic field and thus a braking moment. An integrated analysis circuit recognises when the motor is standing still. The braking current is then shut off and the standing status is communicated outside via a monitored, positively driven relay contact.

If the start/stop contact is open, the braking phase begins. A controlled direct current is injected into the motor, which generates a standing field, and thus a braking torque. An integrated evaluator identifies the motor standstill. The braking current is then switched off and the standstill is transferred externally over a monitored, positively-driven relay contact.

If no motor standstill is identified within a fixed monitoring time, the braking current is switched off and the motor standstill issued only after a safety time of 300 sec. (coast to stop time with largest flywheel) over the secure, positively-driven standstill signal contact. The user has to ensure that the unbraked coast to stop of his drive (with largest flywheel) is not longer than 300 sec.

With connection of the mains voltage, the device initiates a test braking which checks the device functions. If the start/stop input is activated during test braking, the signal relay output "Combined fault" opens and then the red LED flashes. After performed test braking, the contact closes again. The device is capable of optimising the braking time within 3 starts. The optimal braking time is assumed to be <10s.

So that the relevant specifications of DIN EN 12750:2013 (Safety of Wood Processing Machines) are fulfilled, the following functions are in the device:

- Prevention of an unexpected, fault-dependent starting
- Monitored, controlled stop to standstill
- Secure control of a safety gate
- Motor standstill monitoring

structured in agreement with the requirements of Category 2, PL c from EN13849-1:2008, as well as SIL1 to DIN EN 61508.

The VersiBrake Safe recognises a great variety of faults. All faults which do not allow a secure motor operation any longer cause a switch-on interlocking and are simultaneously output over the monitored, positively-driven relay contact "Device Fault". Device faults can be reset only by a disconnection of the control voltage.

Faults which are not safety-relevant are output over the signalling contact "Combined Fault". Combined faults can be reset over the input "Fault reset".

Over a CAN interface with CAN-Open protocol, device parameters and signals can be exchanged with a higher-level control.

4. Utilisation according to specification

The devices of the Series VB S are electrical operating resources for employment in industrial power installations. They are designed for employment in machines for the reduction of the switch-on torque, for the reduction of the start current peaks, as well as for the slow down of centrifugal masses in case of drives with three-phase motors of the efficiency classes IE1 to IE3 (IE4 under preparation).

Preferred areas of application

- Vibrator
- Wood processing machines
- Centrifuges
- Drives with large centrifugal masses
- Belt drives

4.1 Foreseeable incorrect usages

The appliances of the series VB S may not be used for the following applications:

- For the function of a stopping brake (permanent brake).
 - for braking alternating current motors with an oscillating weight with a stopping time exceeding 25s.
 - to operate alternating current motors with an oscillating weight with an unbraked run-down time exceeding 300s.
 - for operation on a supply network generated by a static transformer, (frequency transformer).
-

5. EU Declaration of Conformity

EU Declaration of Conformity

The manufacturer / marketing agency
(authorised agent of the manufacturer / marketing agency established in the community)

Name / Address: PETER electronic GmbH & Co. KG
Bruckäcker 9
92348 Berg

herewith declares that the following product (device, component, component part), in the implementation as supplied,

Product designation: **Braking Device**
Series / Type designation: VB S ... - 72/ - 132/ - 222/ - 360
Article number: 2B500...
Year of construction: 2018

corresponds to the determinations in accordance with EU Directive:

- | | |
|-------------------|---|
| 2014/30/EU | over the electromagnetic compatibility |
| 2014/35/EU | concerning electric operating resources for utilisation within certain voltage threshold limits |
| 2011/65/EU | for the limitation of the utilisation of certain hazardous materials in electrical and electronic devices |

The following harmonised standards were employed:

- | | |
|--------------------------------|---|
| EN 60947-1:2007+A1:2012 | Low-voltage switching devices
General stipulations |
| EN 60947-4-2:2012 | Low-voltage switching devices
Contactors and motor starters - semi-conductor motor control units
and starters for AC voltages |

This product has been designed as a Class A device. Use in Class B environments (such as residential areas) may cause radio interference. In case of malfunctions, appropriate measures are to be taken.

This EC Declaration of Conformity loses its validity if the product is altered or changed without approval. The undersigned bears sole responsibility for the presentation of this declaration.

Berg, 29.01.2026
(Location, Date)

Bernhard Tischner, Managing Director
(Undersigned and function of the undersigned)


(Signature)

6. Declaration related to functional safety

EC Type-Examination Certificate

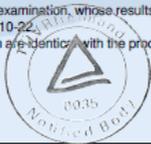




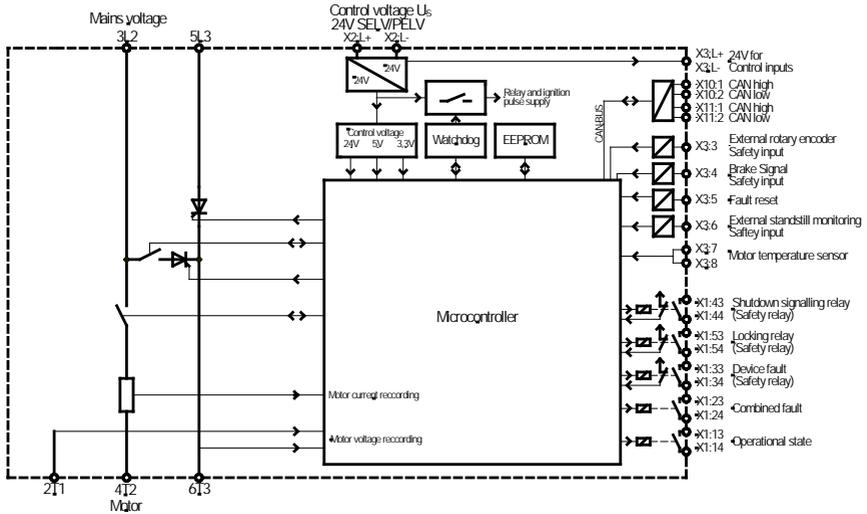
**Product Safety
Functional
Safety**

www.tuv.com
ID 060000000

Reg.-No.: 01/205/5859.00/21

Product tested	Safety Functions within the Brake Control Unit VersiBrake - Monitored, controlled stop to standstill - Secure control of a safety gate - Motor standstill monitoring	Certificate holder	Peter electronic GmbH & Co. KG Bruckäcker 9 92348 Berg Germany
Type designation	VB S NNN-SS X *NNN: 480, 600 (Supply Voltage [V]) *SS: 72, 132, 222, 360 (Nominal Current [A]) * X : non safety relevant		
Codes and standards	EN 60947-4-2:2012 EN ISO 13849-1:2015	EN 62061:2005 + AC:2010 + A1:2013 + A2:2015 EN 61508 Parts 1-7:2010	
Intended application	The Safety Functions within the Motor Brake Control Unit VersiBrake comply with the requirements of the relevant standards (Cat. 2 / PL c acc. to EN ISO 13849-1, SILCL 1 acc. to EN 62061 / EN 61508) and can be used in applications up to PL c and SIL 1. Power shut down has to be implemented by an external motor contactor relay which complies with the requirements of EN 60947-5-1 or EN 60947-4-1. The standstill output (X1:43, X1:44) could be used for Guard interlocking and Guard locking applications. The requirements of EN ISO 14119 apply for the selection and installations of appropriate equipment.		
Specific requirements	The Assembly- and Commissioning Instructions shall be considered. To ensure that maintenance work on the electrical connections of the motor can be carried out safely, the main power supply has to be interrupted before the motor contactor relay and the power ports of the Motor Brake Control Unit.		
It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.			
Valid until 2026-10-28			
The issue of this certificate is based upon an examination, whose results are documented in Report No. 968/FSP 2298.00/21 dated 2021-10-22. This certificate is valid only for products which are identical with the product tested.			
Köln, 2021-10-28		 Notified Body for Machinery, NB 0035	
		 Dipl.-Ing. Jelena Stenzel	

7. Block diagram



8. Commissioning



Installation notice

Electro-technical specialist knowledge is required for installation and commissioning.

The operational start-up is implemented in 4 steps:

1. Installation see chapter 8.1 Installation information
2. Connection and see chapter 8.2 Connection
3. Parameter setting see chapter 8.5 Parameter adjustments
4. Test of safety function

Commissioning must end with a test of the efficiency of the safety functions!

It must be absolutely ensured that no-one is in the safety zone of the machine or near the drive motors.

- If the motor is switched off, a braking must be initiated and by the third braking at the latest, the motor must come to a complete standstill within 8s.
- From the start of the motor to the standstill of the motor after braking (rotating motor) the MS-output contact X1:43 - X1:44 must be open. If a protective door is attached to this contact, this must be closed and locked if the motor is turning.
- If the motor spins down when the mains voltage is closed off after a certain rotational speed is reached, the closed protective door must remain closed and locked with the applied 24V control voltage must.
- the running-down motor must come to a complete halt with its greatest possible oscillating weight muss within 300s from the nominal rotational speed.



Warning note

Consider the maximum admissible starting and braking currents (see Technical Data on Page 48)

8.1 Installation information



Attention: Electric shocks can be fatal!

The following conditions are to be adhered to for a proper operation of the VersiBrake Safe:

1. The VB S is to be used under overvoltage conditions of Category III.
 2. The device may be used only in an environment with degree of pollution 2 or better, in accordance with DIN EN 60644-1/IEC664.
 3. The device is to be installed in a housing (protection type at least IP54). Attention is to be paid that the waste heat generated by the braking device can be removed via the housing.
 4. The device must be operated free from contamination by water, oil, carbon, dust etc.
 5. With the connection of the devices of construction size 1 (72A, 132A, 222A), it is to be noted that the network and motor lines are stripped of insulation for 18 mm and, in case of construction size 2 (360A), stripped of insulation for 15 mm. If lines are stripped of insulation too short, or with too short end sleeves and are used for the connection, this leads to a high contact resistance and to ultimate destruction.
 6. For use in North America, UL and CSA approvals.
Utilisation en Amérique du Nord, certifié UL et CSA.
 - 6.1 Wiring diagram: see Table 18, "Anschlussvorschläge," on page 59
Schéma de câblage : voir Tableau 18, " Schéma de raccordement General ", à la page 59
 - 6.2 The terminal tightening torque of lbs-in (Nm): see Table 15.1, "Allgemeine Angaben," on page 52
Couple de serrage des bornes en lbs-in (Nm) : voir Tableau 15.1, " Caractéristiques techniques ", à la page 52
 - 6.3 To be used in a Pollution Degree 2 environment only.
À utiliser uniquement dans un environnement de degré de pollution 2.
-

6.4 Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 600 Volts Maximum and when protected by fuse or circuit breaker tabulated in the table below:

Peut être utilisé sur un circuit capable de fournir un courant RMS symétrique de 5 kA maximum, 600 volts maximum et si protégé par fusible ou disjoncteur tabulé dans le tableau ci-dessous:

Device Model	Branch Circuit Protection (Cat. No)	Max. Branch Circuit Protection Rating
VBS-72	Class RK5 Fuses	25A
VBS-72	Circuit breaker PKE65-XTU-65	16A
VBS-72	Circuit breaker 3RV2021-4CA	18A
VBS-132	Class RK5 Fuses	40A
VBS-132	Circuit breaker PKE65-XTU-65	30A
VBS-132	Circuit breaker 3RV2031_4PA	34A
VBS-222	Class RK5 Fuses	63A
VBS-222	Circuit breaker PKE65-XTU-65	53A
VBS-222	Circuit breaker 3RV2031_4KA	62A
VBS-360	Class RK5 Fuses	100A
VBS-360	Circuit breaker PKE65-XTU-65	65A
VBS-360	Circuit breaker 3RV2031_4KA	73A

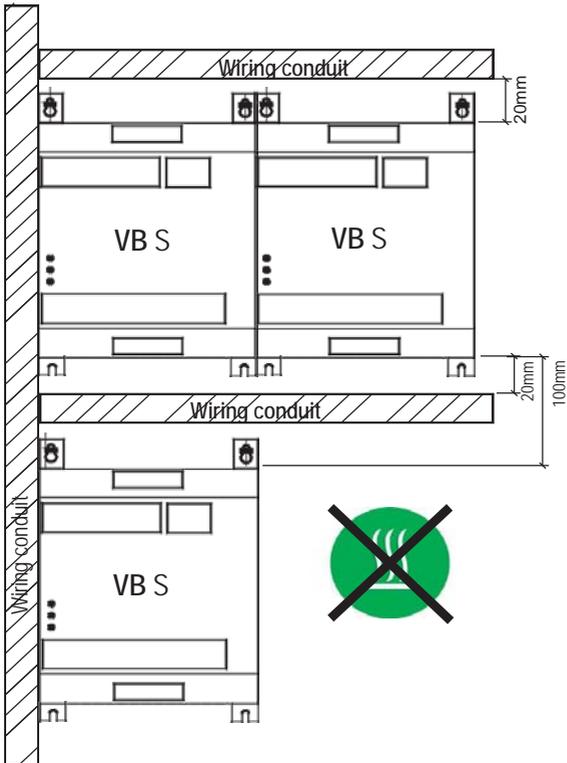
6.5 Surrounding temperature max. 45°C

Température ambiante 45 °C max.

