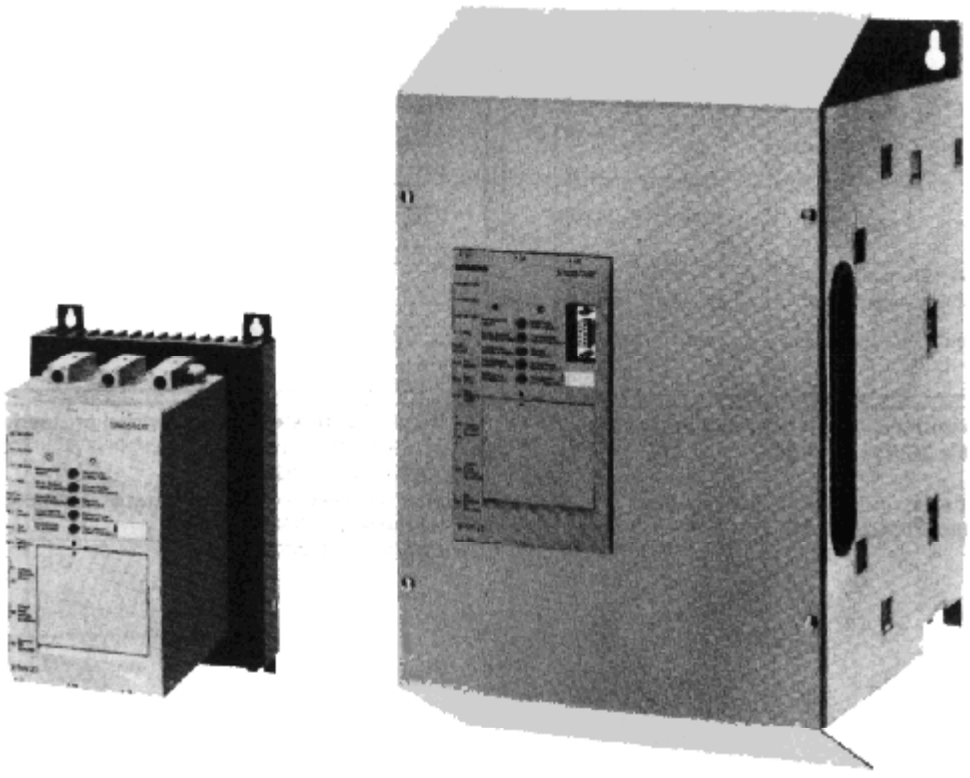
SIEMENS

SIKOSTART® 3RW22



Betriebsanleitung / Instructions / Instructions de service /
Instrucciones de servicio / Istruzioni per l'uso / Manual de operação

Bestell-Nr./Order-Nr./N° de référence/Nº de referencia/N. di ordinazione/
N.º de encomenda: **3ZX1012-0RW22-1AN1**

Ausgabe/Edition/Edición/Edizione/Edição 03/2002

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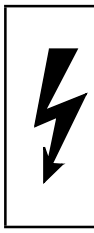


WARNING:

**HAZARDOUS VOLTAGE
CAN CAUSE ELECTRICAL SHOCK
AND BURNS.
DISCONNECT POWER BEFORE PROCEEDING
WITH ANY WORK ON THIS EQUIPMENT.**

English

Contents

For further information, see manual, Order No. E20001-P285-A484-V3 (Deutsch)
E20001-P285-A484-V2-7600 (English)
E20001-P285-A484-V2-7800 (Español)

1 Installation

Mounting position

➪ SIKOSTART 3RW22 can be installed on open switchboards, in enclosed switchboxes or in switchgear cabinets.

Altitude

The maximum permissible altitude is 3,000 m above sea level.

➪ In the case of SIKOSTART 3RW2221 to 3RW2250, at an altitude of 1,000 m or more above sea level, the rated operating current I_e must be reduced. The rated operating current is shown in Figure 1 as a function of altitude.

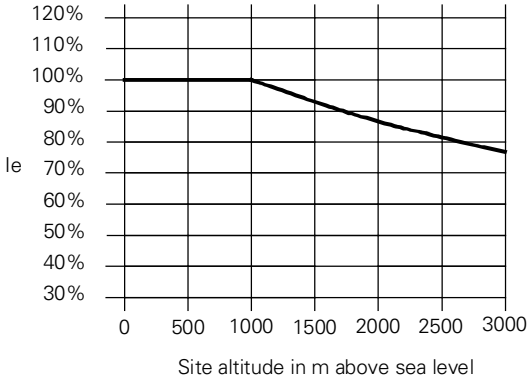


Fig. 1: Rated operating current I_e above 1,000 m above see level

Alignment

➪ Due to the convectional cooling, SIKOSTART 3RW22 must be mounted vertically on a plane surface.

