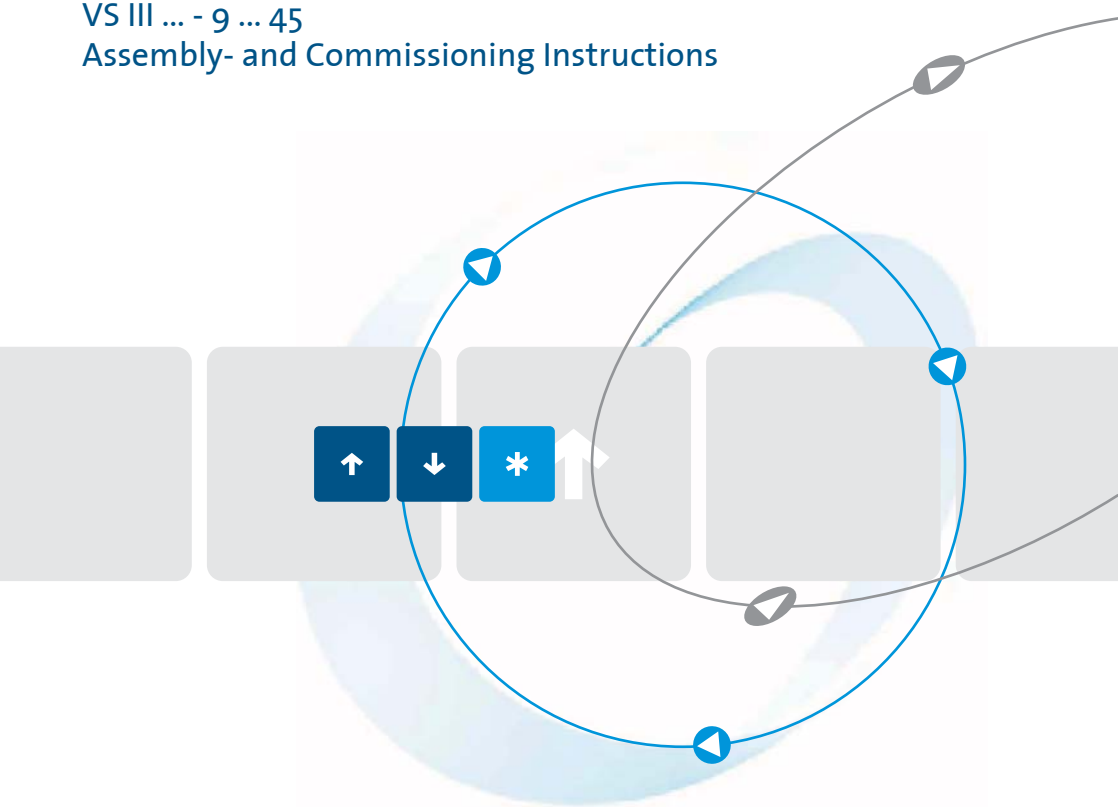
PETER electronic

Soft Starters
VS III ... - 9 ... 45
Assembly- and Commissioning Instructions



Quality is our Drive.

as per 03/19 1S500.10001

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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.

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 notes

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

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

Make sure that all drive components are properly earthed.

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

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

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

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

2. Conformity

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

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

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

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

3. General description

In the case of the soft starters of the VersiStart III type the motor voltage is changed in two phases (1L1/5L3) by a generalized phase control and power semiconductors. Starting from an adjustable starting trigger angle the trigger angle is continually reduced. Via the adjusted ramp-up time the motor voltage increases according to a ramp function until the maximum value is reached. When the acceleration time is over, the power seminconductors are bypassed by integrated relays and the motor is directly supplied with power from the mains.

After opening of the start/stop-contact, the trigger angle is continuously increased via a ramp-function, and, as a result, the motor voltage is decreased. The motor softly decelerates with the adjusted deceleration time.

Acceleration time, starting voltage and deceleration time can be separately adjusted via potentiometers.

By applying a voltage between 24V and 230VAC/DC to the terminals X7/X8, the soft starter is started.

Device set to current control mode:

If VersiStart III is operated in the operating mode "current control" (to be set with potentiometer xI_e), current-controlled starting is enabled. For this, the motor voltage is increased via a ramp function until the adjusted starting current is reached. With this starting current, the drive is further accelerated until the motor current decreases to approx. rated current. Now, the power semiconductors are bridged by the built-in bypass relays.

The boost function is switched on by applying a voltage between 24V...230VAC/DC to the terminals X9/X10. Thereby, at the beginning of soft start, a higher starting voltage is applied to the motor for 0.5s.

In the case of standard devices, the control electronics is supplied with voltage by the power section. Devices with option B require connecting a control supply voltage to the terminals X1 and X2.

The soft starters feature an integrated thermal motor and device protection function. The motor current is measured in one phase and a thermal image of the motor and device is developed.

When the thermal capacity of the motor or device is reached, the device will be switched off and remains in fault mode until it is reset.

The devices are suitable for an operation of 3-phase motors in star or delta connection.
Interconnection of motors in a so-called $\sqrt{3}$ -connection is possible as well.

4. Usage to the intended purpose

The devices of the VersiStart III...-series are electrical equipment for use in industrial electrical power installations. They are designed for application in machines, in order to reduce the starting torque and starting current peaks as well as the tripping torque of drives with three-phase induction motors.