6.6 Use copper conductors 60/75°C, or 75°C only

Utiliser des conducteurs en cuivre avec une résistance thermique de 60/75 °C, ou 75 °C uniquement.

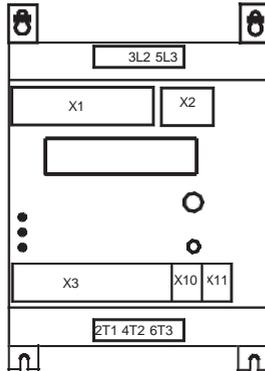
Set the device vertically on a vertical installation surface. The motor terminals are to be mounted below. The installation is implemented by screwed connection of the four fastening plates. The devices can be set in a row near each other without separation distance. If the devices are arranged above each other, a separation distance of 100 mm must be kept between the heatsinks. No additional large heat sources may be arranged below the devices, such as e.g. devices with high power dissipation, heat resistors or similar.



Warning note

For the avoidance of heat backups, a separation distance of at least 20 mm is to be kept between wiring system conduit and device.

8.2 Connection



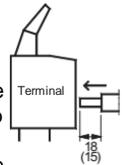
Power module (see also terminal diagram)

Terminal 1 L1:	Mains voltage L1
Terminal 3L2:	Mains voltage L2
Terminal 5L3:	Mains voltage L3
Grounding connection \oplus PE	PE
Terminal 2T1:	Motor connection T1
Terminal 4T2:	Motor connection T2
Terminal 6T3:	Motor connection T3



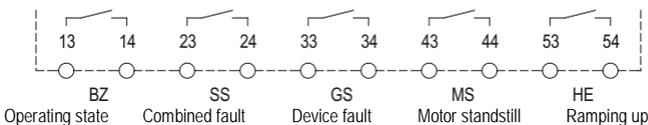
Attention!

In case of the connection of the mains and motor cables for the construction size 1, strip these of insulation at least 18 mm and, for the construction size 2, strip these of insulation at least 15 mm!
Torque for construction size 2: 3 ... 3,5Nm (26,6 ... 31 lbs-in)



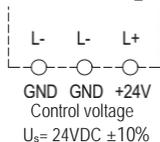
Control part

Control outputs - terminal block X1



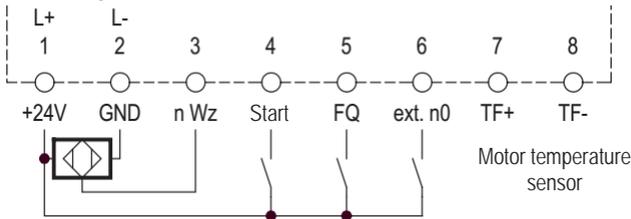
With the output contacts, it involves relay contacts 250VAC/4A; 30VDC/4A

Control voltage U_s - terminal block X2



An external control voltage U_s of 24VDC \pm 10% is connected to the terminals L+, L-.

Control inputs - terminal block X3



The input impedance of the control inputs is 5 kOhm. Switch contacts, which can securely switch the lower control currents (4.8mA), must be used for the control activation!

The terminal X3:1 (L+) is connected internally with the terminal X2:L+.

The terminal X3:2 (L-) is connected internally with the terminal X2:L-.

The input terminals X3:3 to X3:6 are control-activated with the L+ potential.

X3:3 -n tool . recording of the tool rotational speed

X3:4 -Start-Start sequence bridged -> open -> bridged

X3:5 -FQ- reset of the combined fault 24 V - reset of fault.

X3:6 -ext. n0-external standstill monitoring. 24 V - motor standstill identified.

The motor temperature monitoring is connected to the terminals X3:7 and X3:8 (TF+ and TF-).

- Thermo-switch (open = over-temperature)
- Motor PTC
- Motor KTY84 (case of utilisation of a KTY, the motor temperature can be scanned over CAN bus or LCD operator panel).
- Motor PT1000 (case of utilisation of a PT1000, the motor temperature can be scanned over CAN bus or LCD operator panel).

CAN sockets X10, X11 (RJ45)

1 = CAN H

2 = CAN H

3 = GND



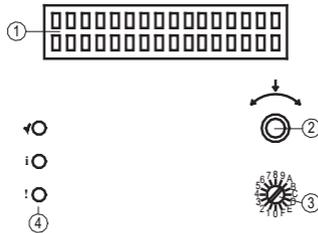
Attention! Electric shocks can be fatal!

Even if the motor stops, it is **not** isolated galvanically from the network.

8.3 LCD operator panel / menu language

The menu language can be changed through pressing the button and holding it pressed. After approx. 5 sec, the display changes into the Selection mode and the required language can be adjusted with the rotating encoder. The adjusted language is confirmed with the button and the display changes into the selected language.

The devices are equipped with a two-line LC display to display the states and programming modes, as well as with a rotating encoder pushbutton function to control and data input.



1	two-line display for operating states, parameters and programming
2	<p>Rotation encoder with pushbutton function for navigation in the menus and data input</p> <p>Scrolling in the menus and value input</p> <p>Pushbutton actuation:</p> <p>1. short press - → selecting a menu item</p> <p>2. Hold for 5s - → Language selection</p> <p>3. Hold for 10s - → Quick access to faults</p>
3	CAN - bus address selection switch
4	<p>3 LED's for the status display</p> <p>● LED green - device ready to operate</p> <p>◐ LED yellow – off</p> <p>◑ LED red -</p> <p>Double flashing - Operating state "Standby"</p> <p>Continuous lighting - Operating state "Braking"</p> <p>Continuous lighting - Operating state "Bypass"</p> <p>Continuous lighting - Device fault</p> <p>Flashes - Combined fault</p>

The LC display has a backlight with a standard lighting duration of 30s. The lighting duration can be changed under the system parameters in programming mode. If the rotating encoder or button becomes activated, the backlight switches on.

8.4 Display / Operation

In the operator panel, a wide range of operating modes of the braking device are displayed.

After the switching on of the mains power supply, as well as the control voltage, the device is initialised and a test braking then carried out. If the test braking has been completed successfully, the device changes into the operating state "Standby" and the device status appears in the display.

01/11	Status indicator	-- Position in the current menu
Standstill	OK	-- Engine standstill detected (status line)

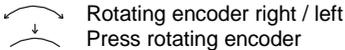
In the status display you can scroll through various operating values. These are as follows:

01/11 Standstill OK	
02/11 U-Motor V	(Motor voltage)
03/11 U-Mains V	(Line voltage)
04/11 Device State	(Device operating status)
05/11 Device Temp °C	(Device internal temperature)
06/11 Therm.Device %	(Device thermal image)
07/11 HeatsinkTem R	(Heatsink temperature)
08/11 MotorPTC R	(Motor temperature)

Furthermore, you can switch to the following menus:

09/11 Operating Data	(see 8.6 Operating data)
10/11 Error Memory	(see 8.7 Fault mode)
11/11 Settings	(see 8.5.2 Settings: Basic parameters)

The device is operated with the rotating encoder placed on the front side with pushbutton function.



The device is operated using the rotary switch with integrated button function located on the front.

As a result of right-hand or left-hand turning of the rotating encoder () , scrolling in the main menu takes place. After selection of a menu, the rotating encoder is pressed shortly () , a branch-out into the corresponding sub-menu occurs.

If no actuation is implemented for 20 sec in the status Parameter mode or 60 sec in the Programming mode, the display returns to the standby operating state. On leaving the Programming mode, the values are saved on request only.

You can now use the rotary encoder to scroll through the submenus. If a submenu is selected, it can be selected by briefly pressing the button. The respective menu can be exited by selecting the last menu item "Back".

In operating mode "Motor running" or during the rundown of the safety time period, a change can be made to the status parameter menu or into the Programming mode. As a result of pressing  during running motor or during the safety time period, a change is made into the main menu. You can now choose between the menu groups Status Parameters and Programming Mode.

8.5 Parameter adjustments

The devices are delivered with a default parameter set.

Motors with a power rating which is in the range of the motor power rating are adjusted to an optimal braking time after a maximum of 3 braking operations.

The default value for the braking time is 8 sec.

If a parameter adaptation is necessary, this can be carried out over CAN bus or the LC display panel with rotation selection key, according to the parameter list.

8.5.1 Programming mode

In order to open the programming menu, confirm the Programming mode . A password (default "2") must be entered. For this purpose, turn the rotating encoder to the right or left () until the correct password is displayed. Then press the rotation knob shortly () and confirm the password with that.

8.5.1.1 Change of parameter values

Scroll in the programming menu  until the required group is displayed and confirm  with button. Select with  the corresponding parameter and confirm . As a result of short pressing  of the button, a switch is made into the Change mode and the cursor flashes. The selected parameter is shown with its value in the display. Change the value with the rotating encoder  until the setpoint value is reached. As a result of short activating  the button, the cursor changes from the ones digit to the tens digit and the parameter value can then be changed in 10 steps. By further pressing  of the button, the cursor is set to the next digit or reset to the ones digit again. For saving the changes or leaving the Change mode, press the button . In the display there appears "Save parameters". Set the required action

no = Leave without saving

Yes = Save parameter value and leave

by rotating the rotating encoder  in and confirm by short pressing the button . The display changes back into the higher-level menu group which was previously selected. In order to leave the programming menu, select the menu item "back"  and confirm . The display changes back into the main menu or into the Standby mode.



Warning note

If the rotating encoder 60s is not activated in the programming mode and/or change mode, then the programming mode is exited without saving. A change is made into the main menu.