➪ Ensure that the following minimum vertical clearance from other equipment to prevent impedance of the incoming and outgoing air flow for the heatsinks (see Figure 2):

3RW2221 to 2245:	200 mm
3RW2247 and 2250:	400 mm

Alignment in rows is permissible.

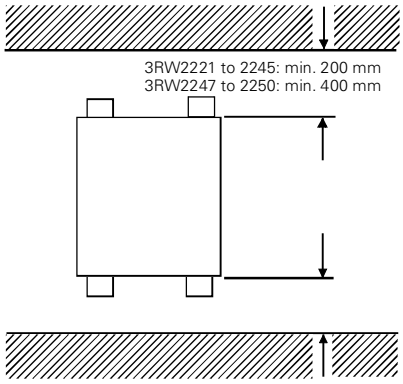


Fig. 2: Vertical clearance from other equipment

Fixing

➪ Use screw bolts in conjunction with plain washers and appropriate securing components, such as spring washers.

Degree of protection

- 3RW2221 to 3RW2231: IP20 Degree of protection (terminals IP00)
- 3RW2234 to 3RW2250: IP00 Degree of protection
- Terminals: IP00 Degree of protection
- Operation of all units: IP42 Degree of protection

Note:
These protection requirements must be met by the construction of the cubicle or installation site.

English

2 Connection and wiring

2.1 Control supply voltage

There are 4 terminals available for the connection of 3 different voltage ranges.

Control supply voltage U_s		Control supply current I_s
100 V - 120 V	+10% / -15%	approx. 100 mA
200 V - 240 V	+10% / -15%	approx. 75 mA
380 V - 415 V	+10% / -15%	approx. 40 mA
50 / 60 Hz		

Example

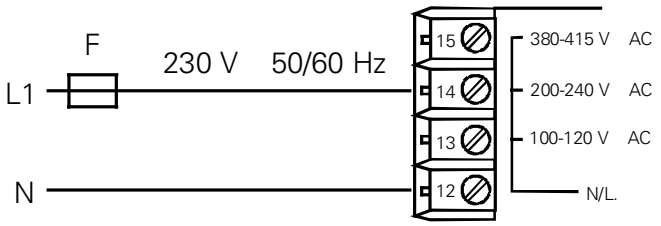


Fig. 3: Terminal connections

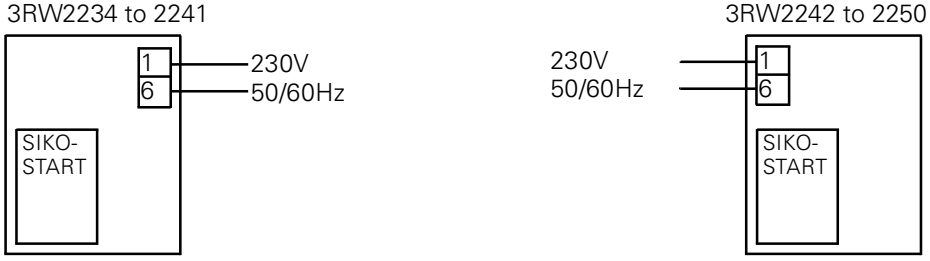


Fig. 4: Fan connection (only to 230 V AC ± 10%, 50/60 Hz)

2.2 Control inputs

The control signals are input from the plant controller via floating contacts. The built-in power supply for the starter connects 24 volts DC via the contacts to the 3 inputs IN1 to IN3.
Four input circuits are available for control.
Inputs IN1 and IN2 are used to switch the 3RW22 on and off.

Note
In the case of those units that have an RS232 serial interface, it is possible to parameterize the function of the control inputs. For example, a separate set of parameters can be assigned to each control input for the serial starting of 3 different motors.

English

2.2.1 Control input circuit 1 - momentary-contact actuator

The ON signal is connected via a momentary contact (NO) between terminals 11 and 10 and the OFF signal is connected via a momentary contact (NC) between terminals 11 and 9. If both signals are pressed simultaneously, the OFF signal has priority over the ON signal.

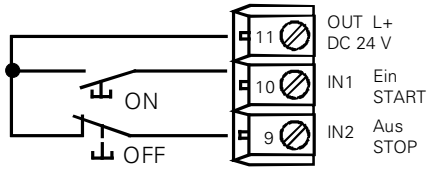


Fig. 5: Terminal connection

2.2.2 Control input circuit 2 - latched-contact actuator

The ON and OFF signals are both connected via a switch between terminals 11 and 10. In this case, input terminals 9 and 10 are connected together.

