Elektroniksysteme GmbH
Development and production of electronical systems

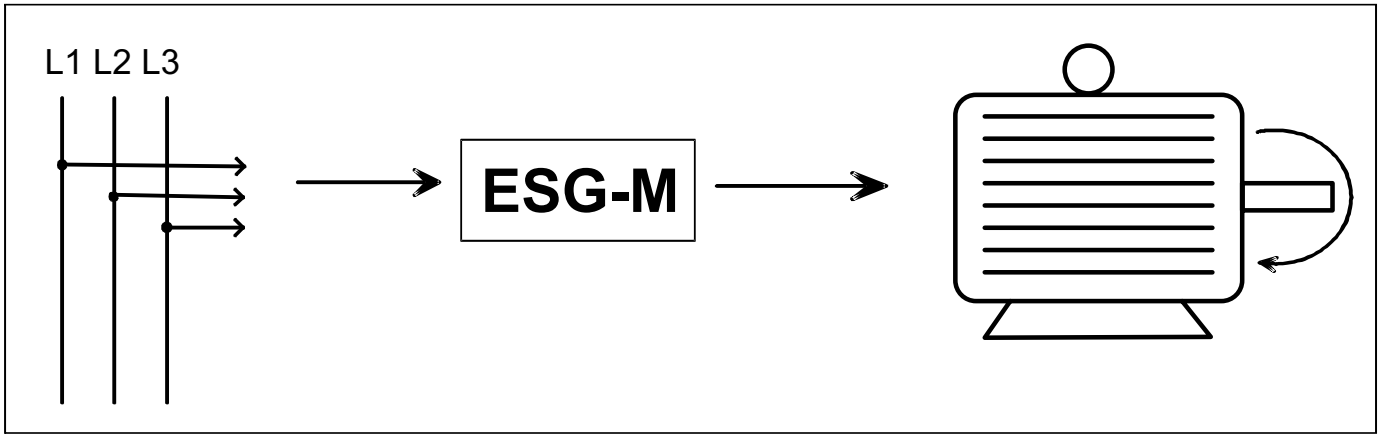
Eichelreuth 13
83224 Grassau

Phone: +49 8641 598360
Fax: +49 8641 598364

E-Mail: info@rs-steiner.com
Internet: http://www.rs-steiner.com

Start-up instructions

Electronic soft-starter
Type: ESG-M



Contents

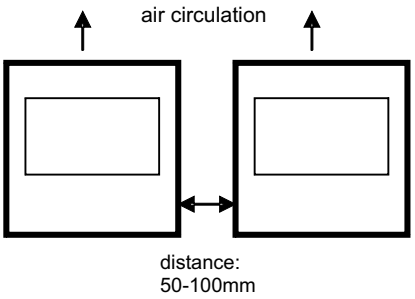
1. Installation of the soft-starter ESG-M

ESG-M complies to the international protection (IP) class 40. Therefore it must be built into a case or a electrical cabinet. Air cooling e.g. by a fan must be ensured to a 55°C level. Temperatures above this level will cause operations to fail, in the worst cause it will destroy the device. The device has to be mounted in an upright postion. This ensures that the air-flow-channels of the heat sink are in an upright postion, too. The environment conditions around the device have to be appropriate, e.g. dry and with a minimum of dust. All environment conditions have to meet IP 40 specifications.

Additional requirements for mounting:

- protection against dust and moisture
- protection against agressiv surounding athmosphere
- free from vibraton
- constant power conditions especially for ESG-M devices with power P >55kW

To ensure an efficient cooling, mounting of additional constructions, devices or components must not be done in a distance closer than 50 to 100 mm of the ESG-M device.



Circuit wiring:

Make mains connections (L1, L2, L3) via fused circuit breakers with the usual safeguards. Simply connect the device to the motor supply lines; it doesn't matter whether the motor is star or delta wired.

The wiring for power supply and the wiring for control must be laid in separate conduits or shielded ducts.

It is essential that the electrical installation comply with general stipulations of the VDE (German Electrical Engineers Association), specifically (VDE 0100, VDE 0113, VDE 160).

2. Initial operation and mounting instructions

To begin with, all electrical connections are to be made according to the accompanying wiring diagrams: L1, L2, L3, T1 (U), T2 (V), T3 (W).

The electronic smooth-starting devices must be connected to the power supply in accord with VDE specifications so that they can be disconnected from the mains using a suitable switching means (i.e., master switch, contactor, protective power switch).

The wiring of the ESG-M power unit must be done arcording to the curicuit diagramm in this instruction. The neutral wire does not have to be conected.

Conduit instllation:

The mains power supply and motor power supply, are to be in separate ducts or conduits.

To avoid malfunctions it is advisable to install the electronic signal wiring separate from the power supply and/or protective control wiring, and either to twist the feed and return signal lines or use shielded control lines.

Fuses:

The mains fuses protection is dependent on the recommended or used power-transmission cross-section, and must be carried out in accordance with DIN 57100, Part 430/VDE 0100 and Part 430/6.81.

The ESG-M size A und B do not include additional semiconductor fuses. Starting with size C, semiconductor fuses are included in the respective device. Please refer to the appendix for a reference table.

Compensation units (containing condensers) must not be used between ESG-M and the motor.

Even if the motor does not revolve, there might be power-potential at the motor. This can lead to serious, potential fatal accidents. Before working on the softstart or the motor, one must physically disconnect both devices (and possible additional relevant devices) from the power supply.

Malfunction reports:

phase malfunction	one or more phases has or have no link to the mains connection
temperature excee-dance of heat sink	• motor overload • excessive running voltage • not enough cooling of the cabinet
PTC	motor overload

3. Meaning of the clamp connections

Standard activation		
3-4		bridged
1-9	ramp-up and continuous operation	closed
	ramp-down	open
3-4		open
1-3	ramp-up and continuous operation via external control unit (e.g. PLC)	closed
	ramp-down via external control unit (e.g. PLC)	open

Reset		
3-4		bridged
2-9	reset	short impulse
3-4		open
2-9	reset via external control unit (e.g. PLC)	short impulse

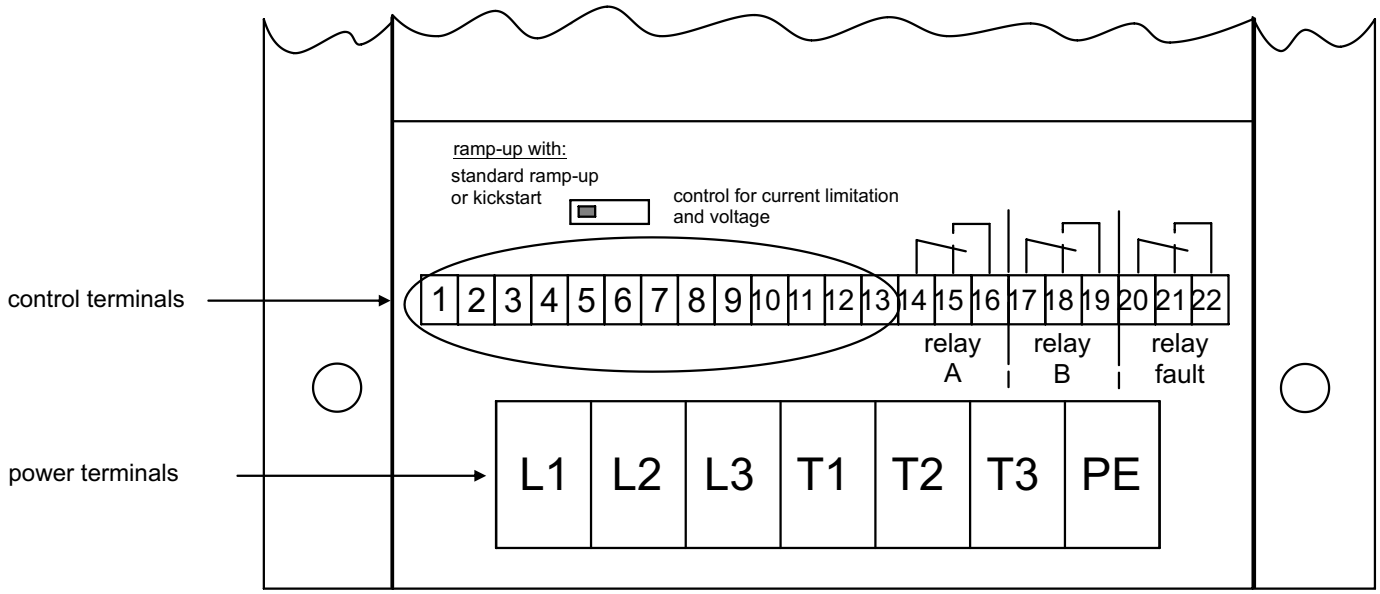
Signals		
7	control voltage (Option)	input
8	control voltage (option)	output

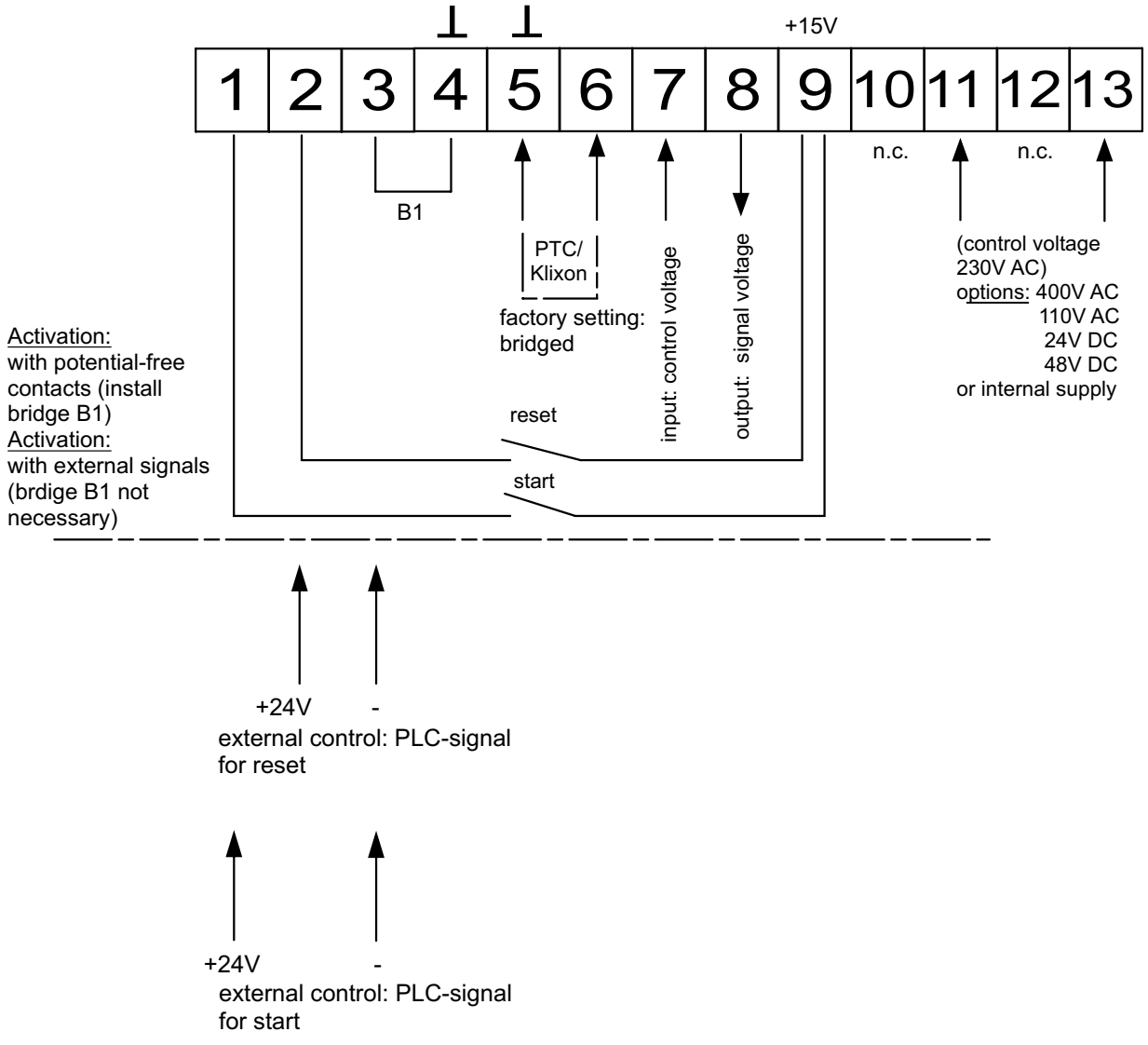
PTC	
5-6	PTC or Klixon (factory setting: bridged)