8.5.2 Settings: Basic parameters

Menu item	Display	Description	min	max	factory settings	CAN-param.	user settings
Rated Motor Current A	Rat.Mot.Cur. A	At factory settings or factory reset, the rated motor current corresponds to the lowest recommended motor power for the respective device size at 400V mains voltage, see technical data on page ????. The max. adjustable rated motor current corresponds to the recommended max. motor power for the respective device size at 400V mains voltage, see technical data on page ???.	$0,1 \cdot I_{e,2}$	⁴⁾	⁵⁾	4032	
Set Point Brake Current A	BrakeCurr. A	The setpoint value of the braking current at BrakeMode 0, 1 or 2, see parameter selection 4003.	$0,15 \cdot I_{e,2}$	$I_{e,2}$	$2,5 \cdot I_{Amax}$	3005	
BrakeMode 0=SO 1=SwO 2=t 3=PA	BrakeMode	Selection of the braking mode as the motor is stops. 0 = SO -> Standstill-dependent braking with braking time optimisation 1 = SwO -> Standstill-dependent braking without braking time optimisation 2 = t -> Time-dependent braking 3 = PA -> Braking with fixed phase angle, see parameter 4801	0	3	0	4003	
Motor Braking Time ms	Bra.Time ms	- At BrakeMode 0 " Standstill-dependent braking with braking time optimisation" - the value is the setpoint for braking time optimisation.. - At BrakeMode 2 "Time-dependent braking" - the value correspond to the braking time. See Parameter BrakeMode 4003.	500	40000	8000	3006	
Sensor Motor Temperature	Motor Temp.	Type of engine temperature sensor (PTC/KTY84/switch) 0 = PTC 1 = KTY84 2 = switch 3 = PT1000 (default)	0	3	3	4012	
Opts Operating State relay	StatusRel.	Allocations of the operating states that are displayed on the B2 signal relay. (Default 0, binary coded: 010001100100=464) 0 = state is not displayed 1 = state is displayed bit 0 = waiting time 1 = determine device data 2 = initialize EEPROM 3 = measure mains frequency 4 = carry out test braking 5 = standby 6 = not assigned 7 = motor running 8 = braking 9 = device or collective fault 10 = device data fault 11 = EEPROM fault 12 = test program	0	8191	0	4077	
Option Star - Delta-Start-up	Star- Delta-	Activation of the star-delta start function (collective fault relay = star contactor relay, operating status relay = delta contactor relay) 0 = star-delta start deactivated 1 = star-delta start activated	0	1	0	4200	
Star-Contactor On-time ms	Close.Time ms	For the switch-on time for the star contactor when the star-delta start function is activated, see parameter 4200.	3000	15000	4000	4201	
Language	Language english	Select display language: 0 = German 1 = English	0	1	0	3010	

8.5.3 Expert Mode

In order to reach the Expert mode and thus to change the extended parameter set, the input of an additional password is necessary. The change of these parameters presupposes very good system know-how and should be implemented with great caution. (Factory setting: 2)

8.5.3.1 Brake parameter

Menu item	Display	Description	min	max	factory settings	CAN-param.	user settings
Minimal Braking Current A	I Br.min. A	Minimum possible braking current at BrakeMode 0 or 1, see selection parameter 4003. The braking current is not controlled below this minimum value. Thus a deceleration of the motor is ensured.	$0,10 * I_{lc}^{(2)}$	$0,9 * I_{lc}^{(2)}$	$1,5 * I_{Mot}^{(1)}$	4060	
Monitoring Time Int. Brake ms	tMo.in.Br ms	Monitoring of the braking time with internal standstill monitoring unit. The standstill must be detected within this time. Only in case of BrakeMode 0 or 1, see parameter selection 4003.	1000	25000	10000	4005	
Max Second Brake Time ms	max 2tBr ms	Post-braking time after motor standstill is detected only with braking type 0 or 1, see parameter selection 4003.	1000	10000	10000	4013	
Selection Brake Termination	Sel. BrakeTe.	Activation or deactivation of the braking interruption, in order to perform a new motor start during a braking period, or to end the braking sequence completely before a new start is performed. 0 = No start during braking possible: Brake period will be finished before a new start is performed. 1 = Start during braking possible: Braking is interrupted, new start is possible immediately.	0	1	0	4030	
Comb. Fault 3x no Standstill	Co. Fau. 3xN.St.	Device fault is triggered if no standstill is detected 3 times.	0	1	1	4021	
Ext. Standstill Monitor	ext.St.Mon.	Standstill detection with external standstill monitor. 0 = inactive 1 = active	0	1	0	4004	
Ext. Brake Time Monitor. ms	Ex.Br.Mo. ms	Monitoring the braking time with an external standstill monitor. The standstill must be detected within this time. Only with an external standstill monitor.	1000	25000	10000	4015	
Ext. Standstill Signal ms	Ex.st.si. ms	Measuring time of the external standstill signal after switching off the braking current. Only with external standstill monitor.	1000	20000	6000	4031	
Test Braking Delay ms	Te.br.de ms	If there are several devices in a system, the test braking is triggered with a delay time. Delay time = test braking delay * switch position on the CAN address selector switch - 1 (0 = 0).	0	20000	3000	4080	
Threshold Motor Standst. mV	Thr.Mo.st mV	Limit value for detecting voltage standstill. A change affects the detection of motor standstill. *	0	10000	4000	4069	
I-Amplification Brake	I-Ampl.Brak.	I-component braking current control. Only with current control.	0	10	9	4008	
P-Amplification Brake	P-Ampl.Brak.	P-component braking current control. Only with current control.	0	3)	3)	4009	
Current Low Lim. Brake %	IBr.Low.Lim %	In braking mode, a device fault is triggered after the measuring time has elapsed and the current falls below the lower limit.	0	100	5	4516	
Monitor. Current Low Limit ms	Mo.Cu.Lo. ms	Measuring time of the lower current limit in braking operation after which a device fault is triggered.	0	10000	500	4517	
Current HI Limit Brake A	IBr.Hig.Lim A	In braking mode, a device fault is triggered after the measurement time has elapsed and the current limit has been exceeded.	0	10000	10000	4518	
Monitor. Current HI Limit ms	Mo.Cu.Hi. ms	Measuring time of the current upper limit in braking operation after which a device fault is triggered.	0	10000	300	4519	
Mode Delay Time Brake	Mod.tDelay.Br.	This parameter is used to select the type of delay time between motor activation and activation of the braking current. 1 = fixed delay time 2 = motor voltage dependent If the star-delta starting option is selected, a fixed delay time is always set.	1	2	2	4017	
Delay Time Brake ms	tDelayBr. ms	Delay between motor release and activation of the braking current at Mode Delay time 1 "fixed delay", see parameter 4017.	0	4000	300	4018	
Threshold Motor Voltage V	U-Mot.Thr. V	Limit value of the motor voltage in delay time mode 2 "Delay time dependent on motor voltage" see parameter 0x4017.	30	200	72A->300 132A->600 222A->900 360A->1200	4019	
Debounce Time Brake Relay ms	tDeb.Rel. ms	Duration of the bounce time of the brake relay. Time between closing the brake relay and controlling the braking current.	50	1000	50	4020	
Standstill Incr. Delta-t ms	Sta.In.dt ms	Time range of the voltage rise during standstill detection by remanent voltage.	4	200	40	4038	
Standstill Incr. Delta-U mV	Sta.In.du mV	Magnitude of the voltage rise when standstill is detected by remanent voltage.	200	20000	20000	4039	

Standstill OV Delta t ms	Sta.OV.dt ms	Time range of the 0-line undershoot during standstill detection by remanent voltage.	4	1000	15	4040	
U-Remanence Cons Delta t ms	U-Re.C.dt ms	Time in which the remanence voltage must remain constant after the motor has stopped.	20	5000	1000	4041	
U-Remanence ConsWindow mV	URe.Co.Wi mV	Limit value minimum voltage at which the standstill detection works by remanent voltage.	500	10000	10000	4042	
Toler. Remanence Voltage mV	URe.Tol.mV	Permissible voltage tolerance of standstill detection by remanent voltage.	0	500	100	4043	
U-Rem Values Out Of Tolerance	URe.V.o.o.To	Number of values that do not have to be within the permissible tolerance of standstill detection by remanent voltage. *	0	1000	429	4075	
Sensitivity Curr Standstill	Ist Sensitiv.	Sensitivity of current standstill detection * 0 = Off 1 = medium 2 = high	0	2	1	4522	
Remanence Volt. Standst. OV	URe.Sta.OV	Standstill OV when standstill is detected by remanence voltage. * 0 = Standstill is detected by remanence voltage Off 1 = Standstill is detected by remanence voltage On	0	1	1	4524	
Phase Angle Brake	Ph.angl.Br.	Fixed phase angle. PE internal.	1600	9500	3000	4801	

Warning note *



The parameters identified with * may be changed only in discussion with PETER electronic. A change affects the identification of the motor standstill. A change can lead to a device failure in the worst case.

8.5.3.2 System parameter

Menu Item	Display	Description	min	max	factory settings	CAN-param.	user settings
Switch Delay StarDelta ms	St.De.S.De ms	For the switching delay between star and delta contactor when the star-delta start function is activated, see parameter 4200.	50	500	100	4202	
Device Warning Temperature °C	Dev.Wa.Te. °C	If the internal temperature of the device reaches the set value, a warning is issued. (Default 70°)	40	80	70	4026	
Motor Warning Temperature °C	Mot.Wa.Te. °C	If the motor temperature reaches the set value, a warning is issued. Only with KTY and PT1000 and motor protection active.	80	190	135	4023	
Trip Temperature Motor °C	Tri.Te.Mo. °C	If the motor temperature reaches the set value, a collective fault is output. Only with KTY and PT1000 and motor protection active. (Default 155°)	120	200	155	4022	
Re-Start Temp. Motor °C	ReS.Te.Mo. °C	If the motor temperature falls below the restart temperature, the "general fault motor overtemperature" can be acknowledged. Only with KTY and PT1000 and motor protection active. (Default 130°)	80	160	130	4024	
Deactiv. Motor Protection	Dea.Mot.Prot.	Motor temperature monitoring is deactivated. The setting in CAN parameter 0x4012 is therefore ineffective. 0 = Motor protection active (default) 1 = Motor protection inactive	0	1	0	4033	
External Tool Speed	ext.Too.Spe.	Aktivierung der externen Erfassung der Werkzeugdrehzahl. 0 = Werkzeugdrehzahl nicht erfasst (Default) 1 = Werkzeugdrehzahl erfasst	0	1	0	4035	
Min. Tool Speed	minToo.Spe.	If the tool speed falls below the minimum tool speed, a collective fault is triggered.	1	10000	2500	4078	
Monitor Duration Tool Spd ms	tMo.To.Sp ms	Measuring time in which no pulse from the tool encoder is to be recorded. Standstill detection.	6000	12000	6000	4016	
Tool Speed Tolerance %	To.Sp.Tol. %	If the tool speed drops in the bridged device state and falls below the tool speed tolerance, a collective fault is triggered (belt break detection).	50	95	80	4076	
Options Combined FaultRelay	Op.Co.FaRe.	The assignment of the collective faults that are displayed with the SS signal relay. (Default 1020, binary coded: 0111111100) 0 = fault is not displayed 1 = fault is displayed bit 0 = not assigned 1 = not assigned 2 = tool speed deviates from target speed 3 = motor overtemperature 4 = braking time optimization not possible 5 = mains phase failure 6 = heat sink overtemperature 7 = maximum braking time exceeded 8 = maximum device overtemperature exceeded 9 = no start contact connected 10 = not assigned	0	2047	1020	4029	
Light Period LC-Display s	Li.P.LC-Di. s	Duration of the LCD backlight. (Default 30s)	5	120	30	3007	
Mains Switch-off Voltage V	UMa.Sw.-off V	Minimum mains voltage level between the 2 phases, which is recognized as the shutdown threshold of the mains voltage. After the mains shutdown measurement time has elapsed, parameter 0x4501, a collective fault is triggered.	0	700	20	4507	
Monitoring Time U-mains ms	tMo UMa ms	Measuring time from mains shutdown to triggering of a collective fault.	0	10000	250	4501	
Password	Password	Access password for expert mode	0	200	2	3009	

8.5.3.3 CAN parameter

Menu item	Display	Description	min	max	factory settings	CAN-param.	user settings
CAN-open Baudrate kB	Baudrate kB	speed of the CAN bus	0	1000	125	4037	
CAN-open Node ID Adresse 0	NodeID Ad.0	Address setting CANopen NodeID 0	1	127	57	4036	
CAN-open Node ID Adresse 1	NodeID Ad.1	Address setting CANopen NodeID 1	1	127	58	4044	
CAN-open Node ID Adresse 2	NodeID Ad.2	Address setting CANopen NodeID 2	1	127	59	4045	
CAN-open Node ID Adresse 3	NodeID Ad.3	Address setting CANopen NodeID 3	1	127	60	4046	
CAN-open Node ID Adresse 4	NodeID Ad.4	Address setting CANopen NodeID 4	1	127	61	4047	
CAN-open Node ID Adresse 5	NodeID Ad.5	Address setting CANopen NodeID 5	1	127	62	4048	
CAN-open Node ID Adresse 6	NodeID Ad.6	Address setting CANopen NodeID 6	1	127	63	4049	
CAN-open Node ID Adresse 7	NodeID Ad.7	Address setting CANopen NodeID 7	1	127	64	4050	
CAN-open Node ID Adresse 8	NodeID Ad.8	Address setting CANopen NodeID 8	1	127	73	4051	
CAN-open Node ID Adresse 9	NodeID Ad.9	Address setting CANopen NodeID 9	1	127	74	4052	
CAN-open Node ID Adresse A	NodeID Ad.A	Address setting CANopen NodeID 10	1	127	75	4053	
CAN-open Node ID Adresse B	NodeID Ad.B	Address setting CANopen NodeID 11	1	127	76	4054	
CAN-open Node ID Adresse C	NodeID Ad.C	Address setting CANopen NodeID 12	1	127	77	4055	
CAN-open Node ID Adresse D	NodeID Ad.D	Address setting CANopen NodeID 13	1	127	78	4056	
CAN-open Node ID Adresse E	NodeID Ad.E	Address setting CANopen NodeID 14	1	127	79	4057	
CAN-open Node ID Adresse F	NodeID Ad.F	Address setting CANopen NodeID 15	1	127	80	4058	