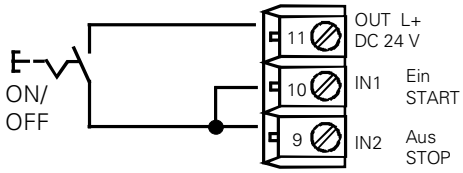


Fig. 6: Terminal connection

2.2.3 With control circuits 1 and 2:

If an ON command is issued during a soft-stop or DC braking, stopping is terminated and a new start follows instantly.
Depending on the position of the DIL-switches, the OFF signal induces coasting down, pump-stopping, soft-stopping or DC braking.

English

2.2.4 Control input circuit 3 - controlling SIKOSTART like a contactor

The ON/OFF signal is connected by switching the control input voltage on and off. In this case, input terminals 9, 10 and 11 are connected together.

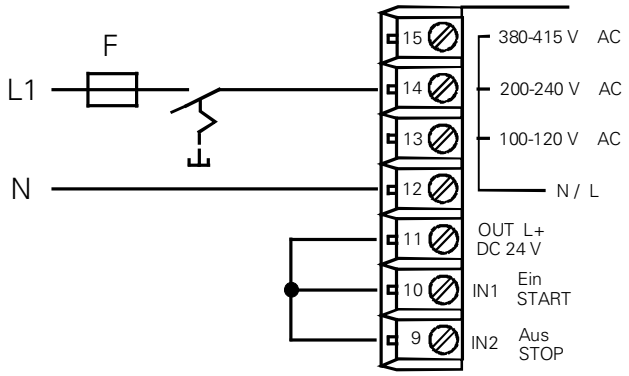


Fig. 7: Terminal connection for U=200 V to 240 V AC

2.2.5 Control input circuit 4 - automatic mode

Automatic operation does not require a separate control supply voltage or any additional control wiring. The control supply voltage is taken from the main motor circuit.

Note:
SIKOSTART is controlled by the ON/OFF switch of the motor circuit via the mains contactor.
It is absolutely necessary to observe the permissible voltages on terminals 12 to 15.

Note: Control input circuits 3 and 4
In circuits 3 and 4, the thermal image of the electronic protection is cleared on switch-off. A pause of 10 s is therefore necessary between switching off and switching on.
Switching off during the switch-on delay time can result in a temporary alarm. This alarm does not have to be reset.
With these control input circuits, coasting down is the only stopping mode that is possible. Any settings made for pump-stopping, DC braking and soft-stopping will remain ineffective.

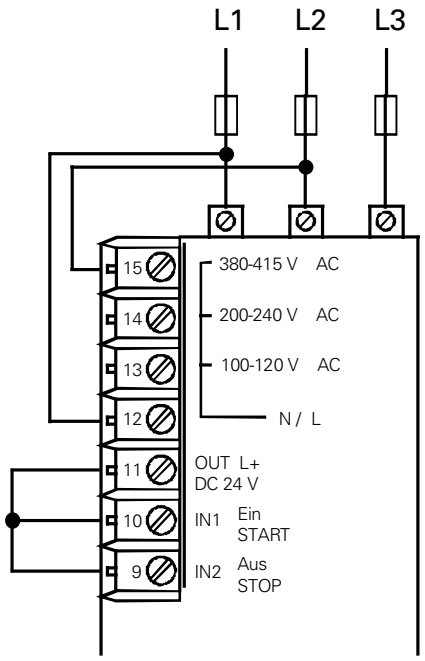


Fig. 8: Terminal connections for U=380 V - 415 V AC

2.3 Relay output "Group alarm"

For indicating a group alarm, 1 NC and 1 NO contact are available in relay 1 as floating auxiliary switches. The flashing LEDs indicate the type of fault.
The alarm is reset by connecting terminals 11 and 8.

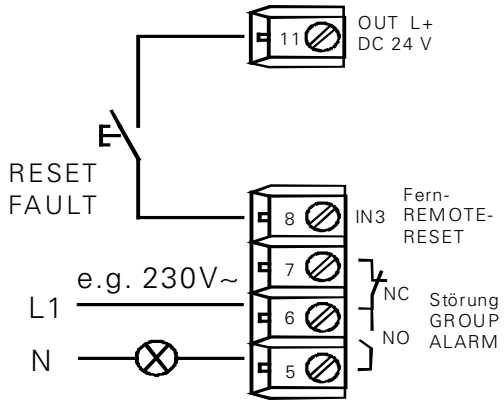


Fig. 9: Terminal connections

2.4 Relay outputs "MOTOR RUNNING" and "DC BRAKING"

In both relays, 1 NO contact is available as a floating auxiliary switch.
The NO contact between terminals 3 and 4 is closed once the ramp time has elapsed or on run-up detection.
The NO contact between terminals 1 and 2 controls a breaking contactor.