Power supply	
11-13	power supply 230V AC (option: 400V AC, 110V AC, 24V DC, 48V DC)

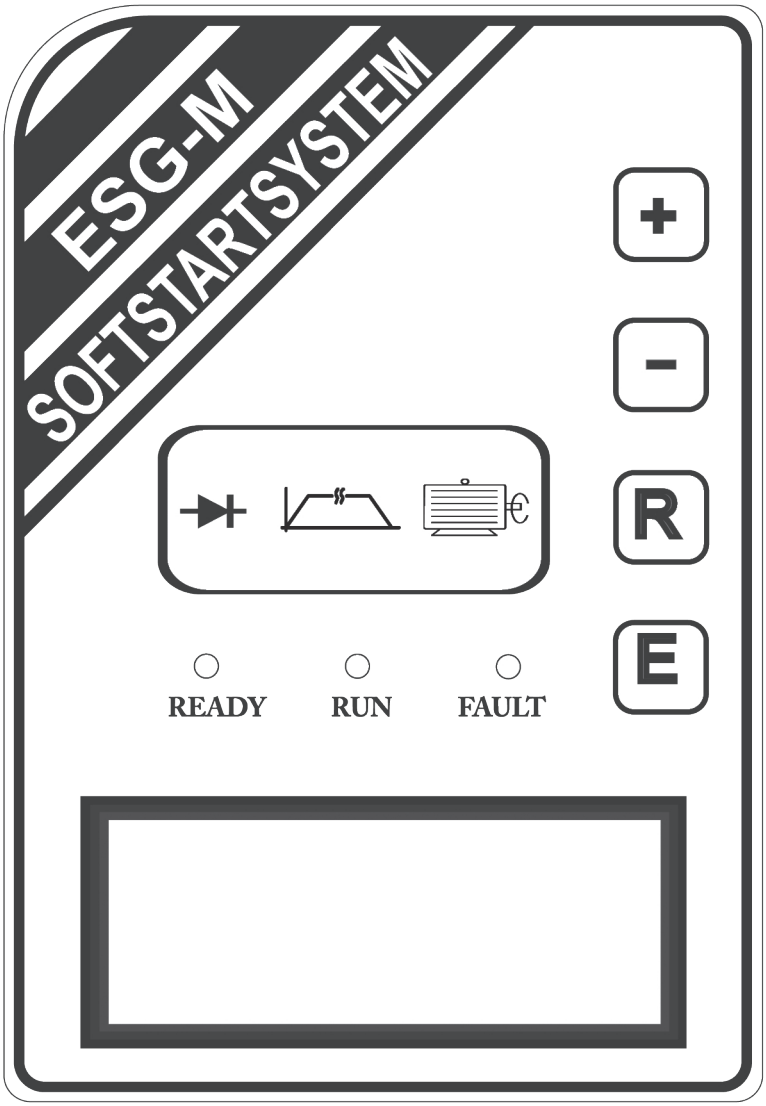
Relais		
14 – 15	relay A	break contact
14 – 16	relay A	open contact
17 – 18	relay B	break contact
17 – 19	relay B	open contact
20 – 21	relay fault	break contact
20 – 22	relay fault	open contact

Connection of the control and power terminals:





4. Control panel



[+], [-]: By pressing this key you are able to increase [+] and decrease [-] the selected parameter.

[R]: By pressing the [R] key you are able to change the parameters during programming mode

[E]: By pressing the [E] key you are able to save recently modified parameters and get back to the main menue. If an error occurs this key also enables you to reset the device. During operation the softstarter can be switched off when pressing [E].

LEDs:

READY: (green)	lights after auxiliary voltage has been applied
RUN: (yellow)	lights as soon as “Start“ is activated, dies out when the start contacts (1-9) are opened; flashes when the [+] key is pressed while changing parameters
Fault: (red)	flashes if an error occurs, dies out after reseting the device.

5. Employment of the devices

The electronic motor-control devices ESG-M... are provided with a set of well defined parameters. Of course, they can be changed quite easily according to the needs of our customers. You will find some pieces of information on that subject in the following chapter.

Typical Employments:

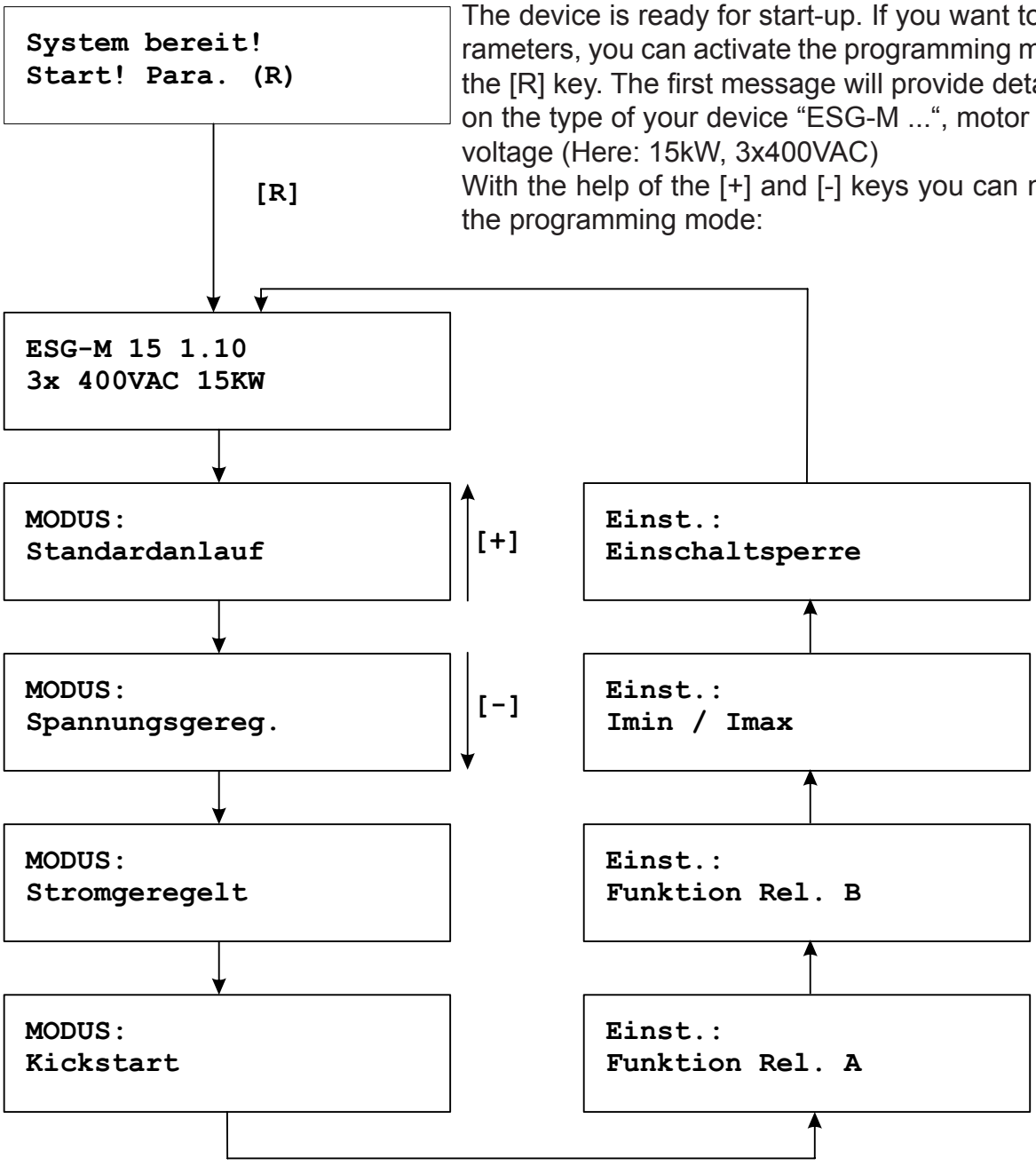
Ramp-up of pumps **(quadratic load torque, low moment of inertia)**	
Recommended start function	voltage controlled or current controlled ramp-up
The motor starts too fast: • voltage controlled ramp-up: increase “Anlaufzeit“ • current controlled ramp-up: decrease “Begrenzungsstrom”	
The motor doesn’t start at all: • voltage controlled ramp-up: increase “Anlaufzeit“ (start function might be changed to current controlled ramp-up) • current controlled ramp-up: increase “Begrenzungsstrom“ as long as motor does not start as intended	

Conveyors **(constant load torque, also with initial torque)**	
Recommended start function	standard ramp-up or kickstart
The motor starts too fast: • standard ramp-up: increase “Anlaufzeit”, “Startspannung” might be decreased • kickstart: decrease “Startstrom”, “Kickspannung” and “Kickdauer” might be decreased, too	
The motor doesn’t start at all: • standard ramp-up: increase “Anlaufzeit” • kickstart: increase “Begrenzungsstrom” as long as the motor does not start as intended	

Fans-mills-applications **(quadratic load torque, high moment of inertia)**	
Recommended start function	current controlled ramp-up
The motor starts too fast: decrease “Startstrom“	
The motor doesn’t start at all: increase “Begrenzungsstrom“as long as the motor does not start as intended	

6. Basic functions of the soft-starter ESG-M

After the auxiliary voltage has been applied, the system will be checked and the following output will appear on the LCD display:



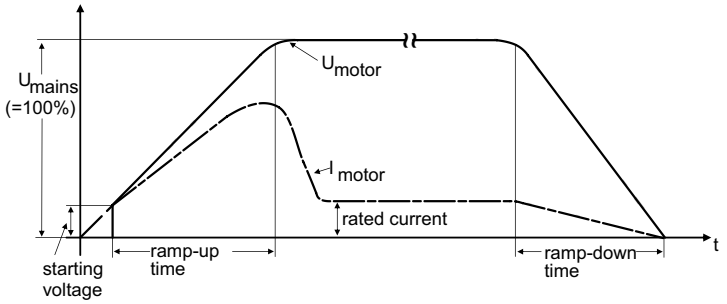
The device is ready for start-up. If you want to change the parameters, you can activate the programming mode by pressing the [R] key. The first message will provide detailed information on the type of your device “ESG-M ...“, motor power and main voltage (Here: 15kW, 3x400VAC)
With the help of the [+] and [-] keys you can navigate through the programming mode:

In order to activate or to change the mode, the key [R] has to be pressed.