8.5.3.4 factory reset

Menu item	Display	Description	min	max	factory settings	CAN-param.	user settings
System Reset Perform	System Reset	All parameters are set to the delivery state or default settings according to the selection. - Perform factory reset no -> exit reset menu. - Perform factory reset yes -> device is set to the delivery state. - Reset CAN communication - Reset fault memory - Reset max. values and operating data	0	4	0	3000	

8.6 Operating data

Menu item	Display	Description
Actual Starts Total	NuStaTo s	Current total of starts performed
Act. Brake Time Total s	t-Br.To s	Current sum of cumulative braking times
Act. Motor Time Total s	t-Mo.To s	Current sum of the cumulative time of the engine running
Act. Standby Time Total s	t-St.To s	Current sum of cumulative time in standby mode
Act. Operat. Time Total s	t-Op.To s	Current sum of cumulative operating time
Max Mot. Current Act. value A	I-max A	Maximum value of the braking current
Actual Control Voltage V	U-maxMa V	Internal control supply voltage
Actual Motor Voltage V	U-maxMo V	Currently measured motor voltage
Maximal Braking Time s	t-maxBr s	Longest measured braking time
Actual Device Temperature °C	T-maxDevic °C	Current device temperature
Actual Heatsink Temperature R	T-maxHeats R	Current resistance value of the heat sink temperature sensor (PTC)
Act. Motor Temp. Resist.PTC R	T-maxMotor °C	Current motor temperature. Depending on the selected temperature sensor X, the display value YY corresponds to: - PTC = resistance value of the temperature sensor in the motor in Ohm - KTY84 = °C - Switch = voltage at the measuring input in mV - PT1000 (default) = °C - no motor temperature sensor selected = 0

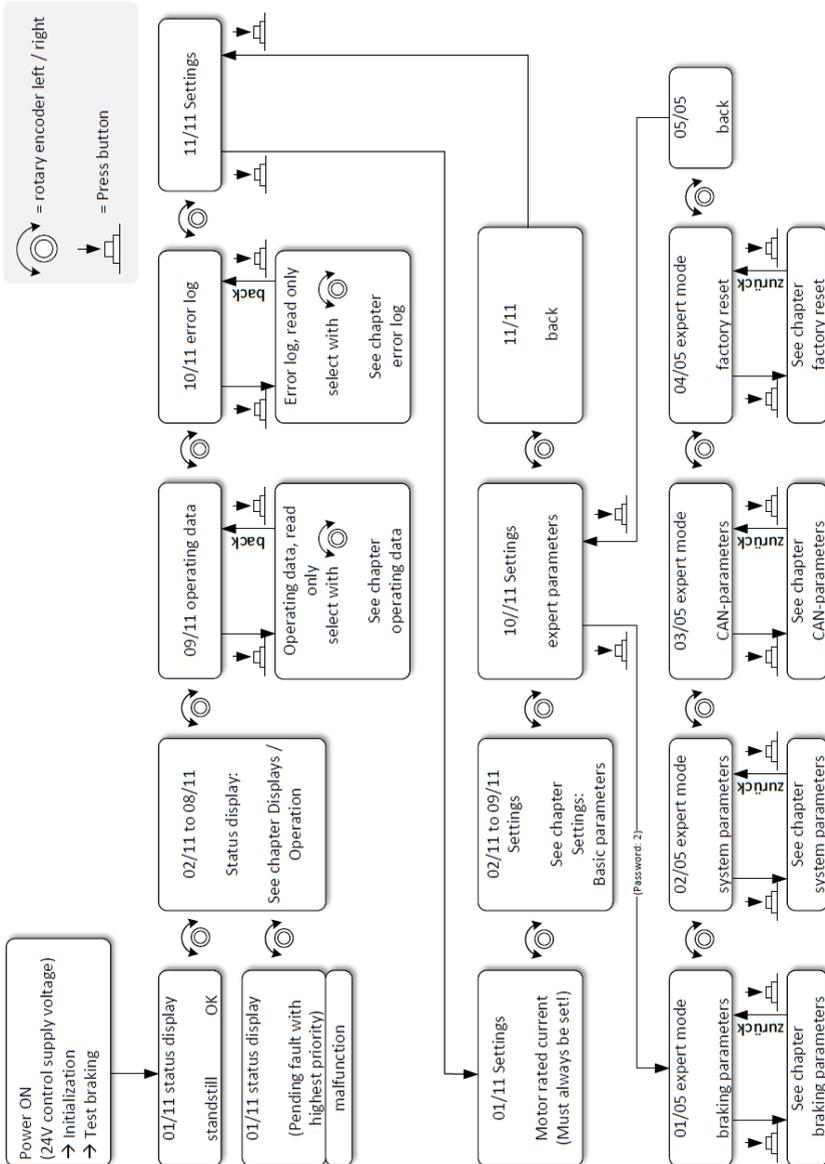
8.7 Fault Mode

If a fault occurs, the display changes into the Fault mode. According to the cause of malfunction, the display indicates the corresponding fault group, combined fault or device fault, output and the corresponding reason for malfunction.

Turning the button switches back to the status menu and allows parameters to be set and data to be read out (see chapter 8.4).

This can be used to access the error log. The last five devices or collective faults are listed there, one after the other.

8.8 Operating sequence



8.9 System reset

A reset to factory default setting, setting all parameters into the default status, can be implemented in three ways.

- a. The VB S ... can be set by simply wiring the reset input into the default status. Terminal 1 "L+" must be connected for 15s with terminal "FQ" for this purpose. If the device is reset to the default condition, then the yellow LED lights up briefly. All adjustments are now set to the default value.
- b. With the LC operator panel, the menu item system reset is selected in the Programming mode, in the Expert mode submenu and confirmed with "1". reset to factory default setting reset is implemented and the yellow LED lights up shortly. All adjustments are set to the default values.
- c. Over CAN bus, the CAN parameter 0x3000 is set to "1". All adjustments are then set to the default value.

9. Braking

9.1 Standstill-dependent braking with braking time optimisation

The motor is braked at the set current limit 15...100% of IBR_max. Initial braking is carried out with $2,5 \cdot I_{Mot}$ (CAN-Param. 0x4032), but always with a maximum of only IBR_max.

Depending on the inertia of the motor and the tool attached to the motor, the braking current regulates itself within three braking processes such that the drive comes to a standstill in the required time desired. In the factory, a required braking time of 8s is parameterised (CAN-Param. 0x3006). The regulation range within which the braking current can vary lies in the range 15...100% of IBR_max. the braking current is optimised after every braking procedure. The last braking parameters remain stored even if the mains voltage fails.

After a tool change or adjustment of the required braking time, a setting of the braking current is again reached after a maximum of 3 braking procedures with which the drive is stopped in the required braking time desired.

The braking time optimisation can only function correctly if the drive has reached its full revolution speed before braking. However, since the attainment of the nominal rotation speed of the drive cannot be monitored with the VersiBrake Safe, it is assumed that the start-up time of the drive corresponds approximately to the specified required braking time in (CAN-Param. 0x3006). That is, the braking time optimisation is not active until the set required braking time has elapsed after the motor is started, as it cannot be assumed that the drive has reached its full nominal revolution speed.

All parameters related to "Braking" can be adapted over the LCD operator panel or CAN bus.



Warning note:

Care must be taken that the specified switching frequency, see Technical Data in chapter 15, (test conditions according to DIN EN 12750) is not exceeded. In the operation modes "Standby" and "Motor running", the power semiconductors cool down.

9.2 Safety time

If no standstill is identified after a braking procedure, the safety time, or unbraked runout time elapses. The standstill notification output contact remains open until the end of the safety time (which prevents e. g. opening of a safety door). The unbraked runout time is the time until the free running drive safely reaches a standstill.



Attention: Electric shocks can be fatal!

Even if the motor stops, it is **not** isolated galvanically from the network.

10. Thermal overload protection

The device series VB S monitors the motor and device temperature.

10.1 Motor temperature monitoring

The type of the motor temperature probe is set via the system parameter "Motor temperature monitoring" (CAN-Parameter 0x4012).

A motor temperature switch, a motor PTC, a motor KTY84 or a PT1000 can be connected. Over CAN bus, a prior warning can be output as soon as the motor has reached the set-adjusted pre-warning temperature. The device enters the fault mode Collective fault if the motor exceeds the set shutdown temperature. This can be set with the system parameter "Switch off motor °C" (CAN-Param 0x4022).

If the motor temperature does not have to be monitored, a motor sensor can be dispensed with. TF- and TF+ must then be bridge-connected and a thermoswitch must be programmed over the parameterisation. Alternatively, a 1100 Ohm resistance can be connected between TF+ and TF-.

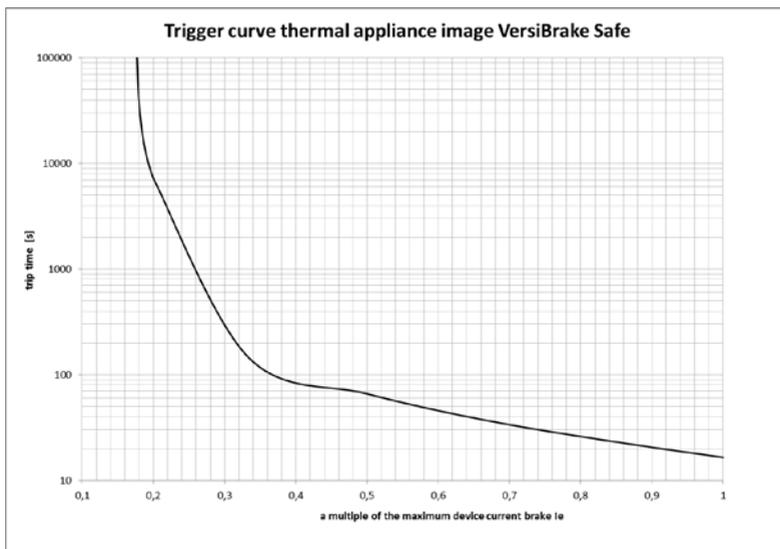
With the "Deactivation motor protection " function activated, (CAN-Param. 0x4033), no error message is issued if the set switch-off temperature is exceeded. However, the current motor temperature can be read via the LCD display or via CAN-Bus and a warning is given if the pre-warning temperature is exceeded.