Typical Applications:

- door and gate drives
- pumps, ventilators, fans
- conveying systems, packaging machines
- transport systems, assembly lines, machine applications
- heat pumps

5. EC Declaration of Conformity

PETER electronic

EC Declaration of Conformity CE

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

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

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

Product designation:	**Soft starters**
Series / type designation:	VS III ... - 9/ -16/ -25/ -37/ -45
Article number:	2S50...
Year of manufacture:	2013

complies with the provisions of the following EU-directives:

2014/30/EU	Electromagnetic compatibility
2014/35/EU	Electrical equipment designed for use within certain voltage limits
2011/65/EU	The restriction of the use of certain hazardous substances in electrical and electronic equipment

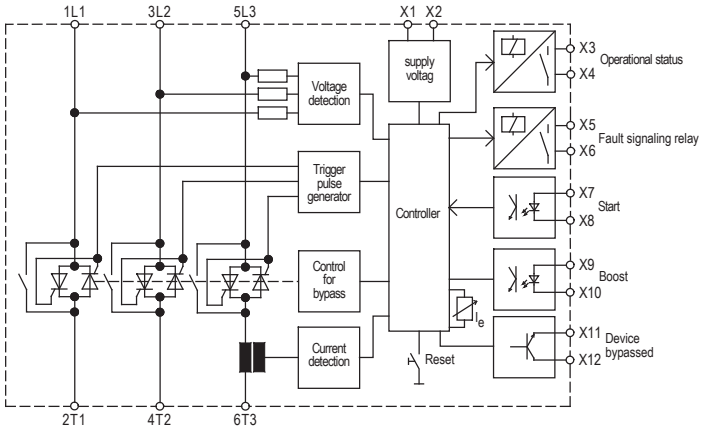
The following harmonized standards have been applied:

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

This EC Declaration of Conformity is no longer valid, if the product is modified or changed without our agreement.
This declaration is issued under the sole responsibility of the signatory.

Berg, 18.04.2016 (place, date)
Dr. Thomas Stiller, Managing director (signatory and function of the signatory)
(signature)

6. Block diagram



7. Commissioning

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

1. Mounting
2. Connection and
3. Parameter setting

Please mind the permissible max. starting currents (see "Technical data" on page 20) .

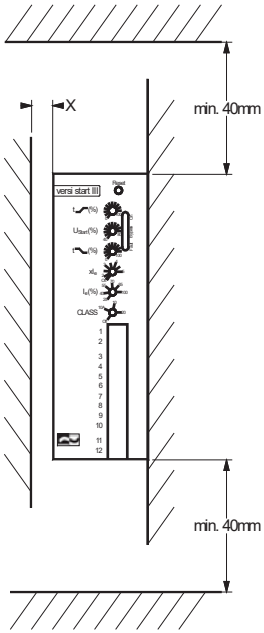
7.1 Mounting instructions

Caution: Danger to life through electric shock!

The following conditions are to be complied with in order to ensure safe and reliable operation of the VersiStart III... :

1. The device series VersiStart III... is to be used under category III overvoltage conditions.
2. The device must be used only in an environment of pollution degree 2 or better, in compliance with DIN EN 60644-1/IEC664.
3. The device has to be installed into a housing (min. degree of protection: IP54). Make sure that the waste heat generated by the soft starter can be dissipated through the housing.
4. The device must be operated without being exposed to contamination by water, oil, carbon deposits, dust, etc.

Place the device vertically on a perpendicular mounting plate with the motor terminals pointing downwards. The device is to be snap-mounted onto a 35mm top-hat rail according to DIN EN 50022. Make sure that no additional heat sources such as equipment with high heat loss, heating resistors or the like are arranged beneath the device.



Clearance X

Under normal drive conditions, the devices can be mounted side by side.

In the case of applications requiring high starting frequencies and/or high-inertia starting, the devices should be mounted with a distance of approx. 10mm in between them, in order to ensure good ventilation of the heat sink.

Warning:

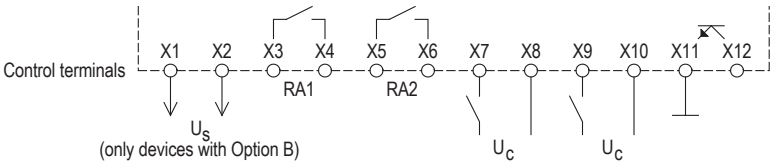
To avoid heat concentrations, a distance of at least 40mm is to be kept between cable duct and device.

7.2 Connection

Power section (see also connection diagram)

Terminal 1L1:	Mains voltage L1
Terminal 3L2:	Mains voltage L2
Terminal 5L3:	Mains voltage L3
Earth connection ⏚	PE
Terminal 2T1:	Motor terminal U
Terminal 4T2:	Motor terminal V
Terminal 6T3:	Motor terminal W

Control section



The input resistance of the control inputs is 80kOhms. To control them, it is necessary to use switching contacts enabling reliable switching of the lower control currents (e.g., AgNi+Au)!

If the contact on the terminals X7 and X8 is closed, the motor accelerates with the adjusted acceleration time ramp. When the contact is open, the motor decelerates with the adjusted deceleration time ramp.

Caution: Danger to life through electric shock!

The motor is **not** physically separated from the supply mains.

Adjusting the control type

The type series VersiStart III may be controlled as follows:

Control by voltage U_c 24V … 230VAC/DC between terminals X7 and X8.

Control supply voltage U_S only in the case of wide-voltage devices (option B)

Between the terminals X1 and X2 an auxiliary voltage of 230VAC ±10%/150mA is to be injected.

(See “Devices featuring a wide-voltage-range power section” on page 26.).

7.3 Parameter settings

The potentiometers on the front panel can be used to make the following settings:

Parameter	Potenti-ometer	Setting range
Acceleration time	t ⌒	Acceleration time adjustable from 0.5...10s
Starting voltage	U_{Start}	40…80% of rated voltage
Deceleration time	t ⌒	adjustable from 0.25...10s
Current limit	xI_e	2...5 x the adjusted rated motor current
Rated motor current	I_e	25%...100% of nominal device current
Tripping class	CLASS	10A, 10, 20

Default setting of potentiometers

Potentiometer	t ⌒	(Acceleration time)	= mid-position
Potentiometer	U_{Start}	(Starting voltage)	= left stop (counter-clockwise)
Potentiometer	t ⌒	(Deceleration time)	= left stop (counter-clockwise)
Potentiometer	xI_e	(Current limit)	= Off (voltage ramp)
Potentiometer	I_e	(Rated motor current)	= 100%
Potentiometer	CLASS	(Tripping class)	= Off

8. Starting and stopping

8.1 Soft start

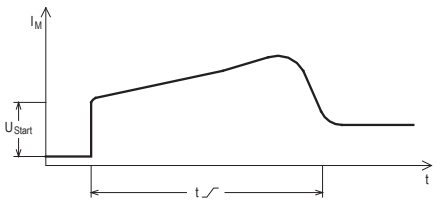
With VersiStart III devices, different starting methods can be selected.