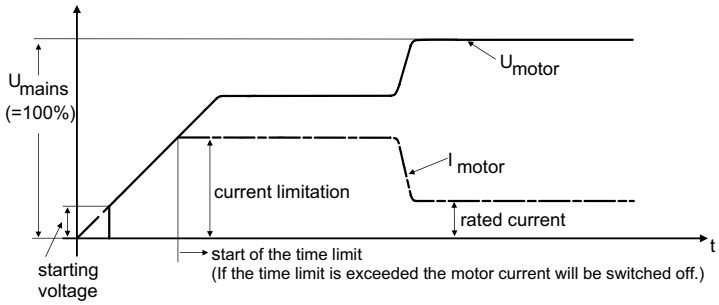
Mode “standard ramp-up”

MODUS:
Standardanlauf

ramp-up: standard ramp-up without reaching the current limit



ramp-up: standard ramp-up with operating current limit



MODUS: [AKTIV]
Standardanlauf

The term “[AKTIV]“ indicates that this mode (here: “standard ramp-up”) has been set.

Startspannung
20 in %

This value specifies with which voltage the ramp-up will start. (Range: 0-50%, factory setting: 20%)

Anlaufzeit
20 Sekunden

The duration of ramp-up can be set here. During this period current limitation or rate operation have to be activated. (Range: 0-240s, factory setting: 20s)

Begrenzungsstrom
58 Ampere

The maximum current can be set here. (Range: I_{rated}-4,5xI_{rated}, factory setting: 2xI_{rated})

Begrenzungsz. (I)
45 Sekunden

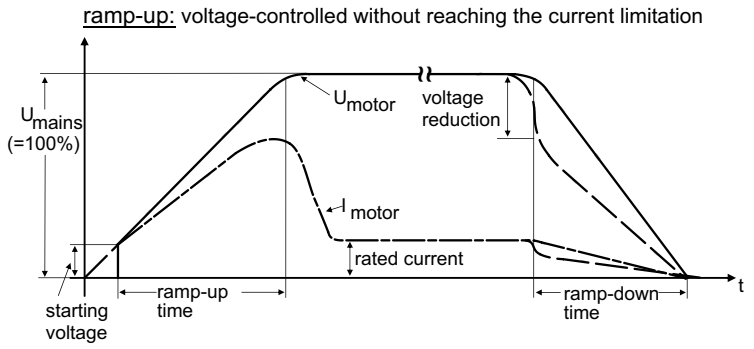
Time limitation specifies how long the motor may run in the current limitation mode. After this time the motor current will be switched off. (Range: 5-180s, factory setting: 45s)

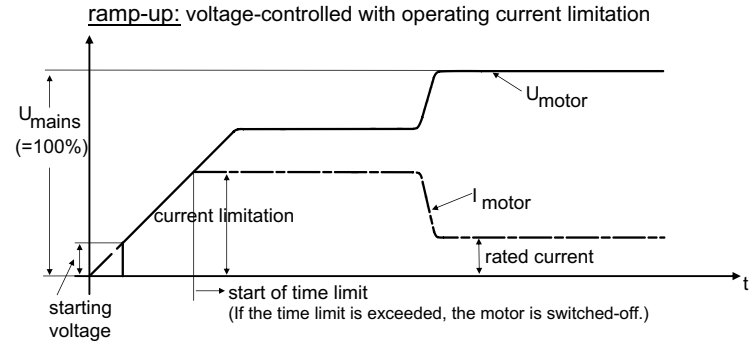
Auslaufzeit
2 Sekunden

The duration of ramp-down can be set here. During this period the motor will be constantly switched off out of the rated operation. (Range: 1-240s, factory setting: 2s)

Mode “voltage controlled ramp-up”:

MODUS:
Spannungsgereg.





MODUS: [AKTIV]
Spannungsgereg.

Startspannung
20 in %

This value specifies the voltage which will be used for ramp-up. (Range: 0-50%, factory setting: 20%)

Anlaufzeit
20 Sekunden

The duration of ramp-up can be set here. During this period current limitation or rate operation have to be activated. (Range: 1-240s, factory setting: 20s)

Begrenzungsstrom
58 Ampere

The maximum current can be set here. (Range: I_{rated}-4,5xI_{rated}, factory setting: 2xI_{rated})

Begrenzungsz. (I)
45 Sekunden

Time limitation specifies how long the motor may run in the current limitation mode. After this time the motor current will be switched off. (Range: 5-180s, factory setting: 45s)

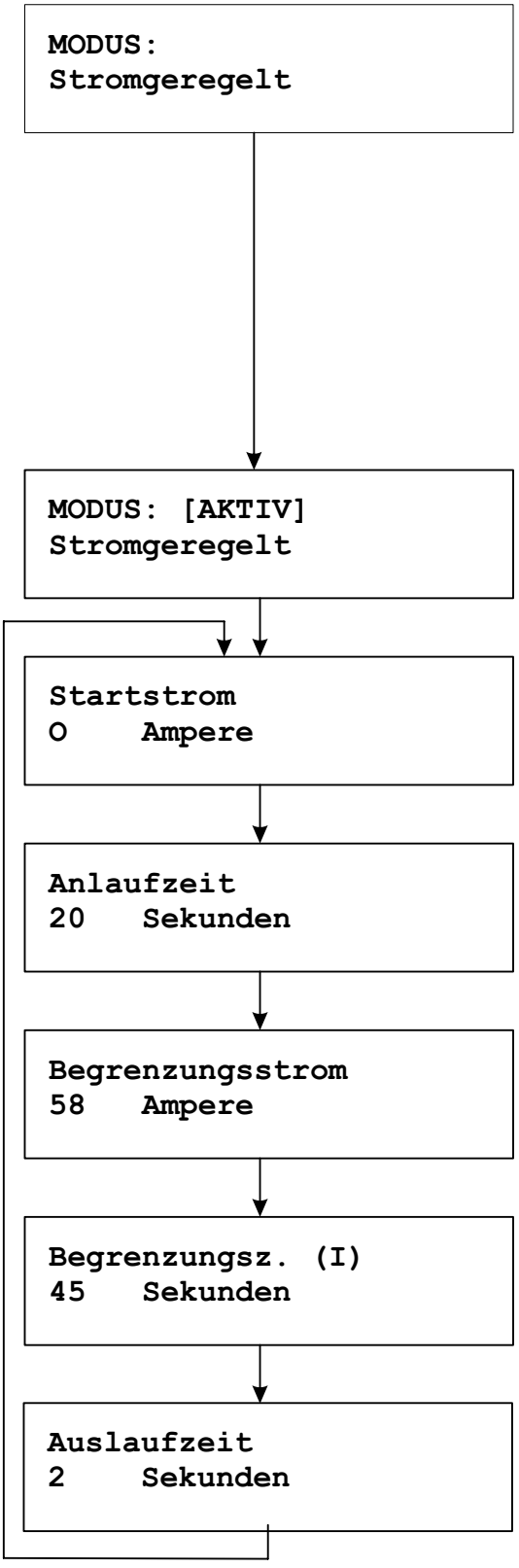
Spannungsabsenk.
50 in %

Voltage decrease specifies the voltage which will be set after the start terminals are opened (Range: 1-100%, factory setting: 50%)

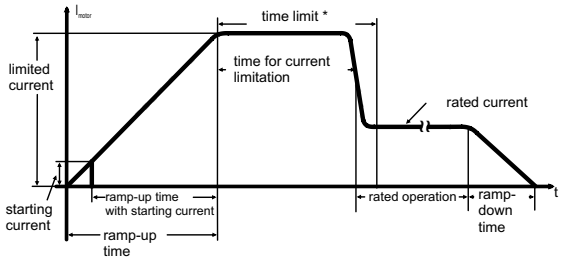
Auslaufzeit
2 Sekunden

The duration of ramp-down can be set here. During this period the motor will be constantly switched off out of the rate operation. (Range: 1-240s, factory setting: 2s)

Mode “current controlled ramp-up”:

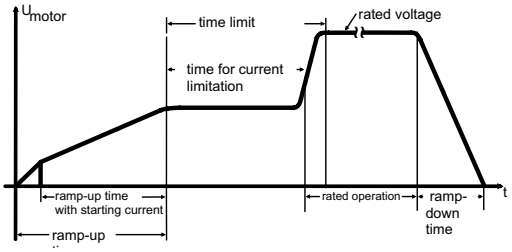


ramp up: current controlled ramp-up



*** The time limit has always to be set to a larger value than it would be necessary for a current limited ramp-up - otherwise the ramp-down process will be started earlier. The time limit depends on the current and on the load torque.**

Voltage progress at current controlled ramp-up



This value specifies with which current the ramp-up will start. (Range: 0 ... 4,5xI_{rated}, factory setting: 0A)

The duration of ramp-up can be set here. During this period current limitation or rate operation have to be activated. (Range: 1-240s, factory setting: 20s)

The maximum current can be set here. (Range: I_{rated}-4,5xI_{rated}, factory setting: 2xIrated)

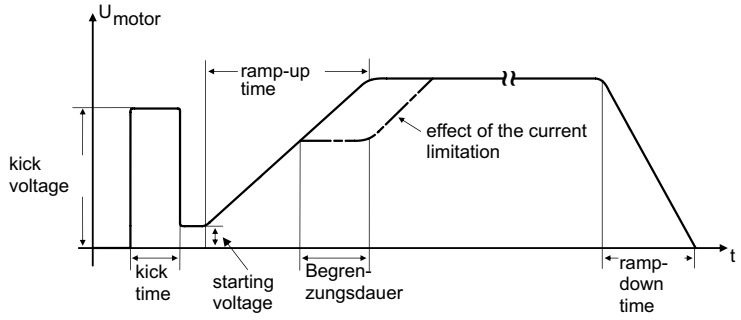
Time limitation specifies how long the motor may run in the current limitation mode. After this time the motor current will be switched off. (Range: 5-180s, factory setting: 45s)

The duration of ramp-down can be set here. During this period the motor will be constantly slowed down out of the rated operation. (Range: 1-240s, factory setting: 2s)

Mode “kickstart“

MODUS:
Kickstart

MODUS: [AKTIV]
Kickstart



Kick-Dauer
3 Sekunden

Specifies the duration of the kickstart impulse. (Range: 1-10s, factory setting: 3s)

Kick-Spannung
25 in %

Specifies the intensity of the kickstart. (Range: 25-70%, factory setting: 25%)

Startspannung
10 in %

This value specifies the voltage which will be used for ramp-up. (Range: 0-50%, factory setting: 10%)

Anlaufzeit
20 Sekunden

The duration of ramp-up can be set here. During this period current limitation or rate operation have to be activated. (Range: 1-240s, factory setting: 20s)