10.2 Device temperature monitoring

10.2.1 thermal device image

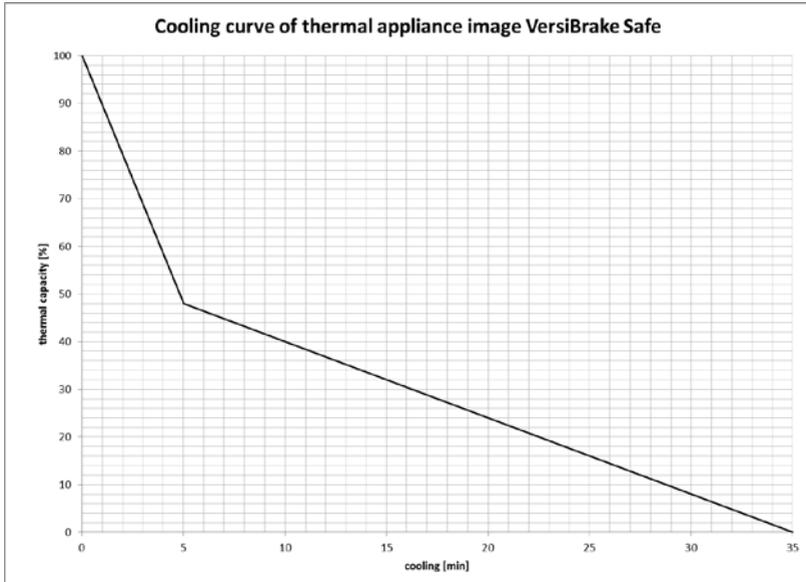
A thermal overload protection for the appliance is integrated in the VB S. Operating currents are recorded with a current sensor and a thermal image of the appliance is calculated. The trigger value for the appliance has a fixed setting and corresponds to the heat capacity of the appliance. The thermal image can be considered simply as a buffer store which fills with appropriately high current flow and empties with appropriately low current flow. If the buffer store is full, it means that the appliance is thermally overloaded and the collective error "max. appliance temperature" (9 flashes) is issued. The braking current in the VB S is immediately switched off in this event in.

How long a certain braking current (factor current braking current/max. appliance braking current) may flow for can be seen in the diagram "trigger curve thermal appliance image VersiBrake Safe". 10.2.1 Thermal Appliance Image



If the thermal capacity has been reached (the buffer store is filled) and the collective fault "max appliance temperature" has been triggered, the buffer store (thermal capacity) must be reduced to 80%, before this collective fault can be reset. It is however recommended that the appliance is allowed to cool for 5 minutes before re-starting the motor. The buffer store (thermal capacity) is then reduced to around 50%. If the motor is restarted and braked again before the expiry of this recommended cooling time, there is a danger that the buffer immediately fills again and the collective fault "max. appliance temperature" is triggered again.

The cooling curve can be seen from the diagram "Cooling curve thermal appliance image VersiBrake Safe".



The VB S has a thermal memory. When the 24V control voltage is switched off the current value of the thermal capacity reached is saved. When the 24V control voltage is applied again, this value is reloaded. Resetting the thermal image by switching off the 24V control voltage is thus not possible.

The current value for the thermal appliance image can be posted in the status line of the display. On selection of "Thermal Appliance Image" the thermal capacity reached is showed in %. (see chapter 8.4.1.1)

10.2.2 Heatsink / device temperature

The heatsink temperature of the power module, as well as the device temperature, are monitored with temperature sensors. On reaching the adjusted device warning temperature, this can be adjusted with "Device Warning Temperature °C" (CAN-Param 0x4026), a warning issued over the CAN bus.

11. Extended, optional operation functions

11.1 External motor-standstill monitor

In operation on special or severely damaged mains supplies or in an area with high electromagnetic radiation there is a possibility that the device's internal motor-standstill recognition does not recognise a motor standstill. In this case, the motor standstill can be recorded by an external standstill monitor, e.g., VersiSafe. The safety functions and messages in the VB S relating to motor standstill are maintained. **Caution!** If the external standstill monitor has a safety level higher than SIL 1 or PL c the safety level reduces to the value of the VB S (SIL 1, PL c).

The standstill monitor is connected according to its commissioning instruction and a safety contact (open contact) of the external standstill monitor is switched between the terminals X3:1 (+24V) and X3:6 (ext. n0) of the VB S.

Involved parameters:

"external standstill monitor", CAN parameter 4004

Default value = 0

To activate the external standstill monitor, the value must be set to "1".

"Measurement period external braking time", CAN parameter 4015, unit ms (milliseconds).

Default value = 10 000 (ms)

This time must be selected 2 000 ms longer than the "brake time/time specification", CAN parameter 3006.

Example 1: If a time specification of 8,000 ms (CAN parameter 3006) is set in braking mode 0 (standstill dependent braking with braking time optimisation), the "Measurement period external braking time", CAN parameter 4015 must be set at 10, 000 (ms).

Example 2: If a time specification of 6,000 ms (CAN parameter 3006) is set in braking mode 2 (time-dependent braking), the "Measurement period external braking time", CAN parameter 4015 must be set at 8, 000 (ms).

NOTE! If too short a time is set, then after the third braking the collective error "3x k. standstill" will be triggered

"Meas. per. ext. standstill sig.", CAN parameter 4031, unit ms (milliseconds).

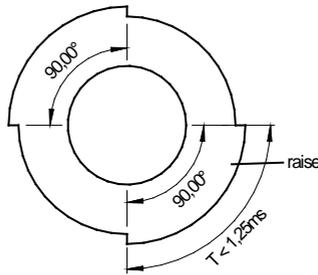
Default value = 6, 000 (ms)

During this time, the measured motor-terminal voltage (remanence voltage) must be 0. That means that the motor may not turn for at least the set time after the braking current is switched off. A standstill notification is only issued after this time has elapsed.

11.2 Recording tool speed

The rotational speed of the tool can be monitored by recording the tool rotational speed with the input "n Wz". The input can be used for identifying too large a deviation in the rotational speed and for identifying a belt tear. An inductive proximity switch 3-wire PNP, suitable for 24V DC, must be connected to the VC II S according to the recommended wiring. The sensor disc must be designed such that at maximum tool rotation speed the run time of a recording is 1.25ms.

Tool rotation speeds up to 12,000 rpm can be recorded with the following recommended sensor discs. All setting parameters for the tool rotation speed are coordinated to these sensor discs. If other sensor discs are used, it must be noted that the run time of the recording is not less than 1.25 ms and the actual minimum tool rotation speed set with ale CAN parameter 4078 must be divided by the factor in table 1.



$$f = \text{Tool Speed} / 60 = 12000 \text{ min}^{-1} / 60 = 200 \text{ Hz}$$

$$T = \frac{1}{\text{Number of segments} * f} = \frac{1}{4 * 200 \text{ Hz}} = 0,00125 \text{ s} = 1,25 \text{ ms}$$

Table 1 – Various sensor discs

Number of segments	Max. tool speed (min ⁻¹)	Factor for actual min. Tool speed
4 *	12000	1
6	8000	1,5
8	6000	2
10	4800	2,5
12	4000	3
16	3000	4
20	2400	5
24	2000	6
32	1500	8

*recommended sensor discs

Parameters involved:

"extern. tool rotation speed sensor", CAN parameter 4035

Default value = 0 to activate external recording of the tool rotational speed, value must be set to "1".

"minim. tool rotation speed", CAN parameter 4078, unit min-1 (revolutions per minute).

Default value = 2,500

If the toll is below the set "minim. tool rotation speed" in Bypass operation, the collective error "tool rotation speed" is triggered.

The parameter value only corresponds to the actual tool rotation speed if the sensor disc with 4 segments is used. If other sensor discs are used, the actual tool rotation speed corresponds to the set "minim. tool rotation speed" divided by the "Factor" in Table 1

"tool rotation speed tolerance", CAN parameter 4076, unit %.

Default value = 80 (%)

If the tool reaches its nominal rotation speed, this rotation speed is assumed as the required value. If the rotation speed deviates by more than the permitted "tool rotation speed tolerance" in bypass operation, the collective fault "tool rotation speed" is triggered. The parameter value 80 (%) means that the tool rotation speed may not fall below 80% of the nominal rotation speed.

"Meas. per. tool-rot speed", CAN parameter 4016, unit ms.

Default value = 6,000 (ms)

If the motor changes to standby operation type after braking and identified motor standstill, the tool rotation speed continues to be recorded in this time. If a tool rotation speed is measured after this time has elapsed, the collective fault "tool rotation speed" is triggered.

11.3 Manual Brake cancellation

The function "manual brake cancellation" can be set using CAN parameter 0x4030 or the LCD operating panel. Manual brake cancellation enables non-activation or cancellation of a braking procedure. Restarting the motor after a braking cancellation is immediately possible. Manual braking is triggered by applying 24VDC to the input X3:3 "tool rotation speed".

If the option "Manual Braking cancellation" is selected, the input X3:3 "tool rotation speed" can no longer be used for recording a rotation speed.

11.4 Star delta start-up

The power contactors for desired star delta start-up can be driven with this function. The star-delta start-up can be parameterised with the CAN parameters 0x4200 to 0x4202 or via the LCD-operating panel. The collective fault relay is used to drive the star contactor and the operation status relay is used to drive the delta contactor.

If the delta start-up function is parameterised, the collective fault relay and the operation status relays can no longer be used as such.

The acceleration time of the star contactor can be parameterised with the CAN parameter 0x4201. An acceleration time of 4s is set by default. The factory-set switch time from start-contactor to delta contactor is 100ms. This switch time can be changed with the CAN parameter 0x4202. Both parameters, "acceleration time" and "switch time" can also be adjusted via the LCD operating panel Parameter.

The star contactor (collective fault relay X1:23-24) is already closed and the test braking carried out in the initialisation of the VersiBrake Safe. The star contactor (collective fault relay X1:23-24) is closed from the beginning. The adjustable acceleration time of the star contactor starts with the closure of the motor protection. After the acceleration time has elapsed, the star contactor opens (collective fault relay X1:23-24) and a parameterizable switch time is allowed to elapse until the delta contactor (operational status relay X1:13-14) closes.

If the motor protection is opened during the acceleration time for the star contactor or during the switching time, the braking procedure is carried out in star-contactor.

If, however, the motor protection is opened when the star-delta contactor acceleration has already completed, then the braking is in the delta circuit. After braking is complete, the delta contactor (operational status relay X1:13-14) is opened again, the switching time elapses and the star contactor (collective error relay X1:23-24) is closed again.

12. Operational signals

All information on the different operating states can be scanned over CAN bus. In addition, 3 light-emitting diodes are located on the device front side, which display the following operating states:

LED	Operating state
Green lights up	Device ready to operate
Red lights up	Device fault (safety-critical fault)
flashes red	Combined fault (not safety-critical fault)
yellow off	Operating state "Standby"
yellow flashes with changing frequency	Operating state "Start"
yellow lights up	Operating state "motor runs" (motor contactor is energized)
yellow flashes (double flashing)	Operating state "Brake"

Signal relays are available at the control terminal block X1. The following operating states are signalled:

13-14 Operating state

Closed during test braking and from the beginning of "Motor Start" until the end of braking. The function of the operating state contact can be adjusted over the system parameter "Opts Operating State Relay" (CAN Parameter 0x4077).

If the "Star-Delta acceleration" is parameterised (CAN param. 0x4200), the operational status relay is used as delta relay. It is not then possible to use it as operational status contact.

23-24 Combined fault

The signal contact is closed in normal operation and opens only if a combined fault has occurred.

If the "Star-Delta acceleration" is parameterised (CAN param. 0x4200), the collective fault relay is used as star relay. It is not then possible to use it as collective fault contact.

33-34 Device fault - positively-driven safety relay

The signal contact is closed in normal operation and opens only if a safety-critical device fault has occurred.

43-44 Motor standstill - positively-driven safety relay

The signalling contact is open in case of rotating motor and closes only if a motor standstill has been securely identified.

53-54 Locking – driven safety relay

The locking contact is closed during operation modes "Standby" and „Motor running“. In the operation modes "Test braking", "Braking" and "Fault", the locking contact is open. This contact is also wired in the control circuit of the motor protection and locks the motor switch-on.

13. Faults

In the device two fault groups are differentiated.