Voltage ramp	xI_e = Off
Current limit	xI_e = 2...5

1. Start with voltage ramp*:*
   In this case, motor starting is time-controlled, with a voltage ramp adjustable within a range from t ⌒ 0,5s to 10s and a starting voltage U_{Start} adjustable between 40% to 80% of the rated voltage.
   To adjust an optimum starting behavior, you should carry out a test run. Contrary to the default settings, you should make the following basic potentiometer-settings:

Fans, roller tracks, conveyor belts, etc.	t ⌒ 50%, U_{Start} 0%, t ⌒ 0%
Centrifuges, conveyor screws, mixers, compressors, etc.	t ⌒ 50%, U_{Start} 50%, t ⌒ 50%
Pressure pumps, etc.	t ⌒ 50%, U_{Start} 50%, 50%

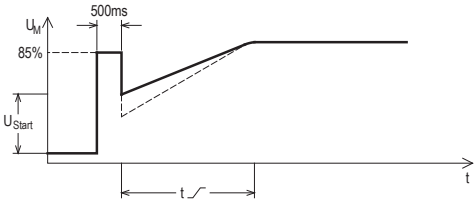
   Switch on the supply voltage and start acceleration. Watch the starting behavior and adapt the approporiate parameters to your drive. At any rate, the starting voltage should be adjusted with the potentiometer U_{Start} so that the motor starts immediately. At the same time, unnecessary humming with the motor being at rest is to be avoided.
   The potentiometer t ⌒ is to be adjusted so that the requested acceleration time or starting characteristics is achieved. The acceleration time should always be chosen as short as possible, in order to keep the thermal stress acting on device and motor as small as possible. This leads to short times until the bypass relays pull in and ensures good acceleration characteristics while the power semiconductors and motor are less heated. This is of special importance in the case of high-inertia starting or high switching frequencies. The acceleration time, however, has to be adjusted so that the motor reaches nominal speed before the internal bypass relays close.



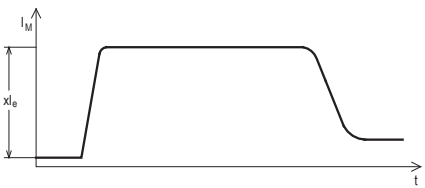
Warning:

If the adjusted acceleration time is too short, the internal bypass relays close **before** the motor has reached nominal speed. This can cause damage to the bypass relays.

2. Start with boost function:
   If a voltage between 24V …230VAC/DC is applied to the terminals X9 and X10, the device will switch into the "Soft start with boost" function.At the beginning of soft start, the motor voltage will, for a short pulse (500ms), be increased to 85% of the rated voltage. This function brings about an increased breakaway torque for the drive and allows starting of drives having a high holding torque at standstill.
   Afterwards, soft start will be continued with the adjusted voltage ramp.



3. Start with current limit:
   At the adjusted current limit xI_e 2...5, the motor will accelerate to rated motor speed. For this purpose, the ratio of rated motor current to rated device current is to be set with the potentiometer Ie between 25%...100%.
   First of all, the device should be adapted to the rated current of the motor (see rating plate). For this, appropriately adjust the ratio of rated motor current to rated device current with the potentiometer Ie. Example: With a rated device current of 16A and a rated motor current of 11A, set the potentiometer Ie to just under 70%. Subsequently, the requested starting current limit is to be selected with the potentiometer xIe. In our example, with a setting of xIe = 3, the motor will accelerate with a fixed starting current of approx. 33A to full speed. With the potentiometers t ⌒ and U_{Start}, it is possible to adapt both the proportional gain (t ⌒) and the integral gain (UStart) and thus to optimize the control behaviour.
   Is the Softstarter in current limiting mode the potentiometers t ⌒ and U_{Start} should be adjusted as default:
   t ⌒ 50% ⟶ V_p = 5
   U_{Start} 50% ⟶ V_i = 2



Warning:

If the current limit is set to a value too low, the motor will not accelerate to full speed and will remain at an intermediate speed. After some time, the device will stop the starting process and go into fault mode in order to not overload the device and motor.
When selecting the current limit, it is important to consider load changes, e.g., over the course of time (mechanical alterations, wear and tear, ...) or thermal variations, etc... . The setting should be such that, even under worst case conditions, the drive accelerates to full speed without any problems.

8.2 Soft stop

Note: Soft stop is only useful for pump drives or applications in the case of which the drive comes to a stop **immediately** after switch off. In the case of drives driving high-inertia loads, soft stop is not sensible.

Note: **To enable soft stop, the VersiStart III, during the deceleration phase, has to be supplied with power from the supply mains.**

In the case of these devices, the cut-off voltage is factory-set to 70%.

The potentiometer t↓ is to be adjusted so that the requested deceleration time or deceleration characteristic is reached.

Caution: Danger to life through electric shock!

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

Warning!

Make sure that the specified switching frequency is not exceeded! After every start, it is necessary to give the power semiconductors sufficient time to cool down. If the time interval between starts is too short, there is the danger of destroying the power semiconductors!
Operation in bypassed condition also allows the power semiconductors to cool down!

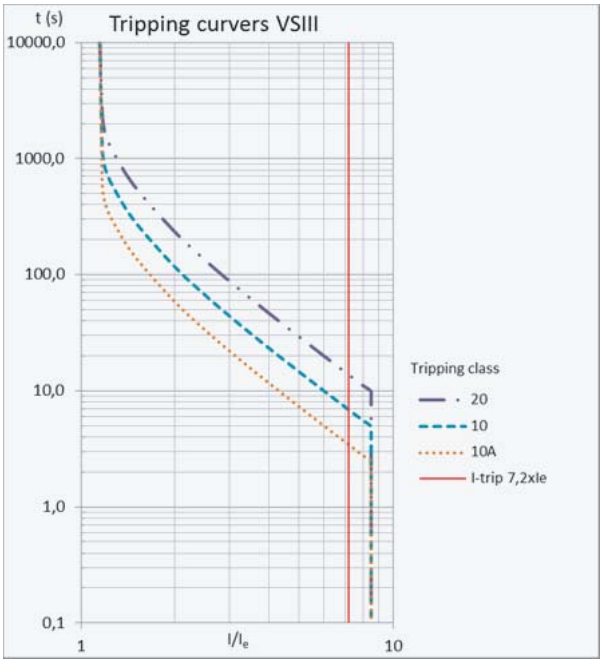
Note: If, in the motor circuit, a motor contactor that closes with the starting contact is used, the deceleration time t↓ is to be set to 0%.