Example

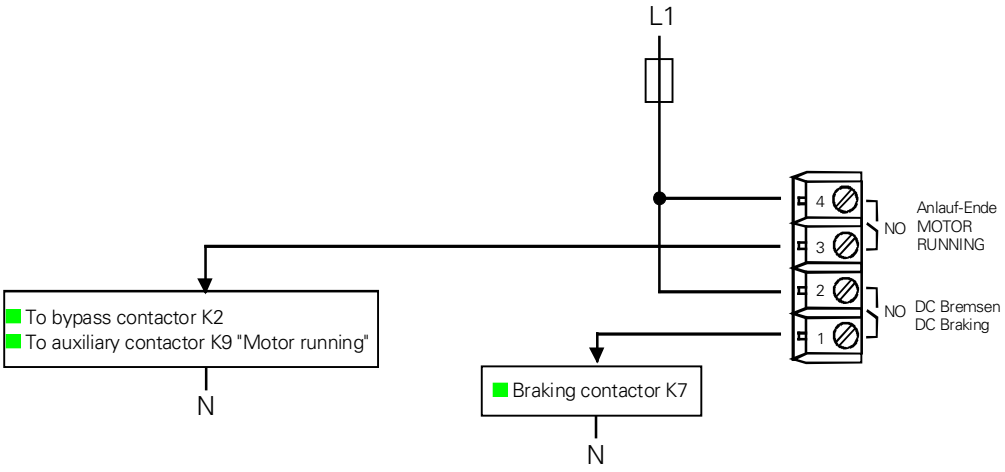


Fig. 10: Relay outputs MOTOR RUNNING and DC BRAKING

2.5 Main motor circuit

SIKOSTART is connected in the motor circuit between the switching device and the motor (see Figure 11). The basic arrangement of the motor circuit remains unchanged and must be designed according to the rating of the squirrel-cage motor.
Capacitors for the compensation of the reactive motor power may be connected only to the line side of SIKOSTART, under no circumstances between SIKOSTART and the motor.
Semiconductor fuses as listed in Chapter 5, Technical Data, are recommended for short-circuit protection of the SIKOSTART thyristors.

Note:
The motor current must be at least 20 % of the SIKOSTART rated current I_e.
For circuits that include a braking contactor:
The braking contactor must be connected between T2 and T3, otherwise there is a danger of generating a short circuit!
For circuits that include a bypass contactor:
If an off-switch for the motor is located between SIKOSTART and the motor, when the bypass contactor is switched on, SIKOSTART is not able to detect motor switch-off and an alarm is not indicated.