Begrenzungsstrom
58 Ampere

The maximum current can be set here. (Range: I_{rated}-4,5xI_{rated}, factory setting: 2xI_{rated})

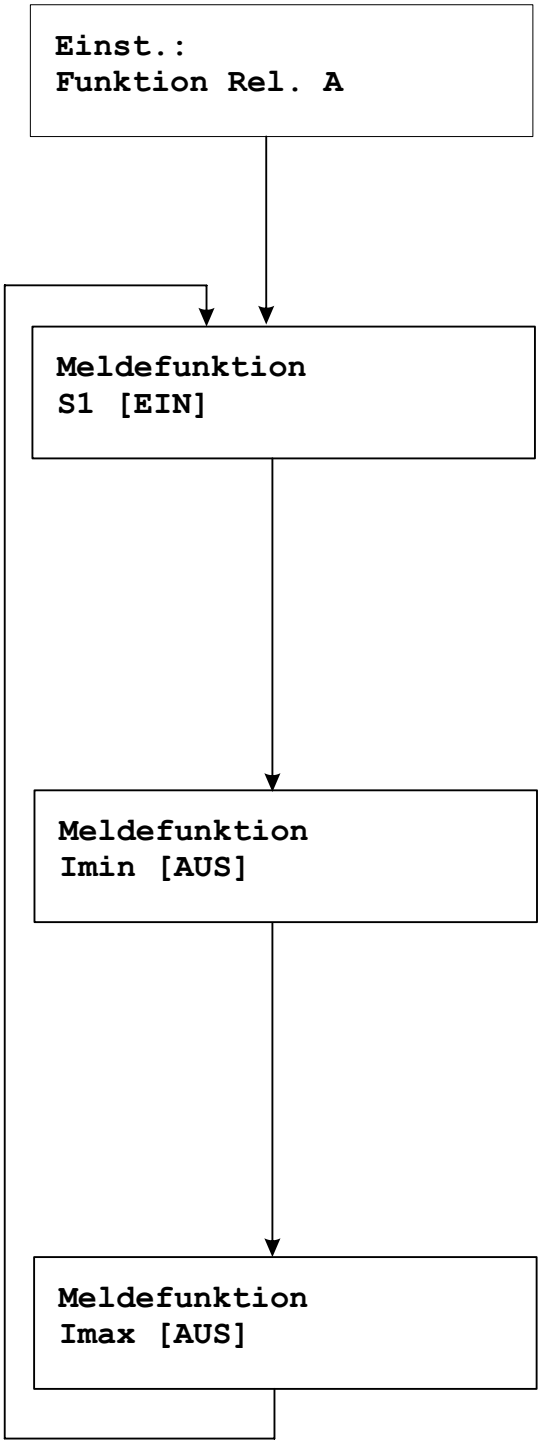
Begrenzungsz. (I)
45 Sekunden

Time limitation specifies how long the motor may run in the current limitation mode. After this time the motor current will be switched off. (Range: 5-60s, factory setting: 45s)

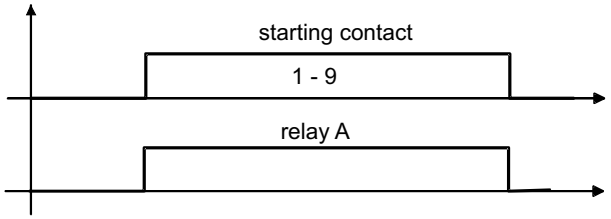
Auslaufzeit
2 Sekunden

The duration of ramp-down can be set here. During this period the motor will be constantly slowed down out of the rated operation. (Range: 1-240s, factory setting: 2s)

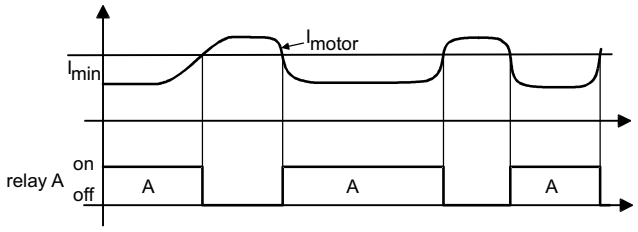
Setting relay A:



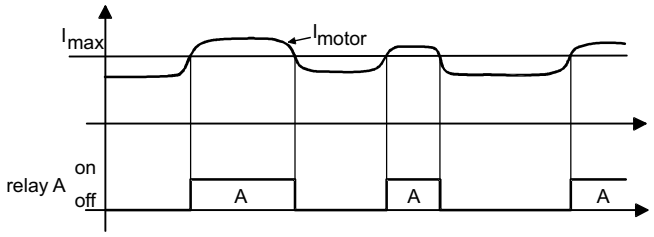
Notifier relay A will switch if start terminals (e.g. 1-9) are being closed and will be reopened after removing of start terminals.



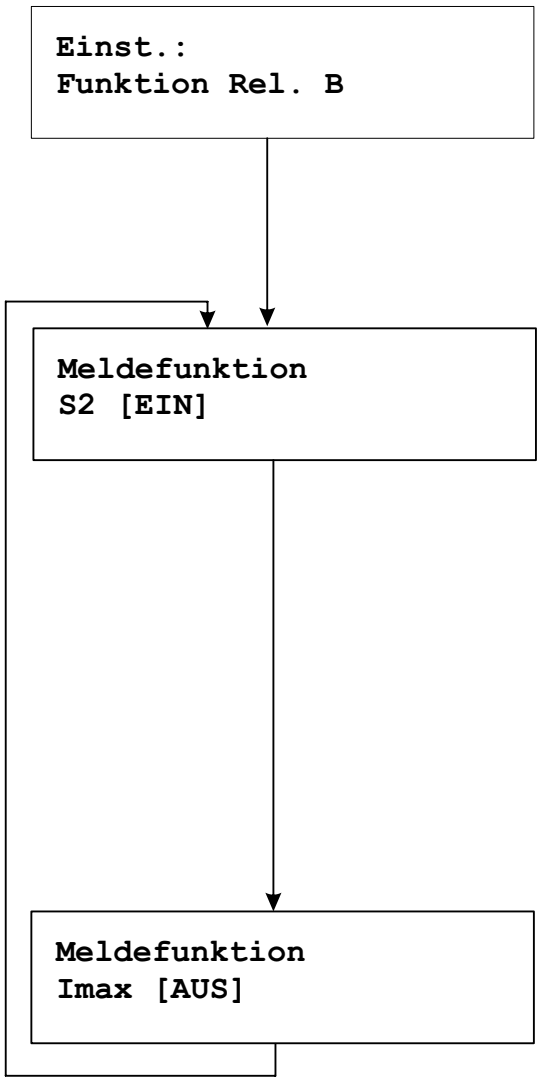
Notifier relay A will switch if the threshold "I_{min}" falls below the value which was set in the menu item "I_{min}/I_{max}" and will be reopened if exceeding.



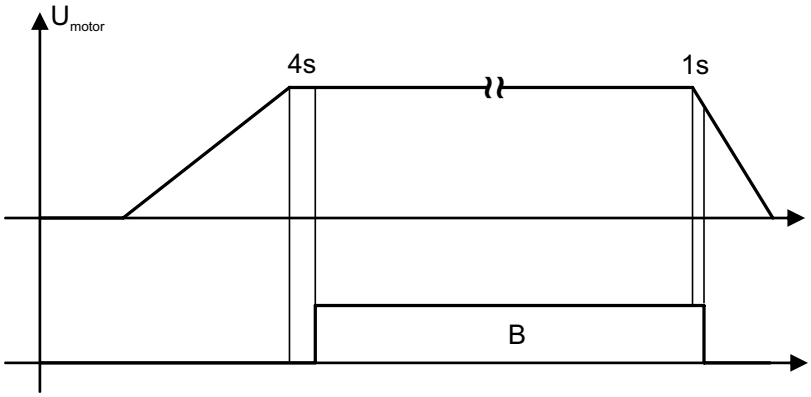
Notifier relay A will switch if the threshold "I_{max}" which was set in the menu item "I_{min}/I_{max}" is exceeded and will be reopened if falling below.



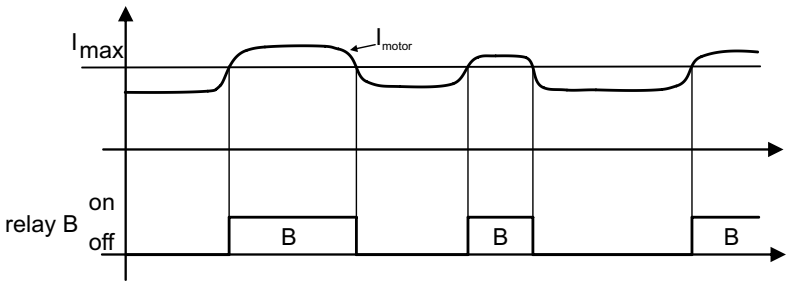
Setting relay B:



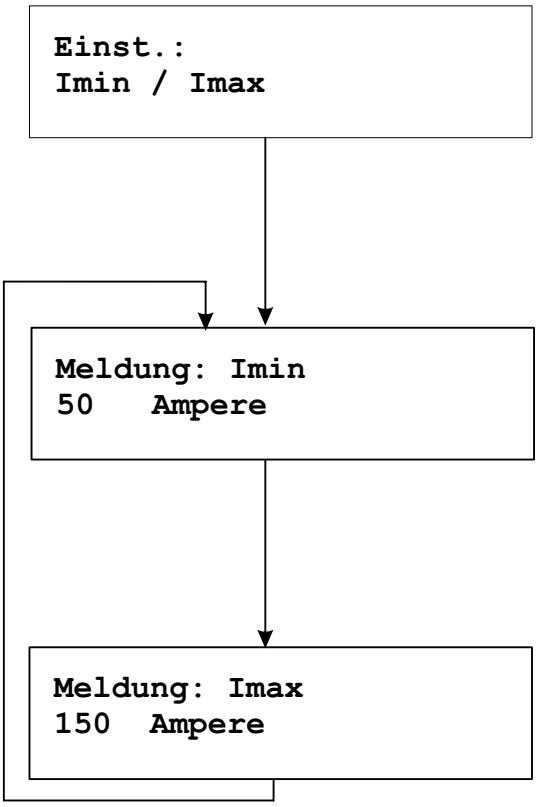
Notifier relay B switches four seconds after rate operation was reached and will be reopened one second after leaving rate operation.



Notifier relay B will switch if the threshold "I_{max}" which was set in the menu item „I_{min} / I_{max}" is exceeded and will be reopened if falling below.



Setting I_{min}/I_{max}

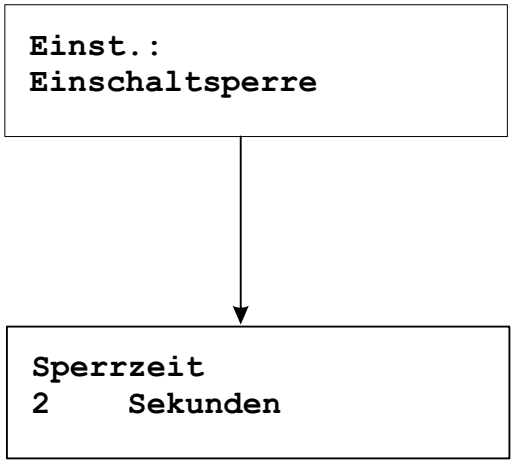


Specifies the minimum threshold for notifier relays A and B. (Range: 0-4,5xI_{rated}, factory setting: 50A)

Specifies the maximum threshold for notifier relays A and B an. (Range: 1-4,5xI_{rated}, factory setting: 150A))

The maximum threshold can be calculated by I_{rated} (minimum current limitation) x 4,5.