9. Thermal overload protection

The type series VersiStart III... features an integrated thermal overload protection function both for the motor and the device. A current sensor measures the motor current and calculates a thermal image of motor and device. If the set threshold value is exceeded, the device switches into fault mode. The fault condition is indicated by the red and yellow LED on the device front panel. After such a thermal overload switching has taken place, the device and/or motor must be given sufficient time to cool down. Only then may the device be switched back into operating mode with the reset key. In this connection, however, the thermal memory will not be reset, i.e., if the cooling off period is too short, the device will very soon again switch off due to overload.

For different motors, appropriate tripping classes can be selected with the potentiometer CLASS = 10A, 10, 20. The "Off" position switches the thermal overload protection of the motor off.

The tripping value for the device is factory-set and corresponds with the thermal capacity of the device.



10. LED indicators

On the device front panel there are 3 light-emitting diodes that indicate the following operational states:

LED	Operational status
Green	Device is connected to mains voltage
Yellow	Start completed, device bypassed
Red	Fault
Red Yellow - flashing	Fault, the flashing frequency indicates the root cause of the fault (see chapter 11.1, page 17)
Yellow - flashing with increasing or decreasing frequency	Soft start / Soft stop

Two signalling relays are available on the control terminals X3 / X4 (RA 1) and X5 / X6 (RA 2); one transistor output (open collector) is available on the terminals X11 and X12:

RA 1 **Operational state**

The signaling contact RA 1 closes at the beginning of soft start and opens at the end of soft stop.

RA 2 **Fault**

Under normal operating conditions the signaling contact RA 2 is closed; it only opens if a fault occurs.

TO 1 **Device bypassed.**

When the start-up ramp is over and the motor is supplied with nominal voltage or the bypass relays are closed, the signaling contact TO 1 will be closed.

11. Fault

The device series VersiStart III... monitors various fault conditions. If a fault is detected, the device indicates the fault via the red LED and by a flashing of the yellow LED (flashes at constant frequency). In case of a fault, the signaling relay RA 2 will be opened. The various fault conditions are indicated via different flashing frequencies of the yellow LED.

11.1 Fault description

Fault	LED	Operational status
1	Yellow LED flashes 1x with a short pause	Undervoltage of electronics supply
2	Yellow LED flashes 2x with a short pause	Heat sink temperature too high/device thermally overloaded
3	Yellow LED flashes 3x with a short pause	Timeout Current control
4	Yellow LED flashes 4x with a short pause	Phase / Trigger failure in phase 1
5	Yellow LED flashes 5x with a short pause	Phase / Trigger failure in phase 2
6	Yellow LED flashes 6x with a short pause	Phase / Trigger failure in phase 3
7	Yellow LED flashes 7x with a short pause	Wrong phase sequence
8	Yellow LED flashes 8x with a short pause	Failure mains frequency-> The Mains frequency has gone beyond the specified range± 5%. or Failure Mains zero crossings -> Mains or motor circuit is defective
9	Yellow LED flashes 9x with a short pause	Overcurrent I-Motor > 4 x I_e in bypass mode
10	Yellow LED flashes 10x with a short pause	Motor current less than 12.5% rated device current
11	1x double flash of yellow LED with a short pause	Overcurrent I-Motor > 8,5 x I_e
12	2x double flash of yellow LED with a short pause	Overtemperature Device
13	3x double flash of yellow LED with a short pause	Overtemperature Motor
14	5x double flash of yellow LED with a short pause	Mains overvoltage
15	6x double flash of yellow LED with a short pause	Mains voltage Off
16	Constantly flashing yellow LED	Manual trip

11.2 Fault remedy

In case of a fault, please proceed as follows:

Fault 1:	Defect in the internal control electronics or connected motor too small (see technical data: min. motor load). Send the device to the producer to have it checked.
Fault 2:	Check the starting frequency and the starting current, and also observe the max. ambient temperature. Give the device and/or the motor enough time to cool down. Heat dissipation can be improved by forced cooling, with of a fan mounted underneath the device.
Fault 3:	The motor does not reach final speed with the adjusted max. starting current. Increase the value of the starting current with the "I" potentiometer.
	**Caution!** After a timeout cutoff, always allow the device to cool down, as an immediate restart may destroy the device.
Fault 4-6:	Power supply failed, motor lead interrupted, power semiconductor(s) defective, motor defective. Check motor and wiring. Send the device to the producer to have it inspected.
Fault 7:	At the supply voltage terminals L1, L2, L3 the wrong phase sequence (left-hand rotary field) is applied. Connect phase sequence L1, L2, and L3 for clockwise rotating field.
Fault 8:	As soon as the mains frequency is beyond this range an ongoing operation is impossible. or Mains supply or motor wiring interrupted, power semiconductor(s) defective, check fuses and wiring. Send the device to the producer to have it inspected.
Fault 9:	Motor current exceeds 4 x I_e in bypass mode e. g. Motor is blocked, or short-circuit in the motor circuit or overload. Check the motor circuit and load conditions.
Fault 10:	Motor is too small or phase failure
Fault 11:	Motor current exceeds 8,5 x I_e. Motor is blocked, or short-circuit in the motor circuit. Check the motor circuit.
Fault 12:	Device is thermally overloaded. Starting current is too high and/or starting time is too long. Starting frequency is too high.
Fault 13:	Motor is thermally overloaded. Motor load is too high.
Fault 14:	Mains voltage is above the permissible limit value.
Fault 15:	Mains voltage is not applied.