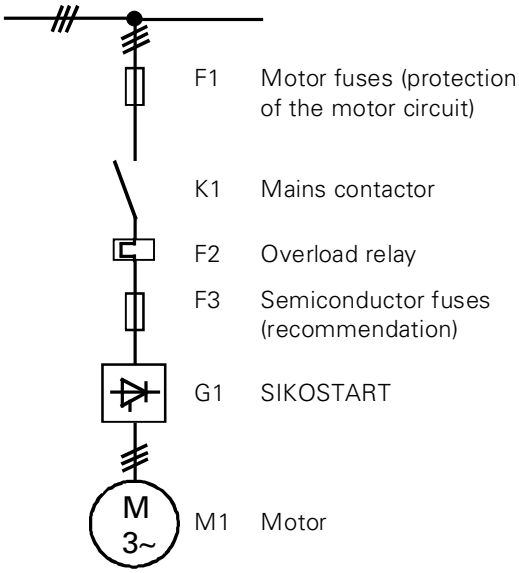


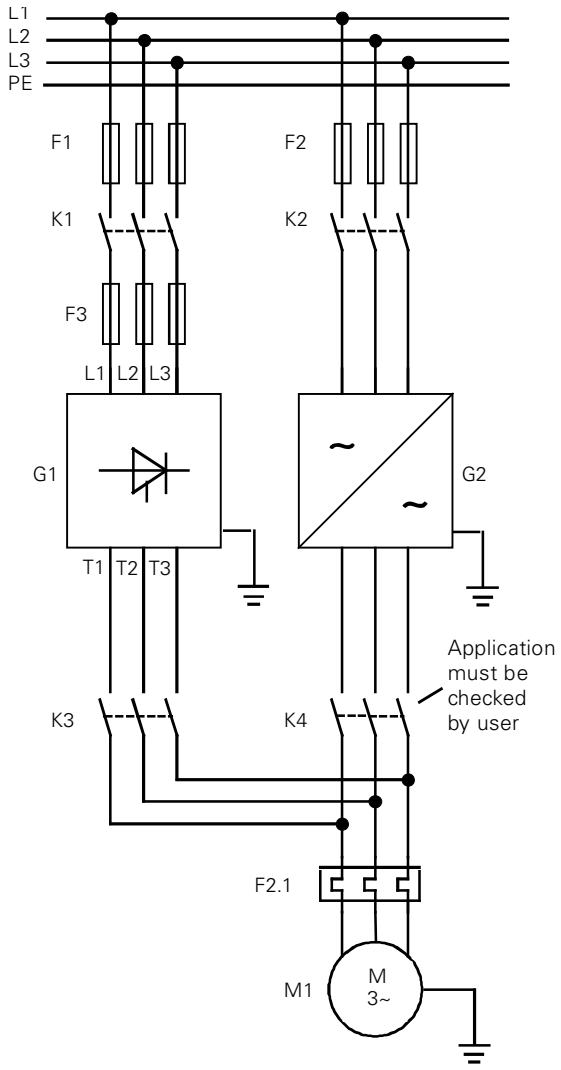
Fig. 11: Basic layout of a motor circuit

English

Example

Note
If the motor is operated with SIKOSTART and in parallel with a frequency converter, the SIKOSTART must be disconnected from the motor at the output side.

F1 Line fuse SIKOSTART
F2 Line fuse converter
F2.1 Overload protection
F3 Semiconductor fuse SIKOSTART
G1 SIKOSTART
G2 Converter
K1 Mains contactor SIKOSTART
K2 Mains contactor converter
K3 Motor contactor SIKOSTART
K4 Motor contactor converter
M1 Three-phase motor



3 Operation

3.1 Note concerning use with motors with EEx increased safety type of protection

SIKOSTART 3RW22 is suitable for starting motors in hazardous locations with "**d**", "**p**" and "**n**" types of protection, provided that the operating mode concerned has not significant effect on temperature rise.
The Federal Testing Laboratories (PTB) in Brunswick have confirmed to SIEMENS that within the specified conditions there are no objections to starting motors with type of protection "**d**" with SIKOSTART, without this being expressly stated.

Furthermore, the units are suitable for starting motors in hazardous locations with "**e**" type of protection, provided that no heavy-duty starting is involved. In this context, the ramp time is to be set on the unit to a value that is at most equivalent to the te time of the machine. PTB Test Report No. 3.53-542/96 has been issued.

3.2 Device protection

The 3RW22 devices possess thermal overload protection. This device protection cannot be used for protecting the connected motors from overload.

3.3 Commissioning and operating modes

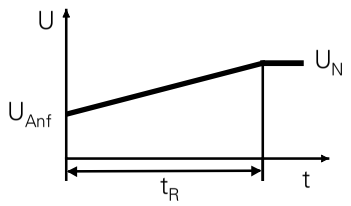
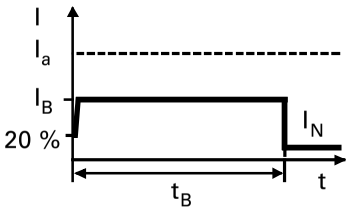
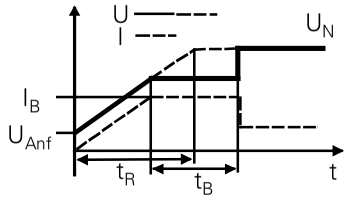
⇨ Set the DIL switches for the required operating mode combination (see Tables A, B and C).

⇨ Set the operating values for your operating mode using potentiometers 1 to 4 (see Tables A, B and C).

⇨ Switch the supply voltage on and check the LEDs.

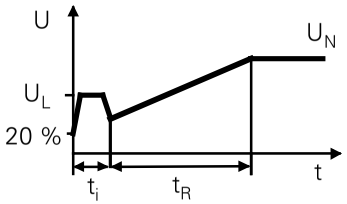
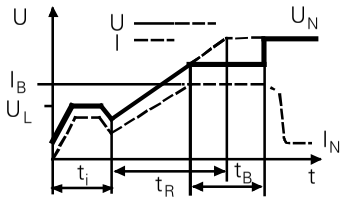
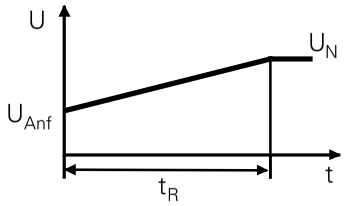
⇨ Switch the motor on and check that it starts up within the required time.