Setting switch-on lock:



Lock time specifies how long the device will be locked for a new start-up after an abbort or ramp-down. Intended to avoid several ramp-ups within a short period of time (e.g. compressors) (Range: 0-600s, Factory setting: 2s)

7. Switching suggestions

Employing ESG-M .. smooth-starting devices allows a great number of application possibilities, all based on the initial conception.

As examples, three fundamental connection diagrams are presented here which should give a survey of the device's integration in existing plants or those in the planning stage.

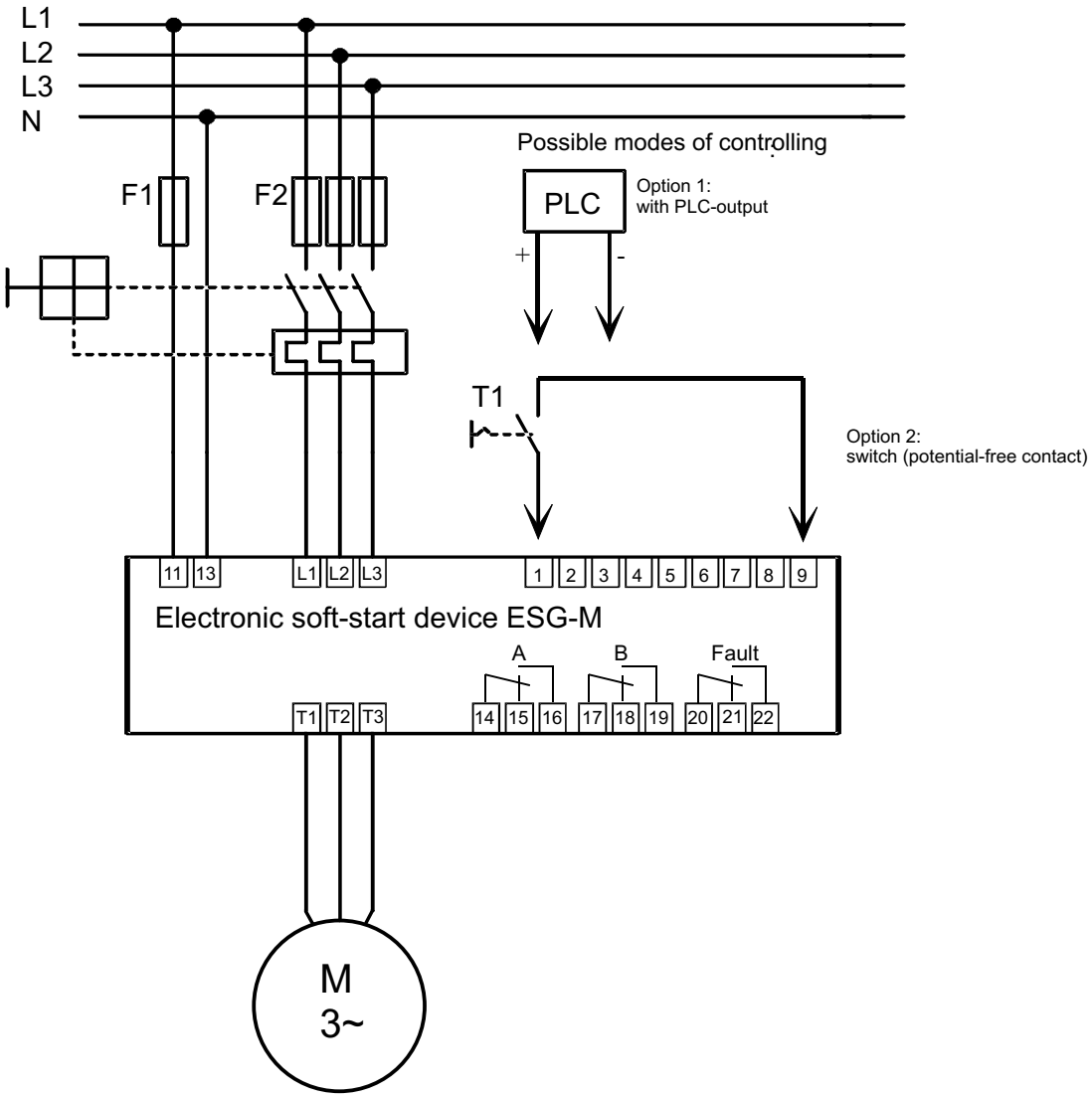
It is in each case up to the user how the device should be installed in order to achieve the greatest effectiveness.

Switching possibilities:

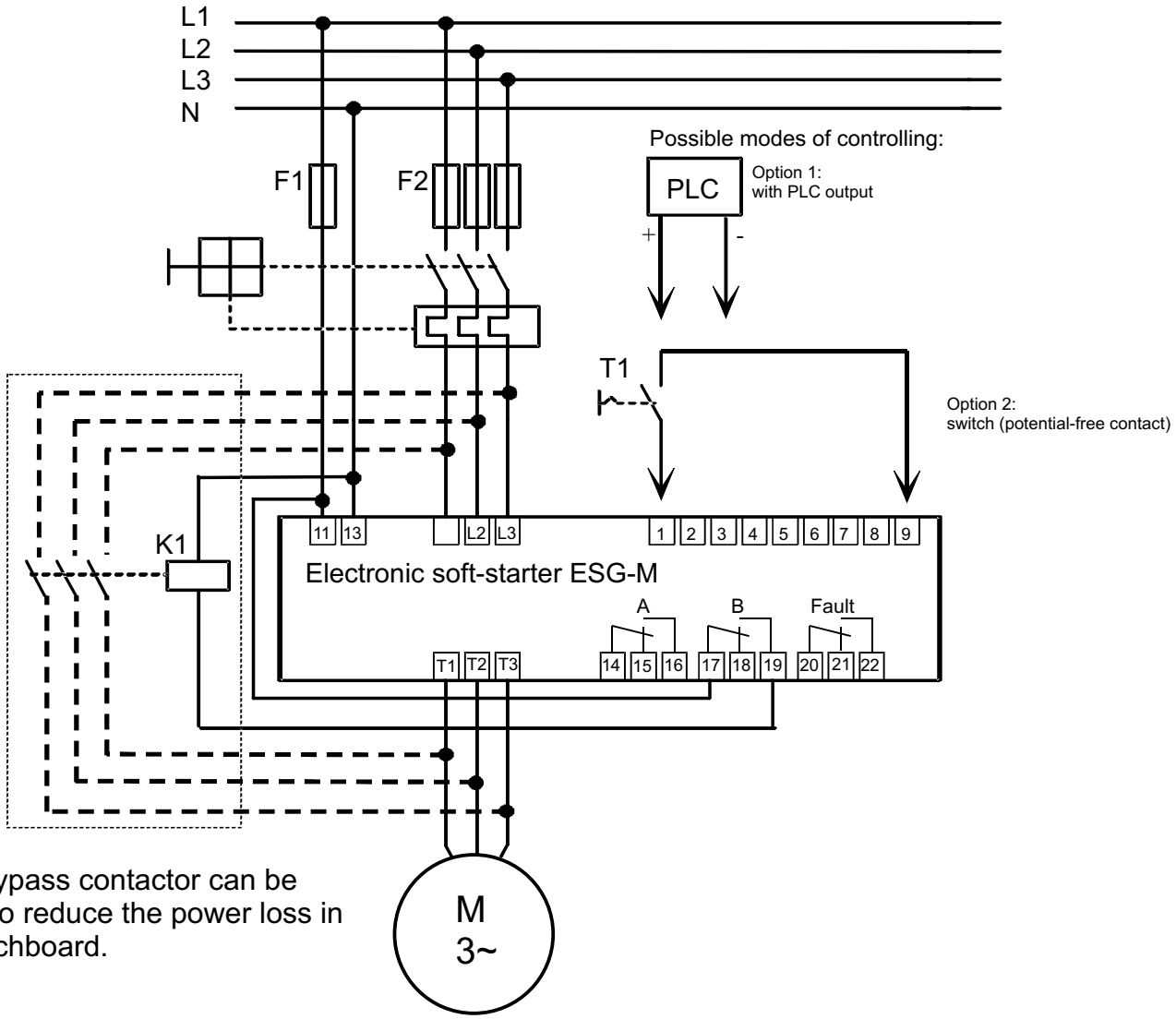
A1:	Fundamental electrical connection and starting-running activation via T1 or by means of an SPS output. By opening T1 slowing down or switching off the device is initiated (minimal configuration).
A2:	Activation of ESG-M… via T1 and T2. A short impulse with T1 (T2 closed) stores the "Start" command. In this version, by then briefly opening T2, slowing down or switching off is initiated. (Key T2 has to be pressed during ramp-down)
A3:	Activating via the mains contactor.

ATTENTION! Be sure to turn on the the control voltage after or at the same time as the load voltage; otherwise the "Phase malfunction" indication will be activated. This malfunction report can be cancelled by turning on the control voltage once again or by bridging the clamps 2-9 (RESET function).

Switching suggestion A1.1 (standard)