11.3 Manual trip

If the device is in stop mode and the reset button is pressed for 5s or longer the VeriStart III… will trip. The red LED is now illuminated and the yellow LED flashes continuously and shows a manual trip (to test trip mode of soft starter).

11.4 Resetting of faults

If a fault occurs, the device will go into failure mode (indicated by the red LED on the device front panel).

To put the device back into operating mode, the following options can be carried out.

1. Reset by pressing the Reset-key on the device front panel. Before the reset, however, the starting signal needs to be turned off. As a result of the reset, the device will be newly initialized. The thermal memory will not be deleted.
2. By switching the supply voltage Off and On, the device is put into its initial state. The thermal memory will be deleted by this, too.

Warning:

The cause of the fault must at any rate be identified and remedied by trained expert personnel. Only then may the device be put into operation again.

12. Technical data

Type designation	VS III 400-..				
	9	**16**	**25**	**37**	**45**
Rated device current I_e	9A	16A	25A	37A	45A
Rated operational voltage U_e	400V ±10% 50/60Hz				
Control supply voltage U_S only with Option B	230V ±10% AC 50/60Hz				
Motor rating at U_e 400V	4kW	7.5kW	11kW	18.5	22kW
Motor rating at U_e 400V IE3 Motors	3kW	5.5kW	7.5kW	15kW	18.5kW
Switch. frequency/hour at $3xI_N$ and t_{an}=5s	50	30	20	15	10
Utilization category	9A:AC-53b:6-3:69	16A:AC-53b:6-3:117	25A:AC-53b:6-3:177	37A:AC-53b:6-3:237	45A:AC-53b:6-3:357
max. Power dissipation - in operation related to max. starting frequency - Standby	20W 5W	20W 5W	20W 5W	20W 5W	20W 5W
I^2t - Power semiconductors in A^2s	390	720	4000	9100	16200
min. Motor load	20% of the device rated current				
Starting time	0.5 … 10s				
Starting voltage	40 ... 80%				
Stopping time	0.25 ... 10s				
Restart time	200ms				
Input resistance Control inputs	80kOhm				
Control voltage U_c	24 ... 230VAC/DC				
Contact rating of Relay outputs RA1 / RA2	2A / 250VAC / 30VDC				
Contact rating of Transistor output	20mA / 30VDC				
Installation class	3				
Overvoltage category / Pollution degree: Control and auxiliary circuit Main circuit	 II / 2 III (TT / TN-systems) / 2				
Rated impulse strength U_{imp}: Control and auxiliary circuit Main circuit	 2.5kV 4kV				
Rated insulation voltage U_i: Control and auxiliary circuit Main circuit	 250V 500V				
max. Cross-sectional area for connection solid/stranded: Control terminals Power terminals	 1.5mm² 6mm²			 1.5mm² 16mm²	

max. Tightening torque: Control- / Power terminals	Spring-loaded terminals
Ambient / Storage temperature	0°C ... 45°C up to an altitude of 1000m / -25°C ... 75°C
Power reduction[1)]	above 45°C - 2% per 1°C up to max. 60°C and installation altitudes above 1000m -1% per 100m
Degree of protection	IP 20
Weight	1100g
Special voltages (optional)	230V / 480V / wide-voltage range 200-480V with ext. control supply voltage 230VAC
Overload relays	
Current settings	40 - 100% of I_e
Tripping classes	Off, 10A, 10, 20
Number of poles	1
Relay version	electronic
Reset	manual

[1)] The reductions refer to the rated power.

Note: Please pay attention and consider for the operation of IE3 motors while dimensioning of softstarters the resulting higher starting currents.
For the use of IE3 motors we highly recommend to dimension and design the needed softstarters one size higher.

13. Dimensioning rules

13.1 Dimensioning of fuses for device protection

Pre-fuses F can be dimensioned according to the following instructions:

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

1. Fusing according to coordination type "1",DIN EN 60947-4-2.
   After a short circuit, the VersiStart III... device is allowed to be inoperative and repair work is possible.
2. Fusing according to coordination type "2",DIN EN 60947-4-2.
   After a short circuit, the device must be suitable for further use. However, there is the danger that the contacts of the bypass or braking relays weld. Therefore, if possible, these contacts are to be checked prior to reconnecting these contacts to the mains supply. If this check cannot be carried out by the user, the device has to be returned to the producer in order to have it checked.

The following dimensioning information refers to the below operating conditions:

- Use of standard asynchronous motors
- Standard starting and stopping times
- Switching frequencies not exceeding the values specified in the data sheet

Fusing according to coordination type "1"

As pre-fuses we recommend to use fuses of the utilization category gG.

If such fuses are also used to provide line protection, the conductor cross section is to be appropriately coordinated!

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

Rated device current (ttechnical data)	Device type	**Fuse value in the case of coordination type 1**	Fuse type (recommendation)
9A	VS III ...-9	20A	500V NH00gG
16A	VS III ...-16	35A	500V NH00gG
25A	VS III ...-25	50A	500V NH00gG
37A	VS III ...-37	63A	500V NH00gG
45A	VS III ...-45	80A	500V NH00gG

Fusing according to coordination type "2":

The power semiconductors are to be protected by semiconductor protection fuses of the utilization category aR or gR. aR fuses do not guarantee line protection, additional line protection fuses (utilization category gG) must be used.

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 starting time and possibly the max. starting 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 starting phase or during soft stop.

13.2 Determining the permissible starting frequency

The starting frequency depends on the:

1. starting current or the heat loss across the power semiconductors.
2. current carrying capacity and the temperature increase of the power semiconductors.
3. heat sink's capability of absorbing the heat loss and passing the temperature increase on to the environment.

The following diagrams are to assist you in determining the maximum starting frequency per hour, i.e., on the basis of the given maximum starting current and for various starting times.

Should the requested starting frequency not be reached, a different device series has to be chosen.

Example: In a drive, a 15 kW-motor is to be started. A maximum starting current of 120A has been measured. This approximately corresponds to the 4-fold nominal current. The device employed is a VSIII 400-37. From the applicable chart it is now possible to read off a max. starting frequency per hour lying between 40 (starting time = 1s) and 4 (starting time = 10s).