13.1 Combined fault

Combined under "Combined fault" are the following faults that do not affect the safety functions, however, in spite of that influence the function of the VB S:

Combined faults				
LED red	LED flashes yellow	LC display	Reason for malfunction	Error memory code
flashes	1x	Failure L2 L3	Failure of mains power supply L2, L3	32
flashes	2x	Tool speed	Error is only active if the "Tool rotation speed monitoring" (CAN param. 0x4035) is switched on. In the "Motor running" operation mode, the error message is triggered if the tool rotation speed measured via the control input X3:3 is below the minimum set tool rotation speed (CAN param. 0x4078), or the measured tool rotation speed is outside the specified tolerance (CAN param. 0x4076). In the "Standby" operation mode, the error is issued if a tool rotation speed is measured.	2
flashes	3x	max. Heatsink Tmp	maximum permissible motor over-temperature exceeded see point 10.2.1	4
flashes	4x	max. braking time	maximum permissible heatsink temperature exceeded see point 10.2.2	64
flashes	6x	3x no standstill	Error is only active if the "Collective fault 3x no standstill" (CAN param. 0x4021) is parameterised. By default, this error is switched on. If the motor standstill is not identified three times in succession in the monitoring time, the collective error "3x no standstill" is issued. The monitoring time is factory-set at 10 seconds and can be adjusted via the CAN parameter 0x4005. In the parameterisation of an external standstill monitor (CAN param. 0x4004) it behaves identically to the error notification, except that the monitoring time for the external standstill signal must be adjusted via a separate parameter (CAN param. 0x4015).	16
flashes	7x	Motor size	During test braking, the braking current exceeds the max. appliance braking current ie. Connected motor too big.	1024
flashes	8x	max. braking time	If maximum monitoring time of 25 sec. has expired and no motor standstill has been identified.	128
flashes	9x	max. device temp	The thermal appliance image has identified an overload of the appliance.	256
flashes	10x	Start input	No break contact attached to the motor protection at the start input. Start input is opened at initialisation.	512

With the occurrence of one or more of these faults, the drive is switched off, the device goes into the operating mode "Combined fault" and the contact of the signal relay "Combined fault" is opened. The locking contact is open and locks the motor's switch-on. The operating mode "Combined fault" is displayed by the flashing of the red LED.

The fault source can be scanned over the CAN bus or the LCD operator panel.

For the resetting of this fault, the interference source must be removed and 24 V applied for a short time on the input, Terminal 5 (FQ) (<15 sec).

If a collective fault arises with a parameterised "start-delta start-up" function (CAN-Param. 0x4200), the appliance moves into the operation type "Collective fault" and the drive is switched off as described above. The notification relay "collective fault" is used at star-relay in the parameterised "star-delta-start-up" (CAN param. 0x4200). Signalisation of a collective fault is no longer possible with "star-delta-start-up" (CAN param. 0x4200) selected.

13.2 Device fault

Combined under "Device fault" are the following faults which could affect the safety functions and bring the device into a safety-critical operating state:

Device faults				
LED red	LED flashes yellow	LC display	Reason for malfunction	Error memory code
lights up	1x	Missing Zero-Crossing L2 – T2 / L3 – T3	synchronisation impulse for ignition of the brake thyristors are no longer recognised. Causes: - Short-circuit between mains and motor side of the VersiBrake Safe - Motor circuit open - Mains voltage failure - Circuit internally defective	4194304
lights up	4x	Zero-Crossing L2-L3	Zero transitions of the mains voltage L2 – L3 are no longer recognised. Causes: - Failure of the mains voltage L2 or L3 - Short circuit freewheel arm - Circuit internally defective in zero transition identification	16
lights up	7x	Pol. Braking current	Polarity (current direction) of the braking current is wrong at the start of braking. Causes: - Voltage and frequency instabilities in the mains voltage - Motor too small	512
lights up	8x	Freewheel. Fault	No freewheel current flows during the braking procedure. Causes - Circuit internally defective	1024
lights up	9x	Over Current	Braking current greater than the value set in CAN param. 0x4518, over the duration of the set measurement period (CAN param. 0x4519). Causes: - Short-circuit motor circuit - Circuit internally defective	65536
lights up	10x	Under Current	Braking current lower than the percentage value of set motor nominal current set in CAN param. 0x4516 (CAN param. 0x4032), over the duration of the set measurement period (CAN param. 0x4517). Causes: - Motor circuit open - Mains voltage failure - Circuit internally defective	32768

Device faults				
lights up	11x	Motor voltage detection	Defect of the motor voltage recording during operation Causes: - Motor wiring T1 not connected - Circuit internally defective	8388608
lights up	13x	Braking current	Test braking failed, braking current smaller than 2A. Causes: - Interruption in motor circuit - Circuit internally defective	64
lights up	14x	Motor voltage	Test braking failed, motor voltage recording defective. Causes: - Interruption in motor circuit - Circuit internally defective in the motor voltage measurement circuit	32
lights up	15x	Diagnosis Output	Monitoring of the safety- orientated outputs "Standstill notification relay", "locking relay" and "device fault error". Causes: - Relay contact welded / stuck - Circuit internally defective	16384
lights up	16x	Diagnosis Input	Monitoring of the safety- orientated inputs "Brake signal", "External rotary encoder" , "External standstill monitoring" and of the internal control voltages 24V and 3.3V Causes: - short circuit between the input signals - Circuit internally defective	8192
lights up	19x	EEPROM	Error in the data stored in the EEPROM blocks. Cause: - Bit error	262144
lights up	20x	Device data	Initialisation error, not possible to determine appliance nominal appliance voltage and nominal appliance current. Cause: - Circuit internally defective	131072
lights up	21x	undef. Status	Program crash of the μ -controller	2048
lights up	22x	RAMTEST	Internal storage error of the μ -controller Causes: - Bit error of an internal variable	256

With the occurrence of one or more of these faults, the drive is switched off, the device goes into the operating mode "Device fault" and the secure contact of the signal relay "Device fault" is opened. The locking contact is open and locks the motor's switch-on. The operating mode "Device fault" is displayed with a permanent lighting up of the red LED.

The fault source can be scanned over the CAN bus or the LCD operator panel.

13.3 Reset fault

In the case of an error, proceed as follows:

Combined fault	After the elimination of the fault, the error message can be reset over the input "Fault reset".
Device fault	After elimination of the safety critical fault, the error message can be reset with a short switch-off (5sec) of the 24V control voltage. If the error cause cannot be eliminated, the error message remains present in spite of a reset attempt.



Warning note:

In every case the fault cause must be determined and remedied by instructed personnel. Only after that may the device be put into operation again.

14. CAN-BUS

All CAN signals are isolated galvanically from device-internal voltages. The connection is implemented over RJ45 plug (X10 and X11, see point 8.2 Connection). As delivered, a baud rate of 125 kBaud is adjusted.

On the front of the appliance is an address selector switch (see 8.4). A unique Node ID (address) is assigned to the VersiBrake Safe in an CANOpen-Network with this address selector switch. This is set to 0 in delivery condition. This corresponds to a Node-ID of 57. Using CAN parameters or the LCD operation panel, an individual Node-ID (address) can be assigned to every address selector switch position, see 8.4.3.4 CAN parameter.

For a trouble-free transfer of the CAN data, it is absolutely necessary that the following be considered:

- After every switchover of the address switch, a short switch-off of the 24 V control voltage is necessary (reset).
- If only one CAN subscriber is plugged on a device, and the CAN plug for this subscriber is removed and plugged in again, a short switch-off of the 24 V control voltage is required (reset).
- If only one CAN subscriber is plugged on a device, a plug with terminating resistor is to be inserted into the second CAN socket.

If the appliance description file (EDS file) and comprehensive documentation of the available CAN parameters of the VersiBrake Safe appliances, please contact us.

15. Technical data

15.1 General specifications

Type designation	VersiBrake S 480/600/690-...			
	72	132	222	360
Device rated current I_e	72A	132A	222A	360A
Rated operating voltage U_e	200...480VAC / 400...600VAC / 480...690VAC $\pm 10\%$ 50/60Hz			
Control voltage U_s	24VDC $\pm 10\%$ / 0,5A			
Motor rated power at U_e 400V - IE3 Motors	7,5 kW	15kW	25kW	45kW
Motor rated power at U_e 400V - IE2 Motors	15kW	30kW	55kW	90kW
Recommended rated motor currents at U_e 400V	13...30A	32...55A	65...100A	128...160A
Switching cycle per hour at $t_{br}=10s$ with I_e	50	30	17	18
Utilisation category	72A; AC-53b; 1-10; 62	132A; AC- 53b; 1-10; 110	222A; AC- 53b; 1-10; 202	360A; AC-53b; 1-10; 190
max. power dissipation - in operation with max. start frequency with $t_{on}/t_{br}=10s$ with resp. $3 \times I_{rated}$ (device) - control voltage only	22W 6W	22W 6W	22W 6W	36W 6W
$I^2t(125^\circ)$ (A ² s) - Thyristors in L1, L3	720	16200	16200	125000
$I^2t(125^\circ)$ (A ² s) - Freewheeling Thyristors	720	4000	4000	51200
Minimum motor load	40% of the device rated current			
Braking time	fixed braking time 0.25 ... 25s or Self-optimising (default)			
Restart time	200ms			
Control voltage U_c	24VDC $\pm 10\%$			
Input impedance control inputs	5kOhm			
Switching capacity relay outputs	4A / 250VAC / 30VDC			
Installation class	3			
Overvoltage category / Pollution degree: Control and auxiliary circuit Main circuit	III / 2 III (TT / TN / IT - Network) / 2			
Rated impuls strength U_{imp} : Control and auxiliary circuit Main circuit	4kV 6kV			
Rated insulation voltage U_i : Control and auxiliary circuit Main circuit	250V 600V			
max. Cross-sectional area for connection solid/stranded: Control terminals Power terminals Length of the insulation stripping or wire end sleeve	1.5 mm ² 1.5 ...16 mm ² 18mm		1.5 mm ² 6 ... 35mm ² 15mm	
max. tightening torque: Control terminals Main circuit	Push-in terminal Push-in terminal		Push-in terminal 3 ... 3.5Nm 26.6 ... 31lbs-in	
Drive connecting screws	-		Hexagon socket 5mm	
Weight	1.35kg	1.45kg	1.45kg	3.6kg

15.2 EMC Information

Radiated interference	Standby/Bypass operation: DIN EN 61000-6-3:2011-09 Start/Braking operation: DIN EN 60947-4-2:2018-12				
Installation class (according to EN 61000-4-5)	3				
Characteristic criteria according to DIN EN 60947-4-2 in case of test level for CE Test.	1 or 2 (if failure, then only in secure direction)				
According to characteristic criteria DIN EN 60947-4-2 in case of increased test level for "Functional safety" (SIL1) according to DIN EN 61326-3-1.	3 (if failure, then only in secure direction)				
DIN EN 61000-4-2; ESD CE Test: SIL1-test:	4 kV contact / 8 kV air 6 kV contact / 8 kV air				
DIN EN 61000-4-3; EMF CE Test: SIL1-test:	0.08-1GHz 10/m, 1.4-2.7GHz 3V/m 0.08-1GHz 20/m, 1.4-2GHz 10V/m, 2-2.7GHz 3V/m				
DIN EN 61000-4-4; BURST CE Test: SIL1-test:	Network/Motor 2 kV, I/O signal 1kV Network/Motor 3kV, 2 kV I/O signal, CAN bus 2 kV				
DIN EN 61000-4-5; SURGE CE Test: SIL1-test:	Network/Motor connections 1 kV conductor-conductor, 2 kV ground conductor 2kV conductor-conductor, 4kV ground conductor				
DIN EN 61000-4-5; SURGE CE Test: SIL1-test:	I/O signal asymmetric 1kV conductor-conductor, 2kV ground conductor 2kV conductor-conductor, 4kV ground conductor				
DIN EN 61000-4-5; SURGE CE Test: SIL1-test:	Screened CAN-Line 1kV ground conductor 2 kV ground conductor				
DIN EN 61000-4-6; HF Field CE Test: SIL1-test:	0.15-80MHz 10V 0.15-80MHz 10V				
DIN EN 61000-4-8; magnetic fields CE and SIL1-test:	30 A/m				
DIN EN 61000-4-11; short interruption CE and SIL test	0% 250/300 network periods (5000 ms)				
DIN EN 61000-4-11 voltage dips CE and SIL test	<table border="0"> <tr> <td rowspan="3" style="font-size: 3em; vertical-align: middle;">{</td> <td>0% 1 network period (20 ms/16.67 ms)</td> </tr> <tr> <td>40% 10/12 network periods (200 ms)</td> </tr> <tr> <td>70% 25/30 network periods (500 ms)</td> </tr> </table>	{	0% 1 network period (20 ms/16.67 ms)	40% 10/12 network periods (200 ms)	70% 25/30 network periods (500 ms)
{	0% 1 network period (20 ms/16.67 ms)				
	40% 10/12 network periods (200 ms)				
	70% 25/30 network periods (500 ms)				
DIN EN 61000-4-13 harmonic component CE and SIL test	Class 3				