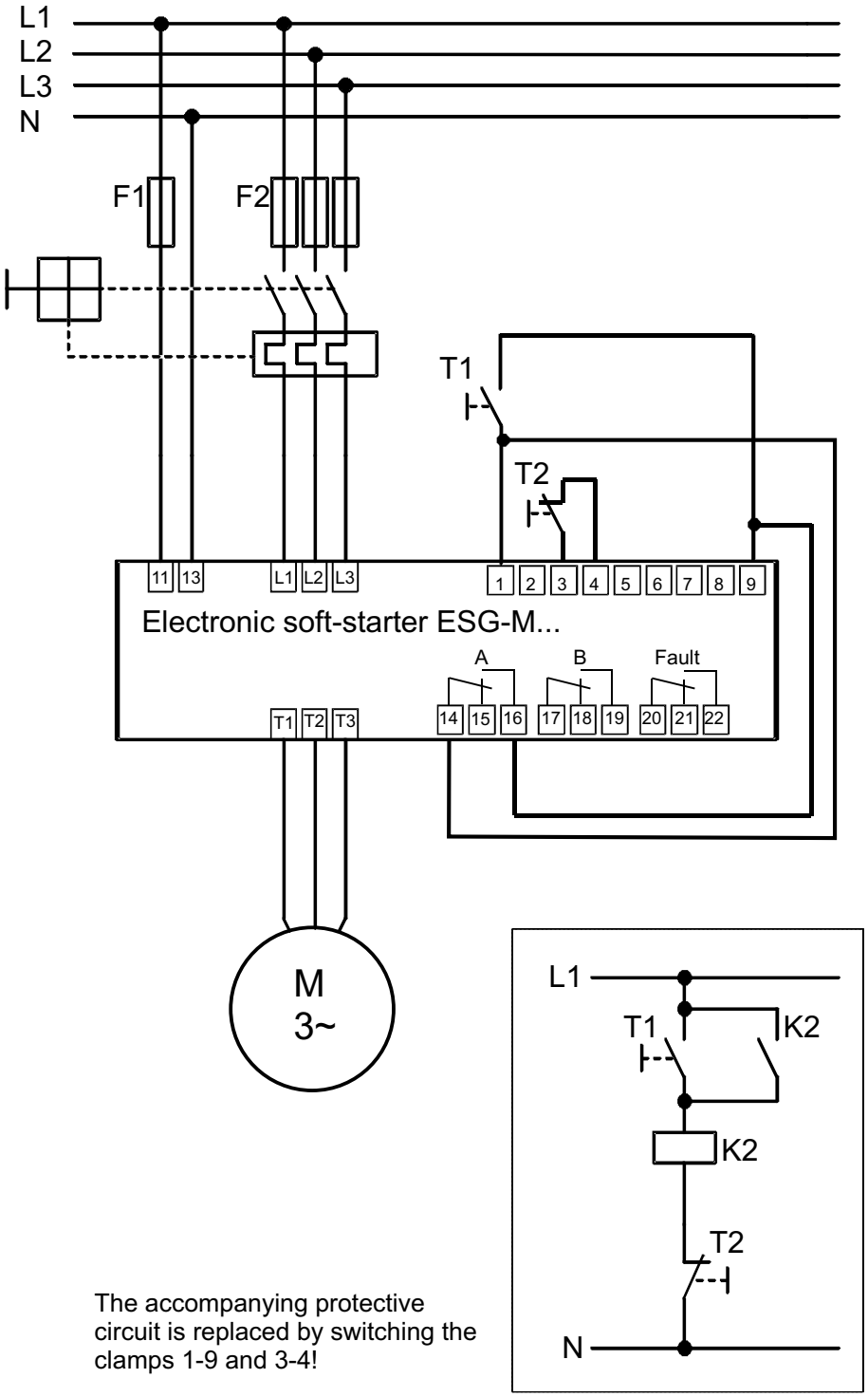


Switching suggestion A1.2 (standard with additional bridging)



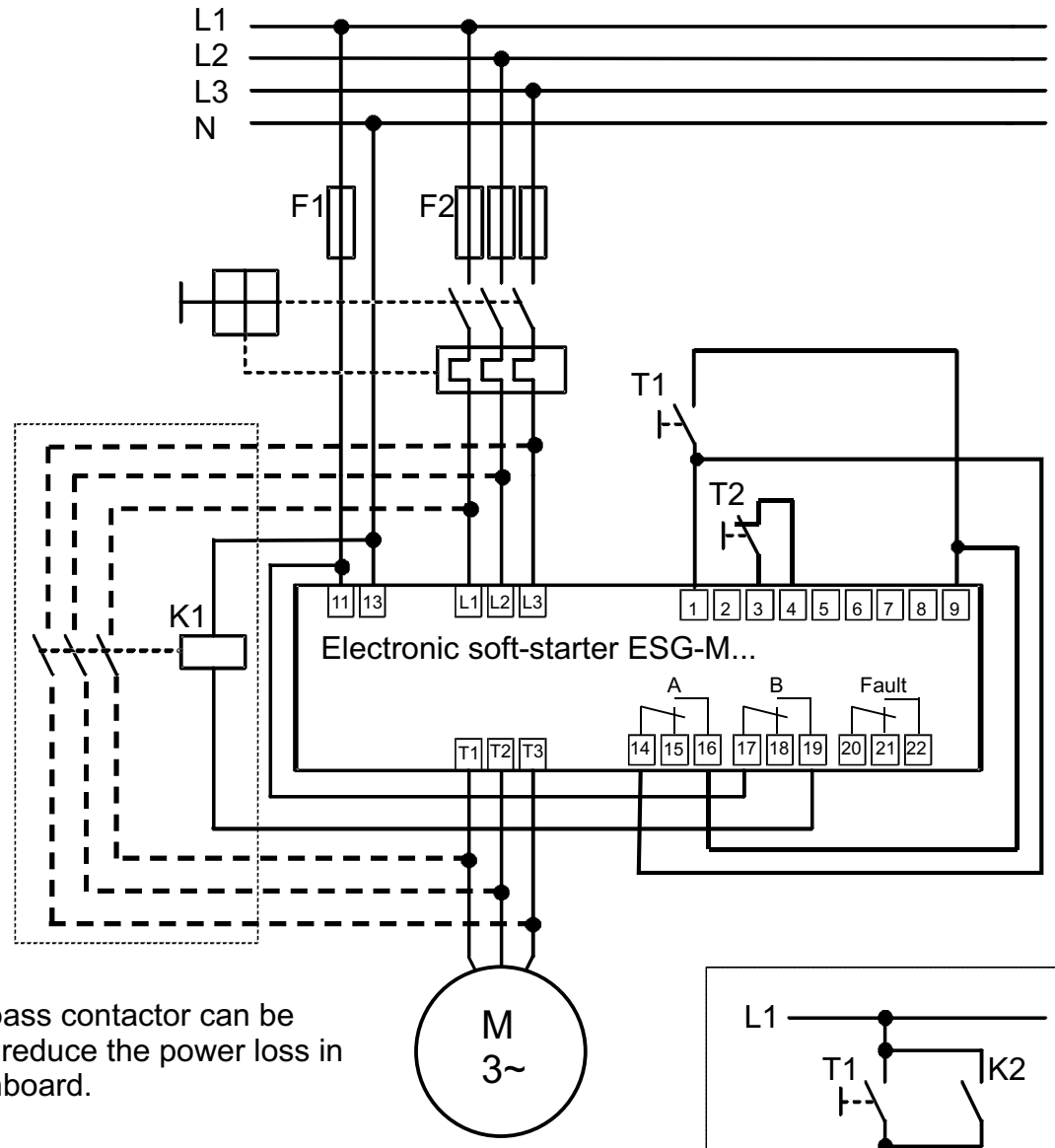
The bypass contactor can be used to reduce the power loss in a switchboard.

Switching suggestion A2.1:

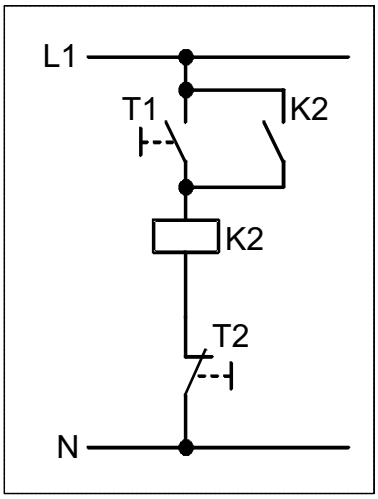


The accompanying protective circuit is replaced by switching the clamps 1-9 and 3-4!

Switching suggestion A2.2:

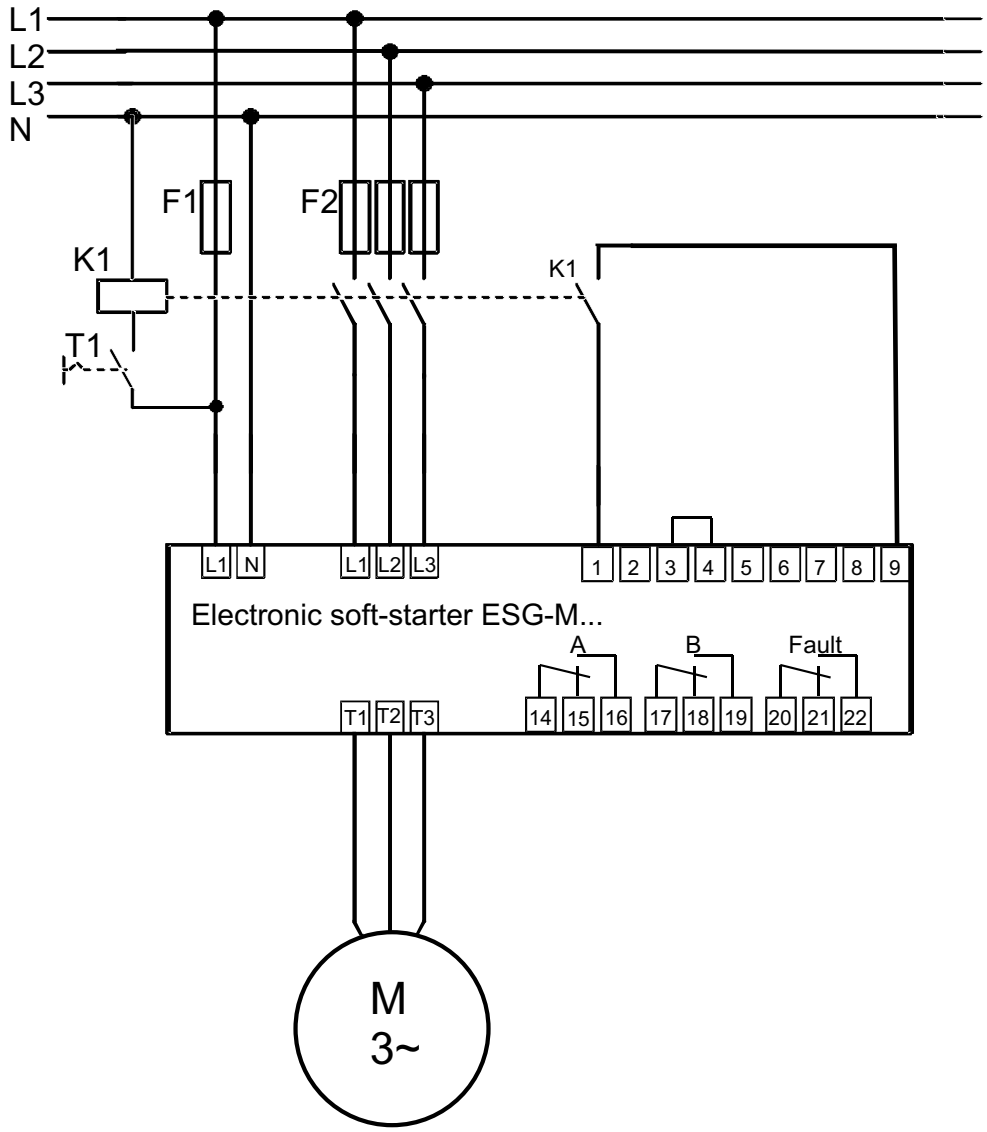


The bypass contactor can be used to reduce the power loss in a switchboard.



The accompanying protective circuit is replaced by switching the clamps 1-9 and 3-4!

Switching suggestion A3:



By actuating switch T1 three phase voltage is switched on to the soft-starter by contactor K1 and the start contact is closed.