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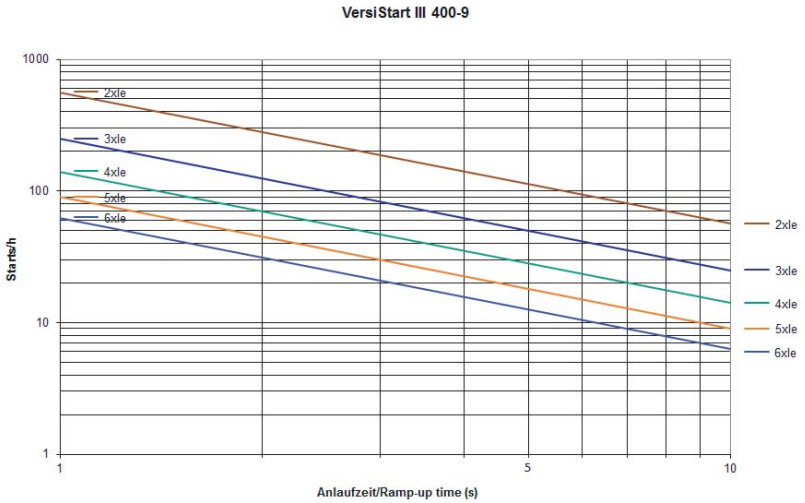
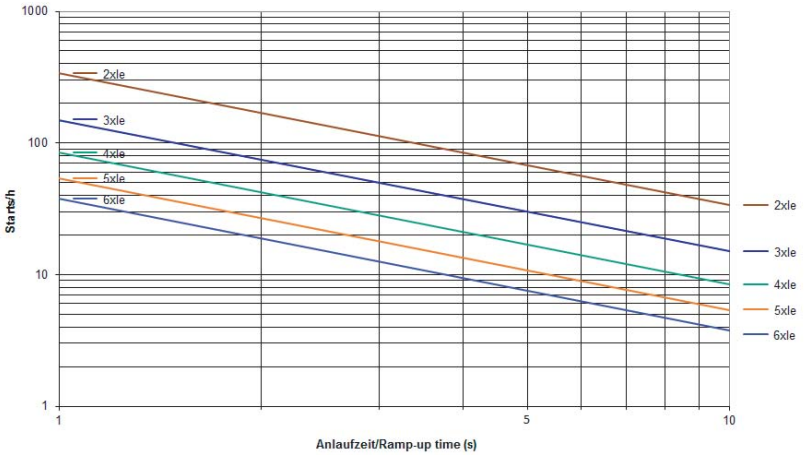
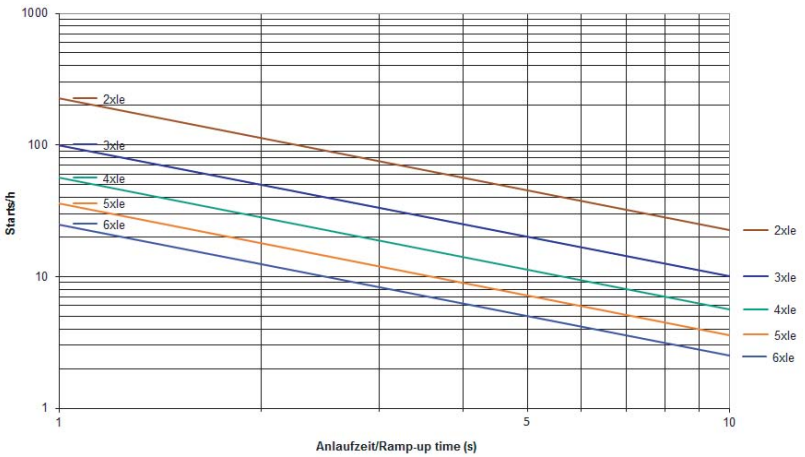


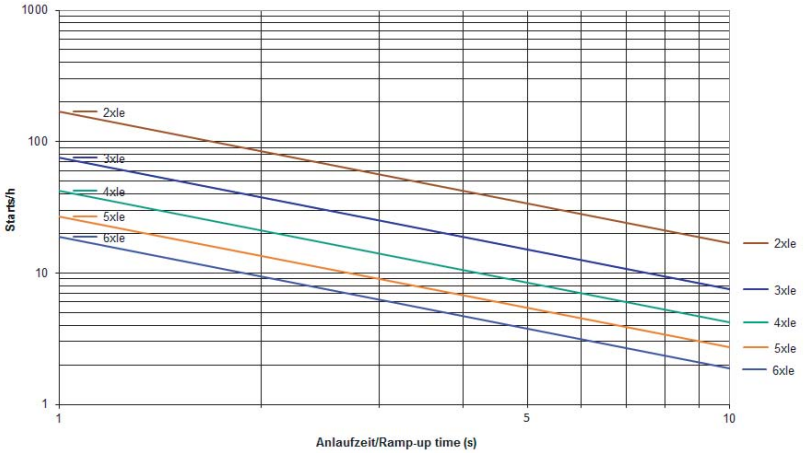
VersiStart III 400-16



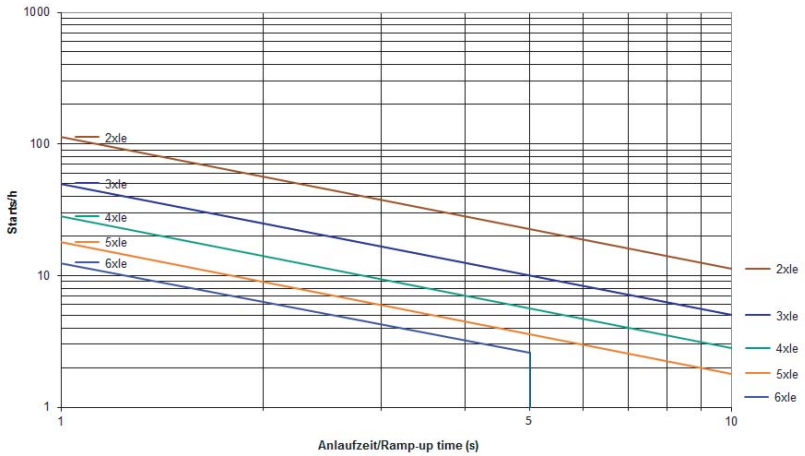
VersiStart III 400-25



VersiStart III 400-37



VersiStart III 400-45



14. Special units

The rated voltage of a device featuring special voltage is indicated on the rating plate. In the case of devices with voltages < 400V it must be ensured that the device rating and the motor rating are not identical. Of prime importance in this connection is the rated device current and the motor current according to rating plate.