15.3 Environmental conditions

Ambient temperature	-15°C ... 45°C to 1000 m height
Storage temperature	-25°C ... 75°C
Power reduction	Greater than 45°C -2% per 1°C to max. 50°C and installation levels above 1000 m -1% per 100 m
Protection type	IP 20

15.4 Safety specifications

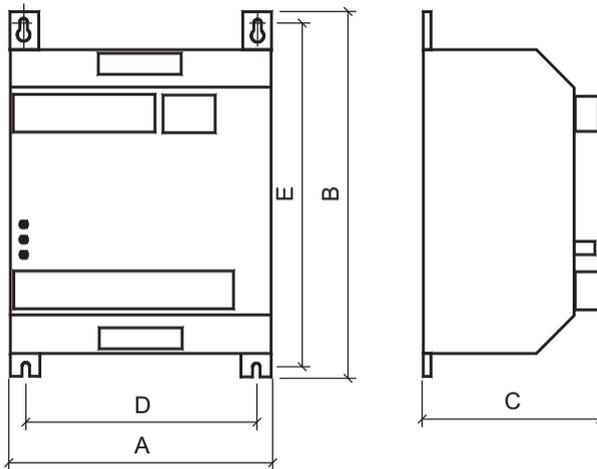
Functional safety according to DIN EN 61508	SIL 1
Safety of machines according to DIN EN 13849	PL c
Safety functions:	<ul style="list-style-type: none"> • Prevention of an unexpected, fault-dependent starting • Monitored, controlled braking down - Secure control activation of the protection door interlocking - Motor standstill monitoring

15.5 Safety figures

Parameter	Value	Remark
PFH	1.7 E-07 1/h	<2% of SIL 1 (1 E-05 1/h)
MTTF _D	67 a	-/-
DC _{avg}	>90%	-/-

15.6 Dimensions

	A	B	C	D	E*
VB S, 72 – 222A (size 1)	103mm	230mm	138mm	86mm	220mm
VB S, 360A (size 2)	205mm	230mm	160mm	183mm	220mm



16. Dimensioning rules

16.1 Dimensioning of fuses for device protection

The pre-fuses can be dimensioned based on the following instruction:

With a fusing according to allocation type "1" to DIN EN 60947-4-2, the VB S may be inoperative after a short-circuit. After an overload or after an output-sided short-circuit, maintenance work is possible.

The following dimensioning rules refer to the following operating conditions:

- Utilisation of asynchronous motors IE1, IE2 and IE3 (IE4 in preparation)
- Braking times according to datasheet
- Switching frequency not higher than as indicated in the datasheet

Fusing according to allocation type "1"

Fuses of the operating class gG are recommended as pre-fuses.

If these fuses are also used as line protection, the line cross-section is to be correspondingly coordinated!

Short-circuit protection according to EN 60947-4-2

Device rated current (Technical data)	Device type	Fuse rating with allocation type 1	Fuse type (recommendation)
72A	VB S ...-72	25A	gG
132A	VB S ...-132	40A	gG
222A	VB S ...-222	63A	gG
360A	VB S ...-360	100A	gG

Short-circuit protection according to UL 508 (Class RK5 Fuse)

Device rated current (Technical data)	Device type	Fuse rating	Fuse
72A	VB S ...-72	25A	600V AC
132A	VB S ...-132	40A	600V AC
222A	VB S ...-222	63A	600V AC
360A	VB S ...-360	100A	600V AC

Fusing according to coordination type "2"

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

To protect the semiconductors it is necessary to select fuses having cut-off- I^2t -values which are approx. 10-15% below the threshold- I^2t -value of the power semiconductor (see technical data). In this connection, the fuse rating of the selected fuse should not be smaller than the starting current to be expected.

Notes:

1. PETER electronic does not prescribe the use of semiconductor protection fuses. However, for some UL- or CSA-listed devices there are exceptions which are indicated in the relevant commissioning instructions.
2. On the basis of the I^2t -value of the power semiconductors, the braking time and possibly the max. braking current, 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.
3. If the value of the fuse or the cutoff- I^2t -value is selected too small, it may happen that the semiconductor fuse reacts during the soft stop.

16.2 Motor protection switch

16.2.1 IEC / Europe 400 V

Device rated current (Technical data)	Device type	Siemens	EATON
72A	VB S ...-72	3RV2031-4CA.. (IN=22A, Ir=16A)	PKE65-XTU-65 (IN=65A, Ir=16A)
132A	VB S ...-132	3RV2031-4PA.. (IN=35A, Ir=30A)	PKE65-XTU-65 (IN=65A, Ir=30A)
222A	VB S ...-222	3RV2031-4KA.. (IN=66A, Ir=62A)	PKE65-XTU-65 (IN=65A, Ir=53A)
360A	VB S ...-360	3RV2031-4KA.. (IN=66A, Ir=65A)	PKE65-XTU-65 (IN=65A, Ir=65A)

16.2.2 UL / CSA

Device Model	Siemens	Max. Branch Circuit Protection Rating (Siemens)	Eaton	Max. Branch Circuit Protection Rating (Eaton)
72A	3RV2021_4CA	18A	PKE65-XTU-65	16A
132A	3RV2031_4PA	34A	PKE65-XTU-65	30A
222A	3RV2031_4KA	62A	PKE65-XTU-65	53A
360A	3RV2031_4KA	73A	PKE65-XTU-65	65A

17. Installation guideline

The devices are to be installed into a switchbox or switchgear cabinet according to point 7. It must be ensured that the switchbox/switchgear cabinet is capable of dissipating the occurring power loss (see techn. data).

17.1 Connection

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

17.2 Earthing

The electrical earthing provided ensures a low impedance connection between all metallic surfaces. Apart from providing a degree of electrical safety and isolation, the earthing also has the beneficial effect that the flow of RF currents can be directed through the structure of the equipment rather than through sensitive circuits, where it could be disruptive. It is for this reason that it is vitally important to provide separate earth conductors for each part of the installation which are all connected to a common star point.

17.3 Cabling

To avoid EMI couplings into the electronics and the disturbances they involve, it must be ensured that the control cables are laid separately in separate cable ducts and as far as possible away from the power cables. If control cables need to cross power cables, they have

to be laid at an angle of 90° (Figure 1).

When connecting shielded cables, make sure that the unshielded cable ends are as short as possible. The large-surface shield bonding must necessarily be located at the end of the shielding but may also be established in a suitable place - at a distance of some centimeters (Figure 2).

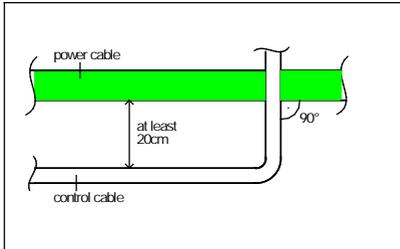


Figure 1

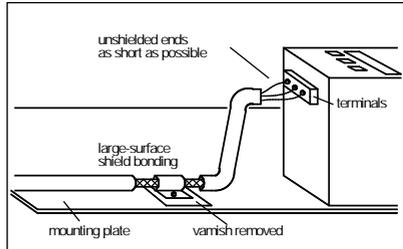


Figure 2

**Caution!**

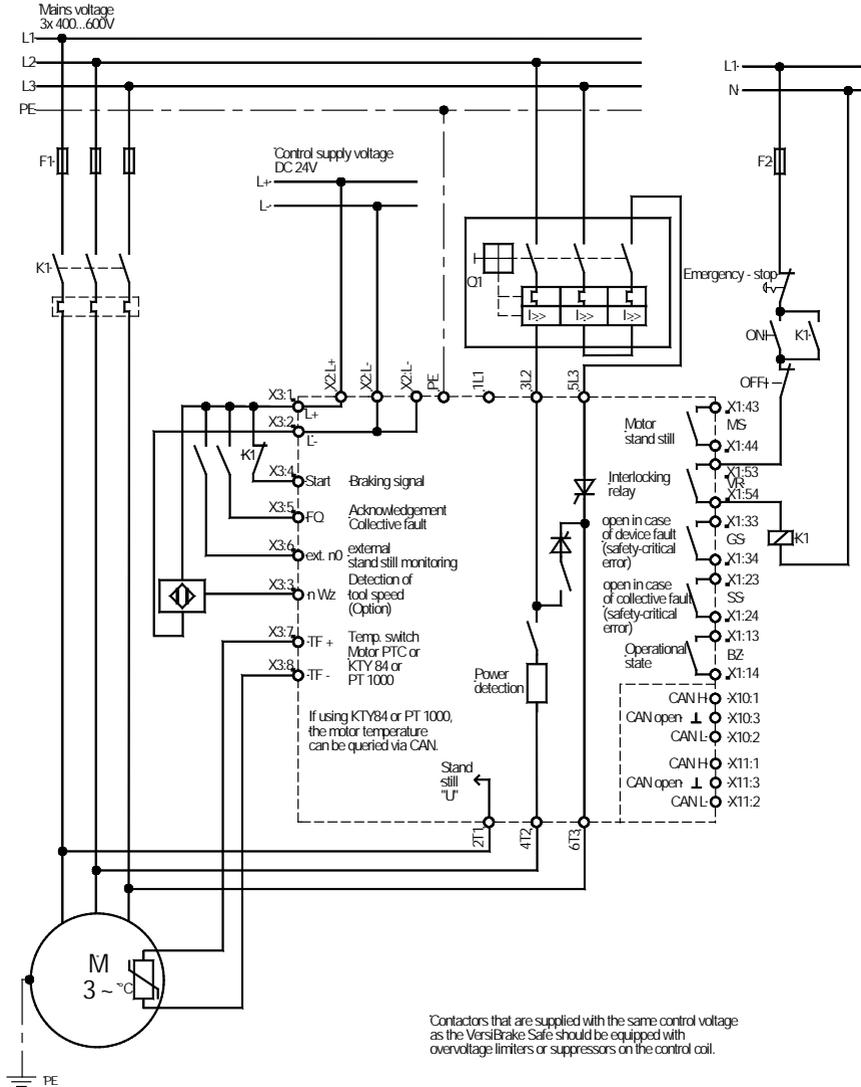
The protective conductor connection to the motor must not be laid in shielded motor cables, but is to be separately laid with an appropriate cross-sectional area. The individual earthing systems, power earth, protective earth, digital earth, and analog earth conductors should be laid separately by using a suitable star-point wiring.