⇨ Optimize the starting process by adjusting the operating values at the potentiometers.

Table A: Control modes during startup		Position of DIL switches 3 and 5 OFF/ON	Potentiometer setting **X** Set operating value ↙ Left stop / ↘ Right stop ↔ Any setting	Remarks
Voltage ramp		3 ■ 5 ■	Potentiometer No. 1 **X** t_R 2 **X** U_{Anf} 3 ↘ 4 ↔ U_{Anf} = 20 % to 100% U_N t_R = 0.3 s to 180 s	
Current limiting		3 ■ 5 ■	Potentiometer No. 1 ↙ 2 ↙ 3 **X** I_B ** 4 ↔ I_B = 20 % to 100 % I_a or 0.5 to 6 I_e t_B *	
Voltage ramp with current limiting		3 ■ 5 ■	Potentiometer No. 1 **X** t_R 2 **X** U_{Anf} 3 **X** I_B ** 4 ↔ t_B *	I_B sets the starting current limit. Depending on the level of U_{Anf}, t_R can be set as short as required.

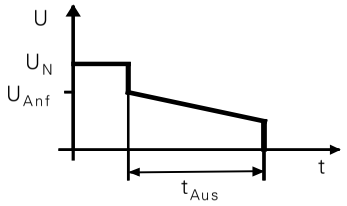
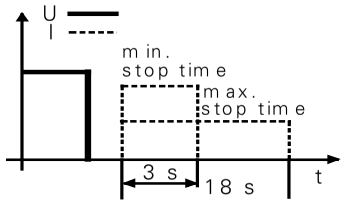
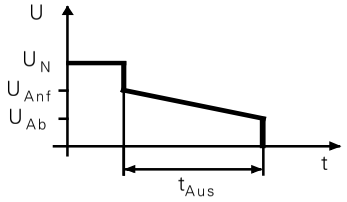
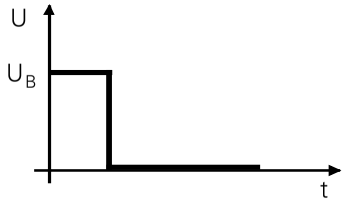
***** Limiting time t_B:
■ Standard model (3RW2221-... to 3RW2231-1AA05): Once run-up has been detected, the motor terminal voltage is increased to the mains voltage. The maximum current limiting time is 20 s. If run-up is not detected within this time it switches off with the alarm "overload".
■ With motor overload protection (3RW2221-... to 3RW2231-1AB05 and ...-.AB1.): The internal protection defines the maximum current limiting time.

****** Limiting current I_B:
Basic device (3RW22..-1AA05): I_B = 20 to 100% of motor starting current in the case of direct-on-line starting (I_a)
3RW22..-1AB.. or 3RW22..-DB.. (device with device protection): I_B = 0.5 to 6 rated current of the 3RW22 (I_e)

Table A: Control modes during startup		Position of DIL switches 3 and 5 OFF/ON	Potentiometer setting **X** Set operating value ↙ Left stop / ↘ Right stop ↔ Any setting	Remarks
Voltage ramp with start impulse		3 ☐■ 5 ■☐	Potentiometer No. 1 **X** t_R 2 **X** U_L ** 3 ↘ 4 ↔ U_L = 20 % to 100 % U_N	** in this case: impulse voltage; Start voltage = 0.8 x impulse voltage Impulse time t_i : 1 s when $t_R \geq 20$ s; otherwise 50 ms per second of ramp time
Voltage ramp with start impulse and current limiting		3 ☐■ 5 ■☐	Potentiometer No. 1 **X** t_R 2 **X** U_L ** 3 **X** I_B 4 ↔ t_B *	
Emergency start		5 ☐■	Potentiometer No. 1 **X** t_R 2 **X** U_{Anf} 3 ↔ 4 ↔	The motor starts with increased start voltage Note: In the case of an emergency start, only a voltage ramp is possible. Energy-saving mode, soft-stopping and DC braking are inhibited. The electric circuit must be connected through to the motor.

Note:
Please ensure on setting the start impulse level that the motor does not exceed its stalling torque! If the stalling torque is exceeded by the starting impulse, run-up detection is not possible. The basic unit will switch off after 20 s and issues the alarm "overload" (starting time exceeded).