14.1 Devices with rated voltage of 230V or 480V

It must be ensured that the mains voltage value indicated on the rating plate is connected to the terminals L1, L2, L3.

Otherwise the devices are to be put into operation like standard devices.

14.2 Devices featuring a wide-voltage-range power section

In the case of wide-voltage-range-capable devices (Option „B, 230VAC“) the voltage range for the power supply is 200V ... 480V. Besides, in order to operate the devices, it is necessary to connect an control supply voltage U_S of 230VAC to the terminals X1 and X2.

15. 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).

15.1 Connection

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

15.1.1 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.

15.1.2 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).

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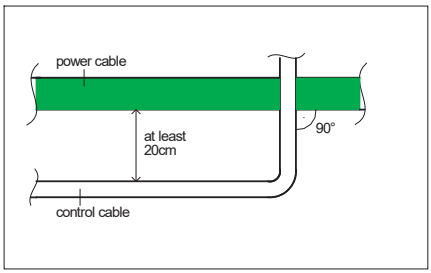


Figure 1

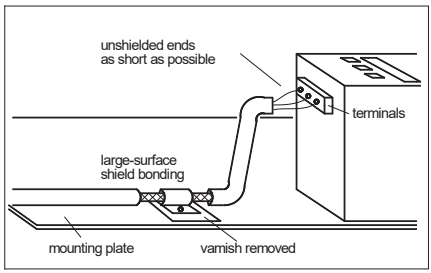


Figure 2

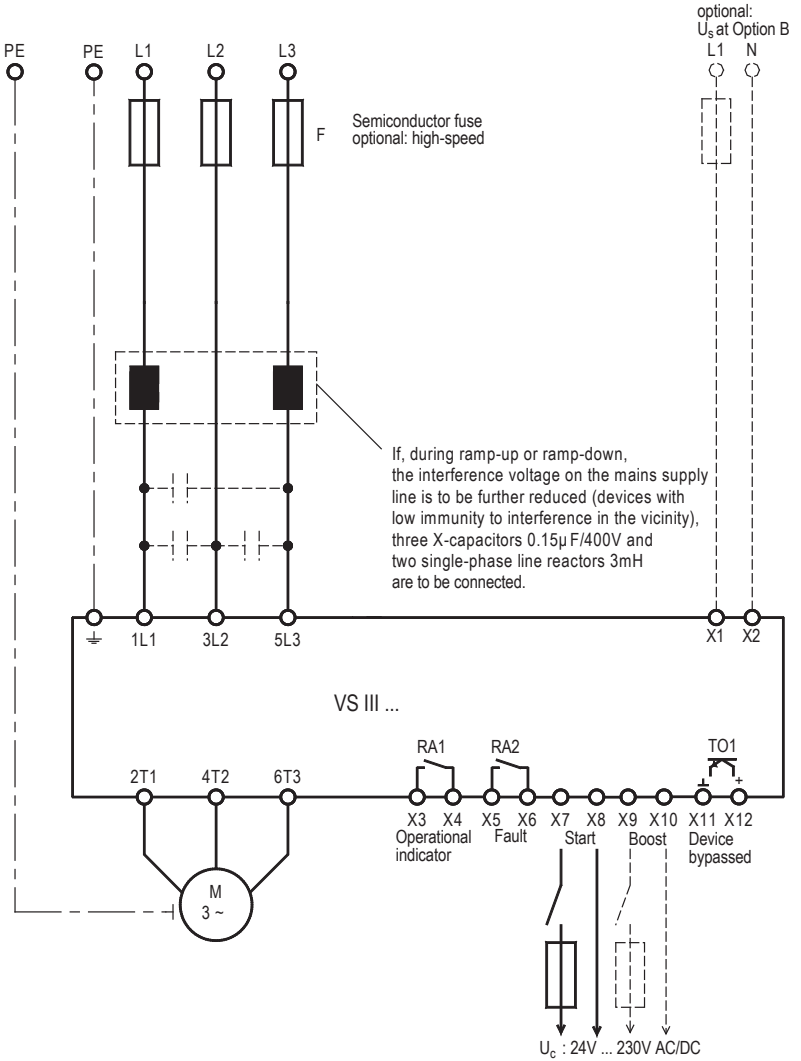
Caution!

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.