8. Technical data

Power supply	230V/50-60Hz (standard)
Mains voltage	3-phase 230-500V AC (+/-15%)
Mains frequency	48Hz-62Hz
Rotary field	self-synchronizing
Kind of protection	IP40
Further regulations	DIN 40050, VGB4, DIN VDE 0160, DIN IEC 38, VDE0110
Humidity class	E nach DIN 40040
Built-in device	VDE 0558
Mounting	vertical, electrical connections below
Service condition indicators	LEDs and LCD-display
Ambient temperature	0-55°C
Storage temperature	-25°C-70°C, relative humidity 95% (without condensation)
Current limitation	0,5-5xI_n
Malfunction indicators	phase failure, temperature exceedance of heat sink, low voltage, thyristor defect, PTC
Control options	for current and voltage
CE-marking	EMC Directive 2014/30/EU LVD 2014/35/EU
Installation altitude	at rated load up to 1000m above sea level; current has to be decreased by 1% each 100m
Test voltage	according to VDE 0160 Tab. 6
Overvoltage category	ÜIII according to VDE 0160 5.7 (05/88)
Pollution degree	1, IEC 664
Connection	clamps or bus bars

9. Survey of the individual types

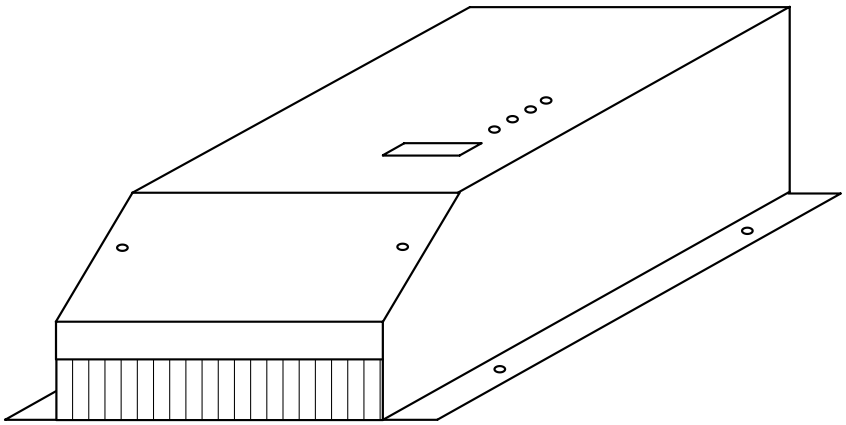
Type	Motor power [kW]	Max. starting current [A]	Rec. semi-conductor fuses [A]	Mains fuse [A]	Rec. cross-section [mm²]	Weight [kg]	Frame sizes	Dimensions WxHxD [mm]
ESG-M 5,5	5,5	55	35	16	2,5	4,4	A	190x300x155
ESG-M 7,5	7,5	70	50	20	4	4,4	A	190x300x155
ESG-M 11	11	90	63	25	6	4,4	A	190x300x155
ESG-M 15	15	120	80	35	10	4,7	A	190x300x155
ESG-M 18,5	18,5	155	80	35	16	4,7	A	190x300x155
ESG-M 22	22	200	100	63	16	5,0	A	190x300x155
ESG-M 30	30	240	125	63	25	5,5	A	190x300x155
ESG-M 37	37	280	160	100	35	6,0	A	190x300x155
ESG-M 45	45	350	200	100	35	6,3	B	230x370x175
ESG-M 55	55	420	250	125	50	7,0	B	230x370x175
ESG-M 75	75	600	350	160	70	7,5	B	230x370x175
ESG-M 90	90	700	350	200	95	8,0	B	230x370x175
ESG-M 110	110	750	500	250	120	18,0	C	360x450x185
ESG-M 140	140	920	500	300	150	18,0	C	360x450x185
ESG-M 160	160	1250	500	350	240	41,0	D	600x545x375
ESG-M 200	200	1400	630	400	300	41,0	D	600x545x375
ESG-M 250	250	1800	630	400	300	42,0	D	600x545x375
ESG-M 315	315	2100	750	630	2x185	42,0	D	600x545x375
ESG-M 355	355	2800	800	630	2x240	44,0	D	600x545x375
ESG-M 400	400	3200	800	1250	2x300	51,0	E	850x765x495
ESG-M 560	560	4500	1250	1250	2x350	53,0	E	850x765x495

Errors and technical modifications excepted (Date: 2008/08)

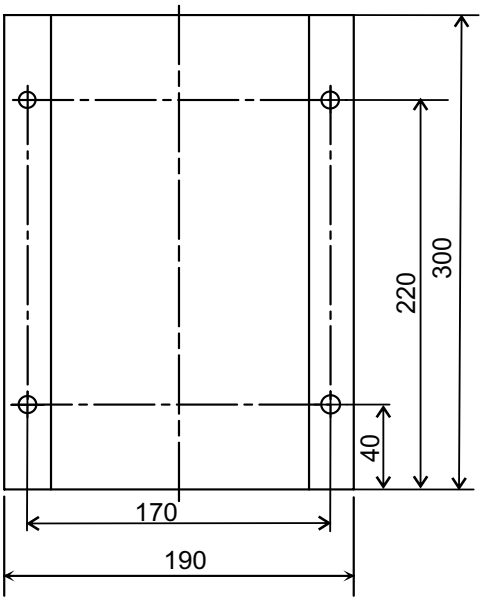
The given values refer to a rated operating voltage of 3x400 V AC. The given values for overload are valid for an ambient temperature of 40°C maximum and an installation altitude of 1000m. The given ratings deal with values for standard motors accordng to IEC 72 and UNE 20106.

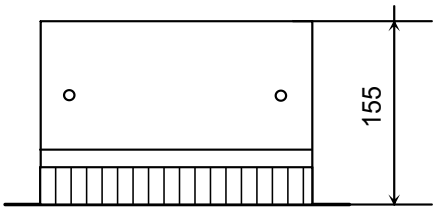
10. Frame sizes

Frame sizes: A, B



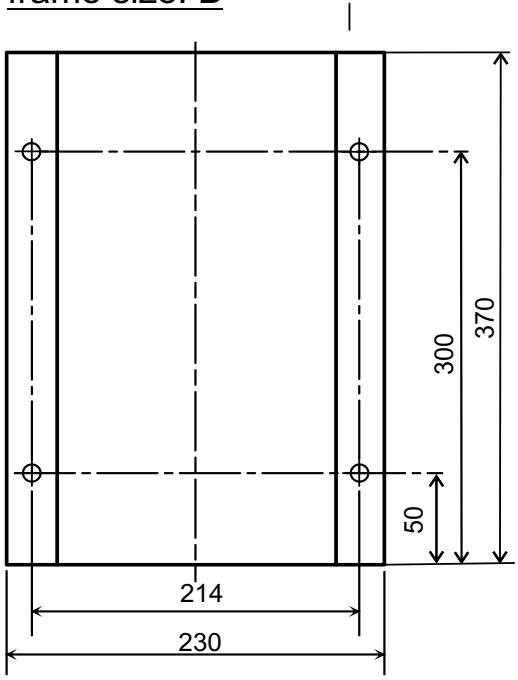
frame size: A

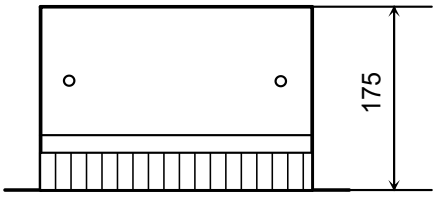




Mounting holes: d = 6,5mm

frame size: B

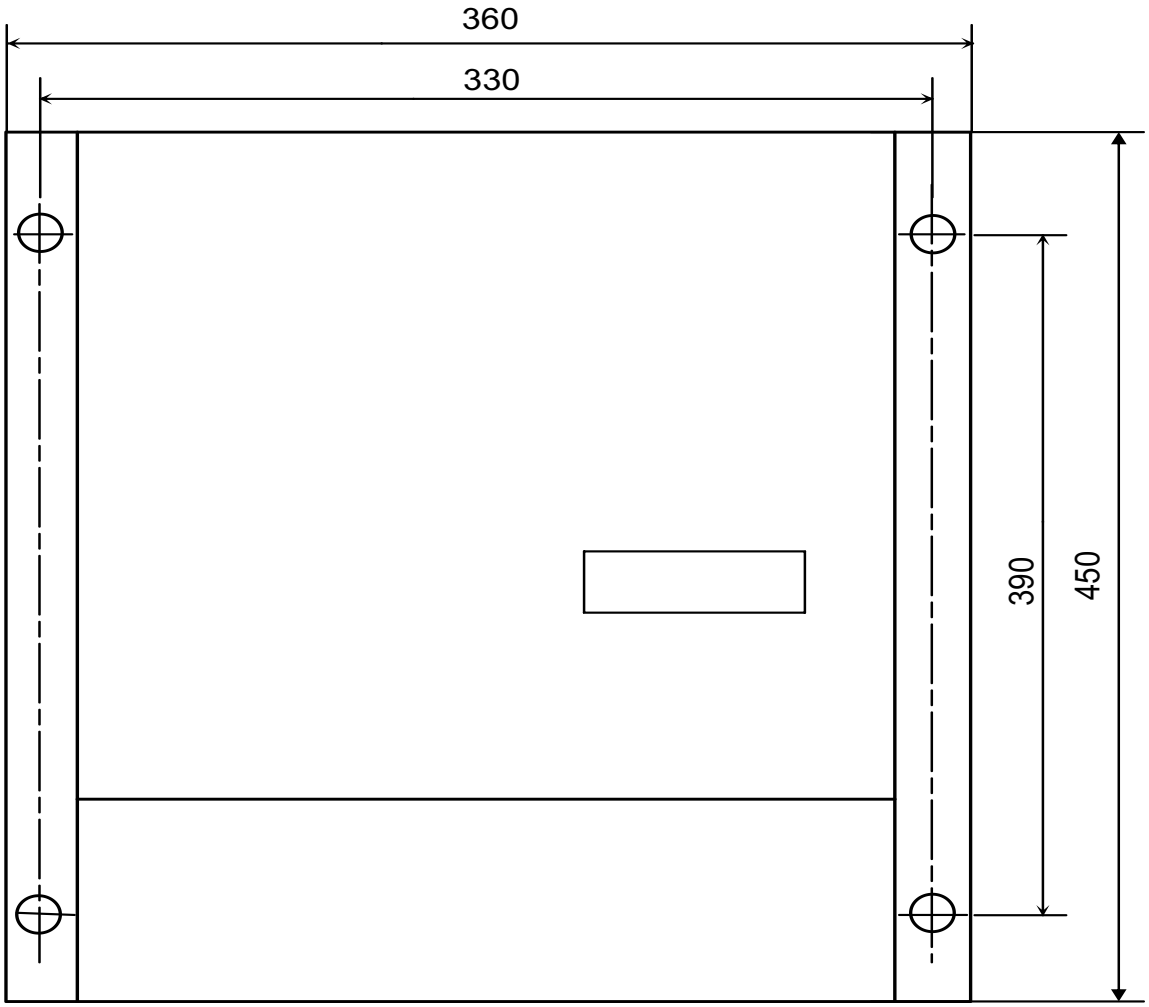


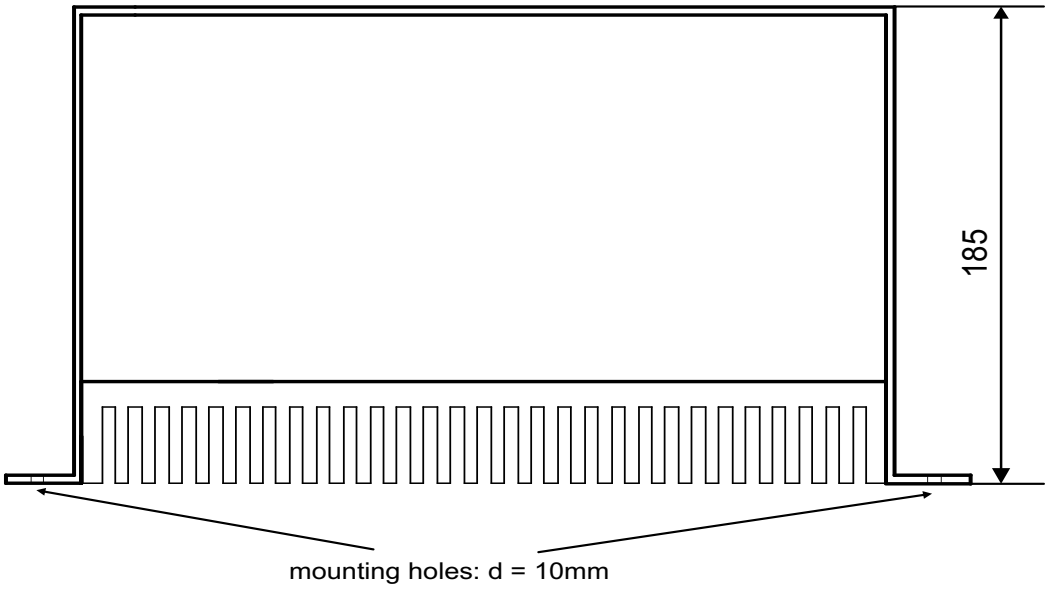


Mounting holes: d = 6,5mm

Due to ongoing technical development and modifications we reserve the right to deliver products which might be slightly different from those described above.