Table B: Motor running modes	Position of DIL switch 4 OFF/ON	Remarks
Full-on mode	4 	**Warning:** High temperatures can be generated by the heatsinks! Depending on the model, the maximum heatsink temperature in continuous operation can be 100 °C.
Energy-saving mode	4 	**Warning:** In energy-saving mode, with driving loads, the motor may reach oversynchronous speeds. To prevent unpermissibly high speeds, energy-saving mode must be switched off.
With bypass contactor	4 	In the case of AC-1 layout of the bypass contactor: set DIL switches 1 and 2 to soft start. Turn soft stopping time to minimum (left-hand end position).
With bypass contactor	1  2	In the event of an OFF command, the thyristors of the SIKOSTART are turned on before the bypass contactor opens. The bypass contactor switches the current at zero voltage and hence with minimum stress on the contacts. The current goes over to the thyristors. Note: In this mode, the SIKOSTART should not be switched off with a line contactor if control voltage is applied continuously at the SIKOSTART. A line fault will otherwise be signalled and the SIKOSTART will not be able to be switched on again until after the fault has been acknowledged.

Table C: Stopping modes		Position of DIL switches 1 and 2 OFF/ON	Potentiometer setting **X** Set operating value ↔ Any setting	Remarks
Pump-stopping		1 ☐■ 2 ☐■	Potentiometer No. 1 ↔ 2 ↔ 3 ↔ 4 **X**	Ramp time t_{Aus} can be varied from 5 s to 90 s using potentiometer 4.
DC braking		1 ■☐ 2 ☐■	Potentiometer No. 1 ↔ 2 ↔ 3 ↔ 4 **X**	The use of a braking contactor is recommended.[1)] **Warning:** **The braking contactor must only be connected between T2 and T3, otherwise there is a danger of generating a short circuit!**
Soft-stopping		1 ☐■ 2 ■☐	Potentiometer No. 1 ↔ 2 **X** * U_{Ab} 3 ↔ 4 **X**	Without PC interface: U_{Anf} = 0.9 U_N t_{Aus} = 1 s to 20s *In this case, the switch-off voltage U_{Ab} is 85% of the startup starting voltage. Note: When operated with bypass contactor, the SIKOSTART should not be switched off with a line contactor if control voltage is applied continuously at the SIKOSTART. A line fault will otherwise be signalled and the SIKOSTART will not be able to be switched on again until after the fault has been acknowledged.
Coasting down		1 ■☐ 2 ■☐	Potentiometer No. 1 ↔ 2 ↔ 3 ↔ 4 ↔	

1) Parameterizing with COM SIKOSTART permits considerably better braking performance to be achieved is possible with potentiometer setting.

3.4 Fault analysis

Flashing LED No. Alarm	Cause	Action
1 Supply fault	■ Load voltage missing	⇨ Check fuses / check mains contactor
	■ 1 or 2 phases missing	⇨ Check mains contactor ⇨ Check voltage on L1, L2 and L3
	■ Harmonics in the mains	⇨ Check mains (phase sequence, phase imbalance, harmonics) ⇨ Reduce harmonic content
	■ Supply voltage too low	⇨ Check supply voltage and adjust it
	■ Load missing*	⇨ Connect motor
2 Thyristor fault	■ 1 or 2 thyristors shorted ■ All 3 phases of bypass contactor not closed	⇨ Check thyristors and replace if necessary. Undamaged thyristors must have a resistance > 100 kΩ ⇨ Check contactor function
3 Overload	■ Heatsink overtemperature	⇨ Check ambient temperature ⇨ Check DIL switch 6: Is ambient temperature or rated current set correctly? ⇨ Check required SIKOSTART type (rating) ⇨ Drive blocked? ⇨ Too many restarts?
	■ Operating current or starting current too high	⇨ Drive blocked?
	■ Starting time exceeded (only for ...-1AA05)	⇨ Adjust current limit ⇨ Switch off run-up detection
	■ Short circuit on load side	⇨ Check main motor circuit

Note: * When a bypass contactor is in use, the alarm "Missing load" cannot be indicated when the motor is running.

Flashing LED No. Alarm	Cause	Action
4 General fault	■ Bypass contactor opens immediately after closing	⇨ Check function of bypass contactor
	■ Bypass contactor not open	⇨ Check function of bypass contactor
	■ SCR firing fault	⇨ Check mains (phase sequence, phase imbalance, harmonics)
	■ Wrong machine-readable product designation (MLFB) has been set in the control section for the power section.	⇨ Replace the SIKOSTART control electronics
	■ EEPROM fault (only with ...-1.B15)	⇨ Ensure motor current > 0.2 I_e ⇨ When parameterizing at the controller: Set DIL switch 8 to OFF ⇨ When parameterizing with the PC: Store parameters in the EEPROM ⇨ If parameterization is not successful: Replace the control section
	■ EEPROM fault (only with ...-1AA05)	⇨ Set DIL switch 8 to OFF
	■ Thermistor short-circuited or interrupted	⇨ Check thermistor
5 Start inhibited	■ Heatsink for starting momentarily too hot (a running motor can continue operating without any problems)	⇨ Do not start before LED is off ⇨ Too many restarts?