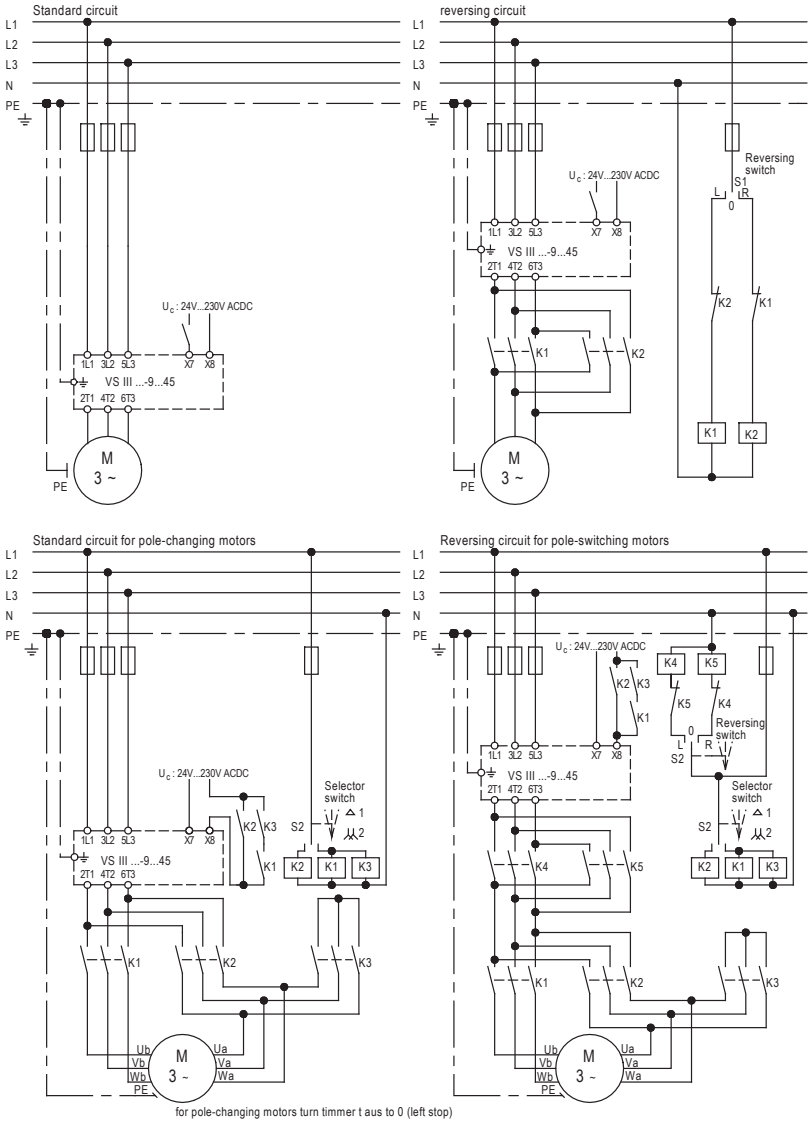
Note: Further connection diagrams for special circuit arrangements are available on our homepage at **www.peter-electronic.com**.

Note: Prior to putting the VersiStart III... into operation, the wiring is to be checked.

15.2 General connection diagram

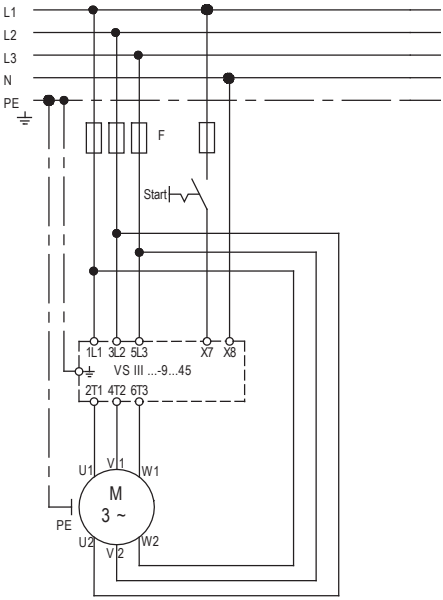


15.3 Typical connections



Further connection diagrams are available via the internet at **www.peter-electronic.com**

15.4 Motor/Soft start in delta connection

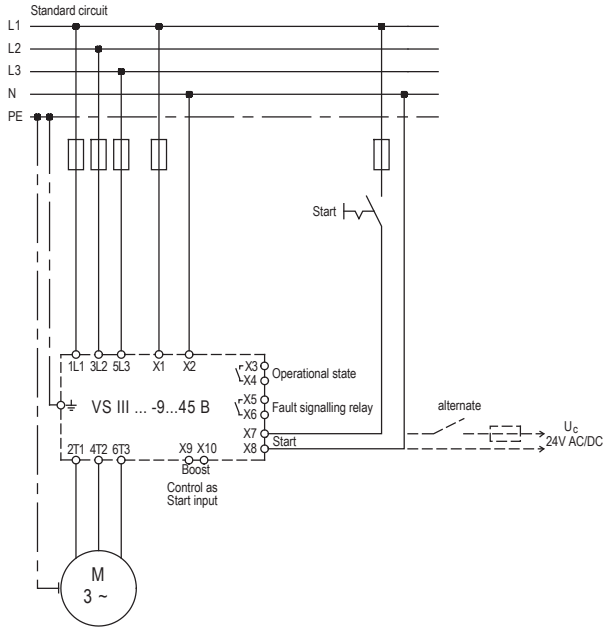


Caution!

If the motor is operated in inside delta connection, the setting of the motor current needs to be adapted with the potentiometer Ie. Without such adaptation, the thermal overload protection would trip too early.
The motor current setting Ie is to be adjusted to a value which is lower by the factor of 0.58 than the rated motor current.

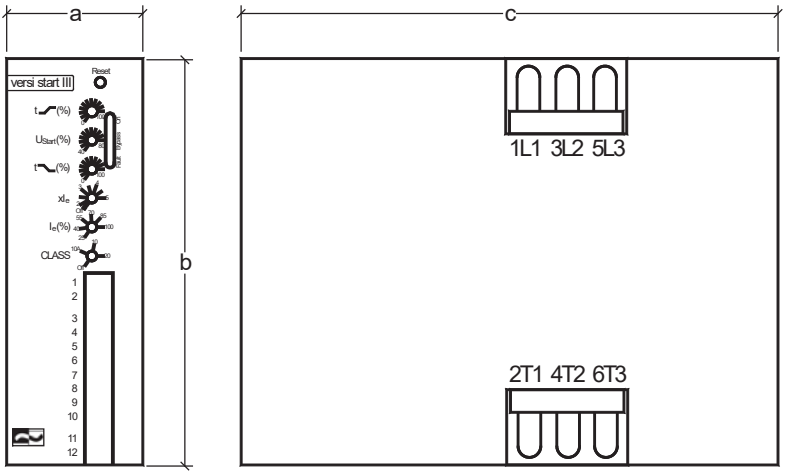
Further connection diagrams are available via the internet at **www.peter-electronic.com**

15.5 Wide-voltage-range connection



Further connection diagrams are available via the internet at **www.peter-electronic.com**

16. Dimensions



Mounting dimensions	a	b	c
VS III ... - 9 … 25	45	147	158
VS III ... - 37 ... 45	52,5	147	158

All dimensions indicated in mm.

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