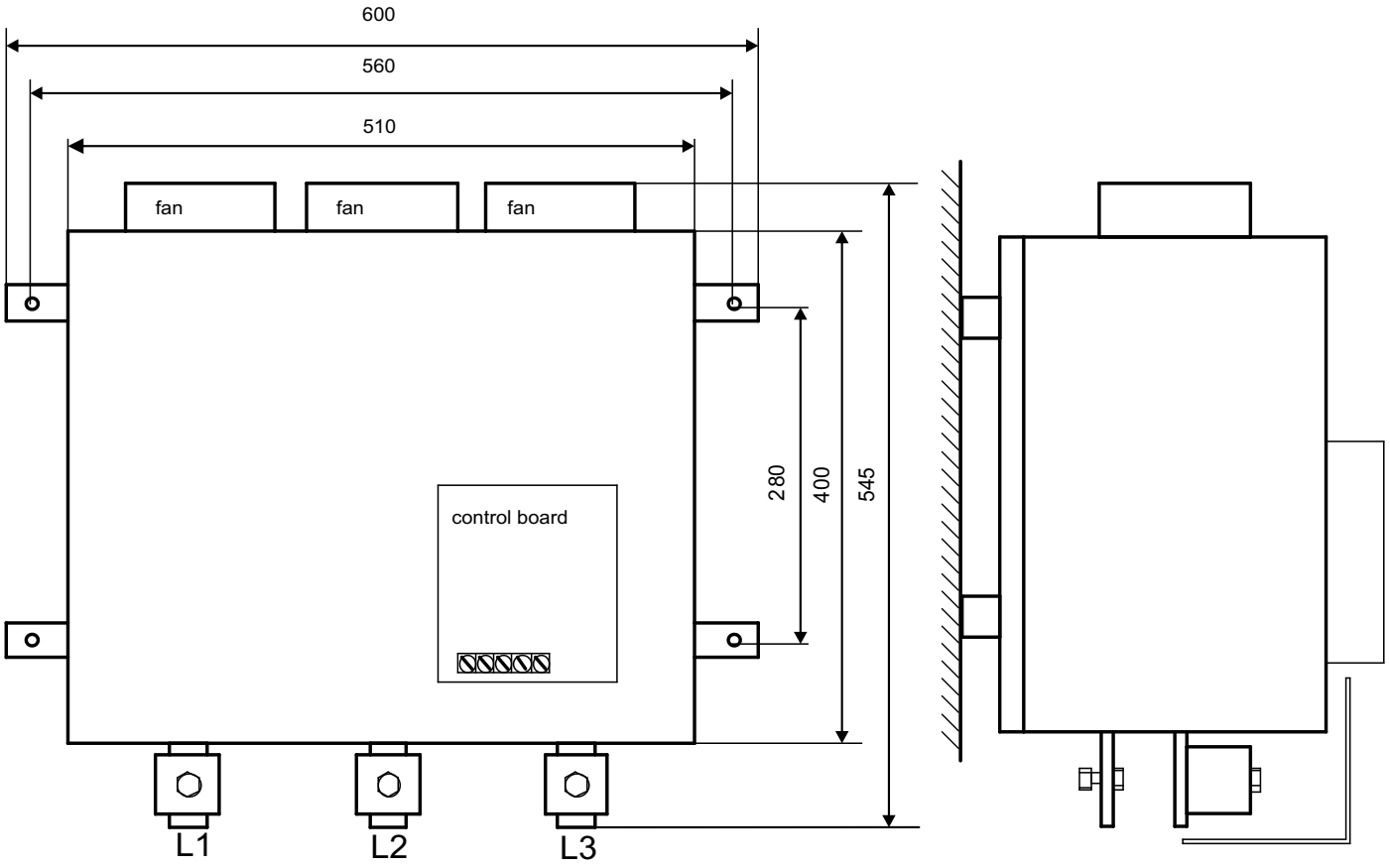
Frame size: C

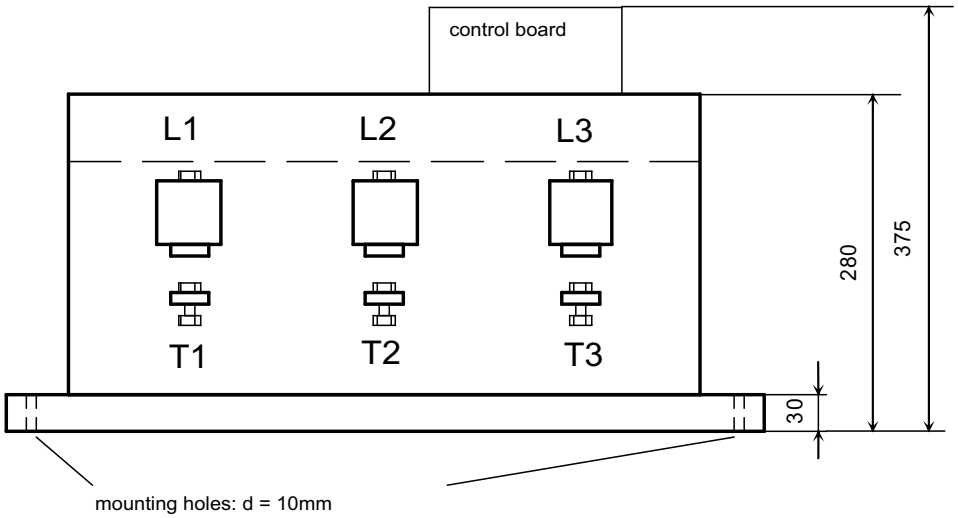




Due to ongoing technical development and modifications we reserve the right to deliver products which might be slightly different from those described above.

Frame size: D

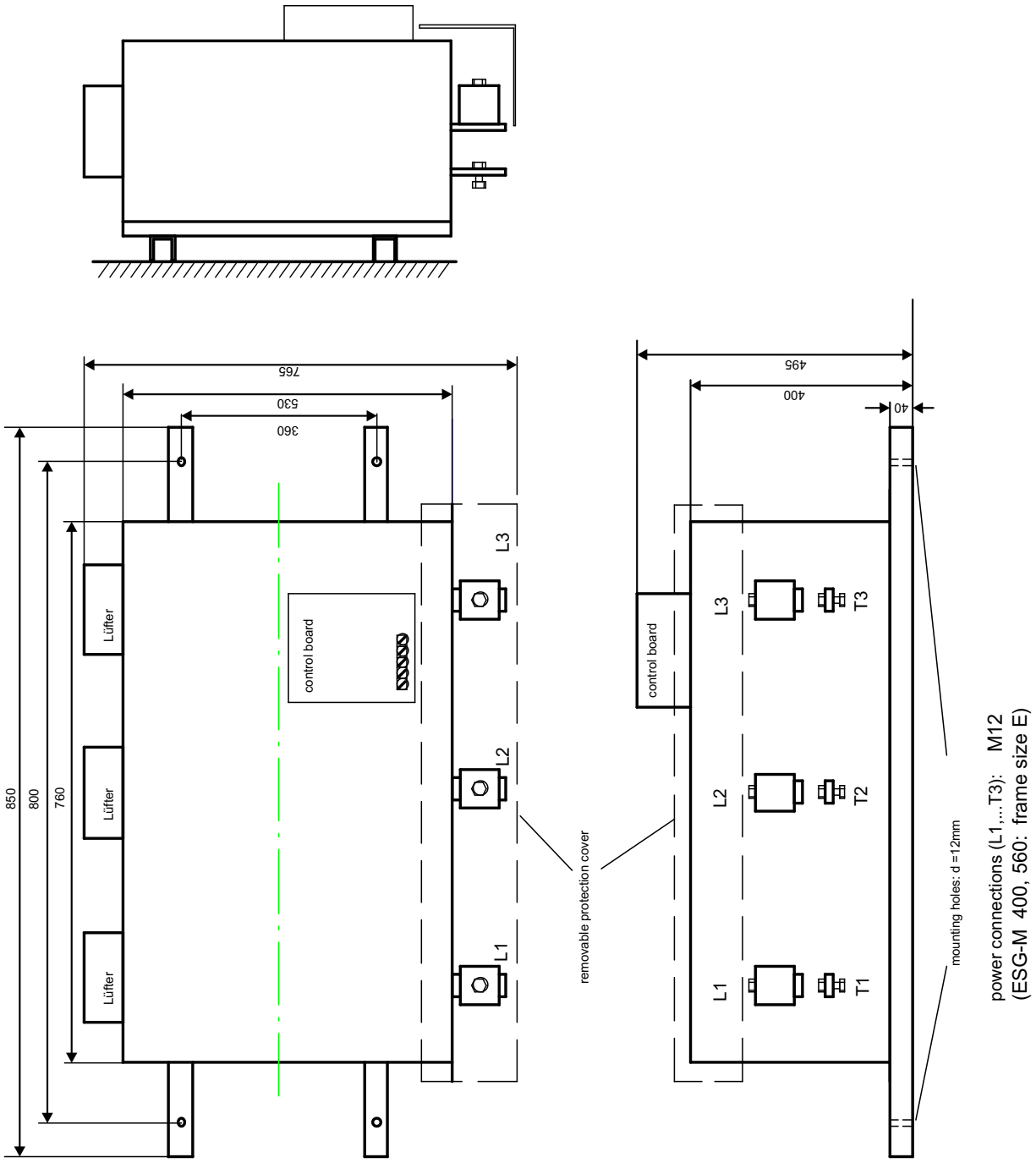




power connections (L1,..., T3): M10/M8

(ESG-M 160, 200, 250, 315, 355: frame size D)

Due to ongoing technical development and modifications we reserve the right to deliver products which might be slightly different from those described above.



power connections (L1,...T3): M12
(ESG-M 400, 560: frame size E)

Frame size: E