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

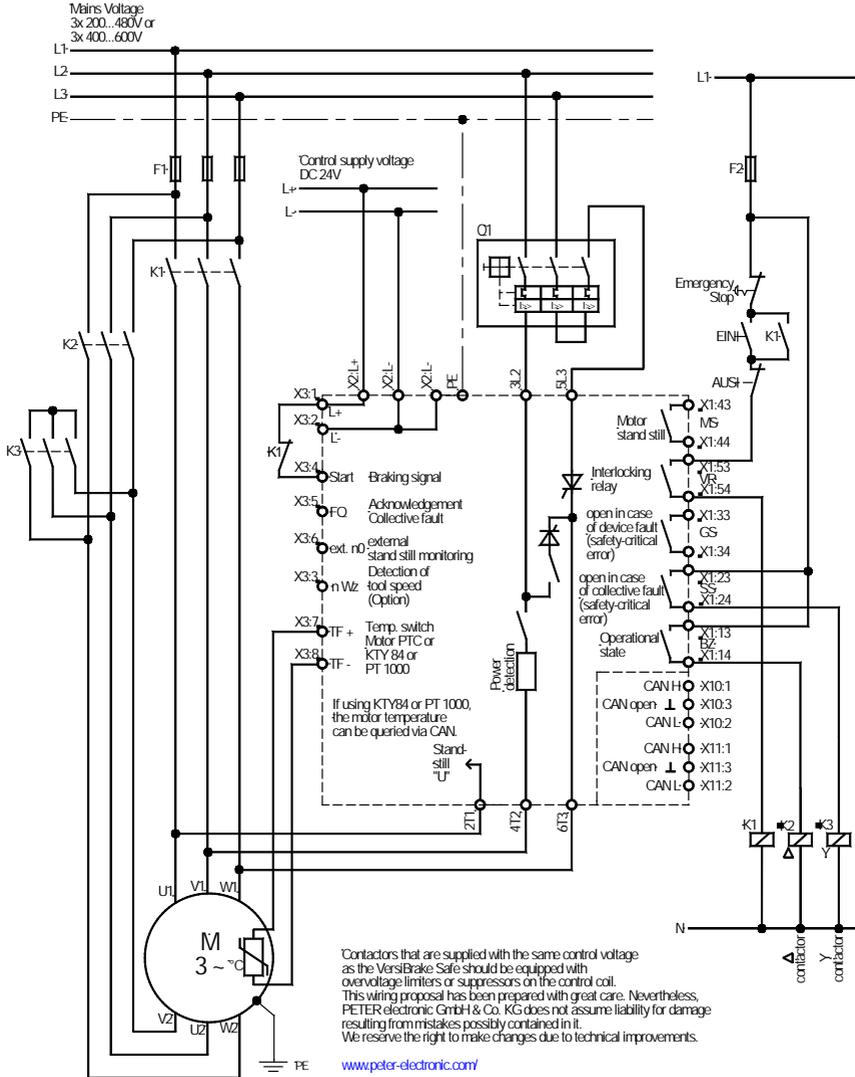
Note: Prior to putting the VersiBrake S into operation, the wiring is to be checked.

18. Connection proposals

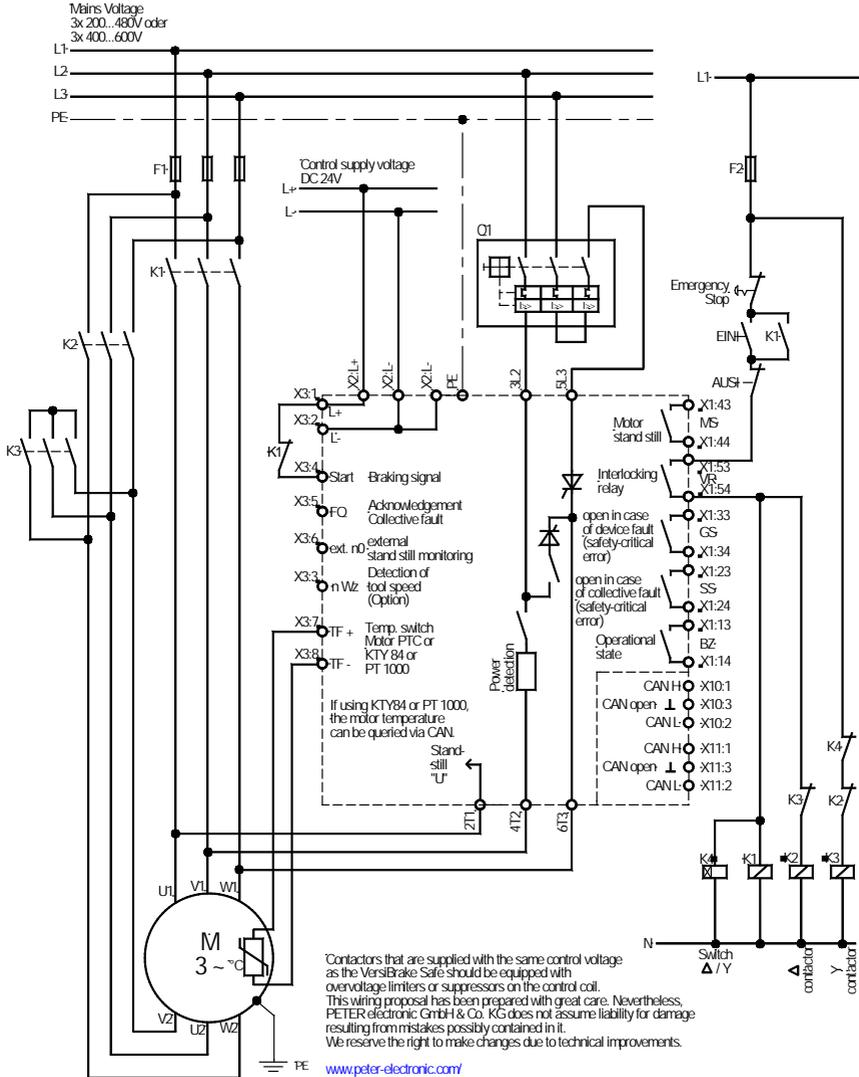
18.1 Connection proposal: Standard connection diagram



18.2 Connection proposal: With internal star-delta connection



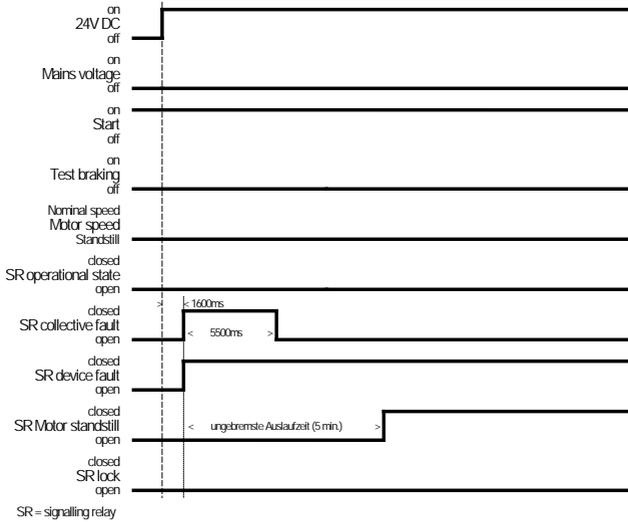
18.3 Connection proposal: With external star-delta connection



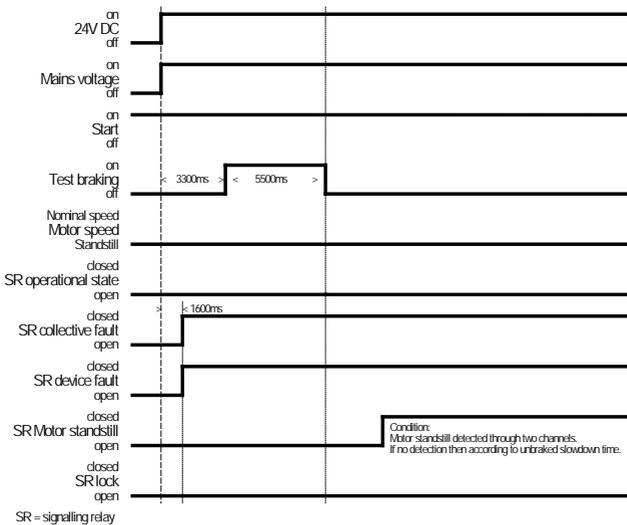
Note: Further connection suggestions on our homepage at www.peter-electronic.com.

19. Timing diagram

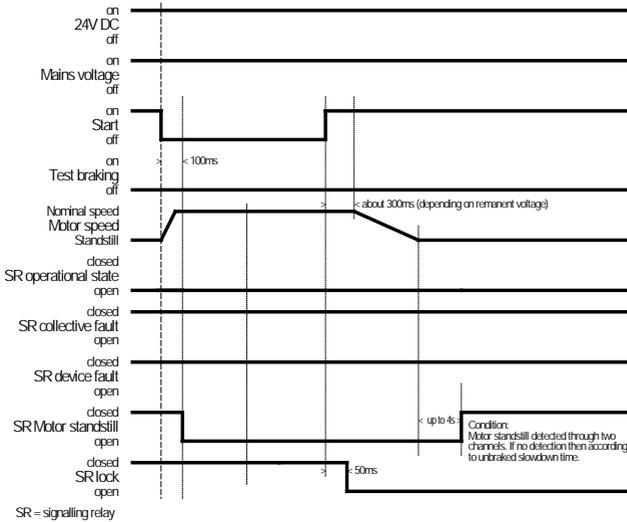
19.1 Switch-on of the control voltage 24 V DC



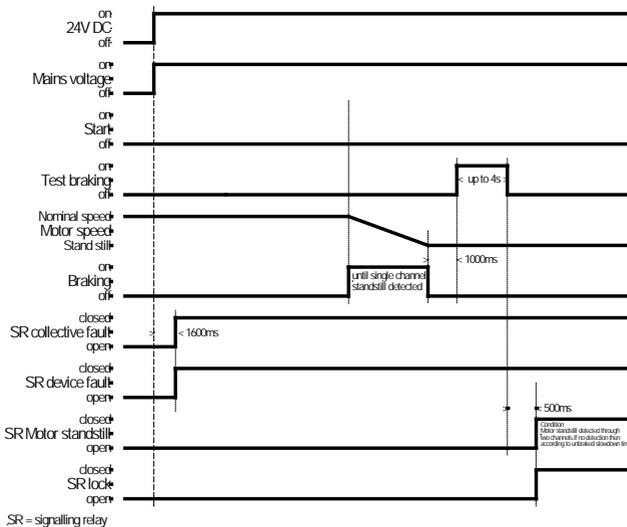
19.2 Switch-on of the 24 V DC control voltage and the mains voltage



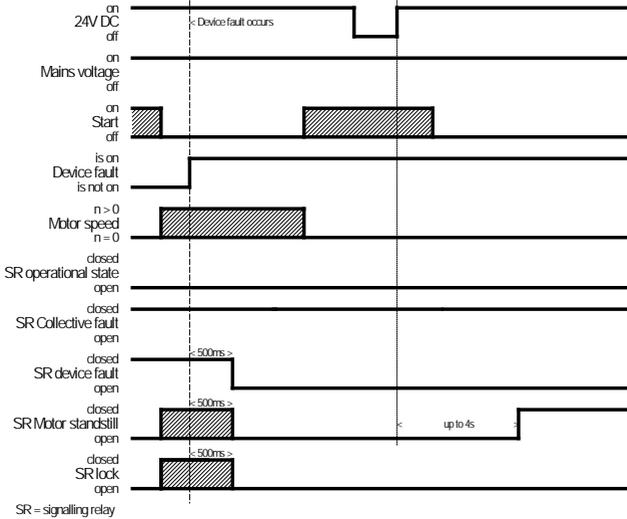
19.3 Start/Stop procedure



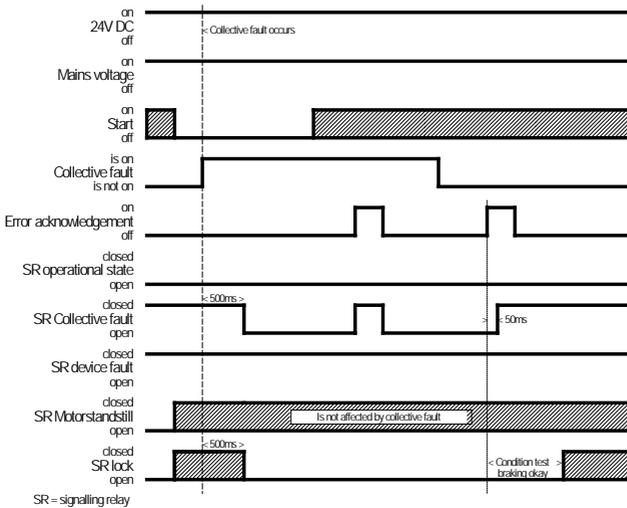
19.4 Switch-on of the voltages if motor rotates



19.5 Occurrence of a device fault



19.6 Occurrence of a Combined fault





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