Note
Please ensure on setting the start impulse level that the motor does not exceed its stalling torque! If the stalling torque is exceeded by the starting impulse, run-up detection is not possible. The basic unit will switch off after 20 s and issues the alarm "overload" (starting time exceeded).

4 Service and maintenance

Warning:
Dangerous electric voltage!
Can cause electric shock.

English

4.1 High-voltage test

Carry out a high-voltage test after every repair:

➪ Set the unit up so that it is isolated from ground and disconnected from the power supply.

➪ Fence off the test area.

➪ Short circuit terminals L1, T1, L2, T2, L3, T3.

➪ Short circuit terminals 1 to 15 on the control section.

➪ Short circuit fan terminals 16 and 17, if a fan is fitted.

Important:
No high voltage must be applied between control section terminals 1 to 15 and PE because otherwise the control section will be damaged.

➪ Apply a test voltage of

- 2 kV AC for units 3RW2221 to 2250-0..14/15 or
- 2.4 kV AC for units 3RW2236 to 2250-0DB16

for one second between

- L1, T1, L2, T2, L3, T3 **and** control section terminals 1 to 15
- L1, T1, L2, T2, L3, T3 **and** PE
- if fan ist fitted
  L1, T1, L2, T2, L3, T3 **and** fan terminals 16, 17

➪ Apply a test voltage of

- 1.5 kV AC for units 3RW2234 to 2250 with fan

for one second between

- fan terminals 16, 17 **and** PE
- fan terminals 16, 17 **and** control section terminals 1 to 15

Important:
No arcing must occur during the high-voltage test.

4.2 Cleaning

The electronic motor control units hardly require any maintenance.

➪ Occasionally the dust should be removed carefully from the circuit boards and the cooling ducts using dry pressurized air or a vacuum cleaner.

In heavily contaminated atmospheres it is recommended that after a short operating time, the local pollution level is assessed to determine the date of the next cleaning procedure.

4.3 Repairing

If the power section is defective (shorted thyristors), the affected phase can be detected simply by measuring the resistance. It is extremely unlikely that all thyristors will fail simultaneously.

➪ After de-energizing, the resistance is measured using an ohmmeter between one line phase and the associated motor phase (e.g. L1 - T1).

Undamaged thyristors must have a resistance of >100 kΩ. It is not necessary to disconnect the motor.

4.4 Spare parts

When ordering spare parts, please quote the specific component designation, quantity and order number as well as the equipment type No., test marking and serial No. (crossed) according to the rating plate.

Replacing the thyristor submodules

➪ De-energize the SIKOSTART.

➪ Disconnect the main terminals.

➪ Remove the upper section of the casing containing the control electronics.

➪ Dismantle the conductor bars.

➪ Mark the conductors and note down their wiring position.

➪ Disconnect the wiring.

➪ Dismantle the semi-conductor submodule.

➪ Remove the remaining thermo-lubricant (e.g. with methylated spirits)

➪ Coat the new submodule with a thin layer (of approx. 0.1 mm) of silicon-free thermo-lubricant (approx. 1 W / mK; e.g. type WLPF Fischer-Elektronik/Lüdenscheid)

➪ Install the submodule.

➪ Carry out a high-voltage test (see Section 4.1).

SIKOSTART Type	Total per SIKOSTART	Thyristor submodule Type designation	Manufacturer
3RW2221-1A..5	3	SKKT15/14E	Semikron
3RW2223-1A..5	3	SKKT19/14E	Semikron
3RW2225-1A..5	3	SKKT41/14E	Semikron
3RW2226-1A..5	3	SKKT71/14E	Semikron
3RW2227-1A..5	3	SKKT71/14E	Semikron
3RW2228-1A..5	3	SKKT91/14E	Semikron
3RW2230-1A..5	3	SKKT91/14E	Semikron
3RW2231-1A..5	3	SKKT132/14E	Semikron
3RW2234-0DB15	3	TT142N14KOF	eupec
3RW2235-0DB15	3	TT170N14KOF	eupec
3RW2236-0DB15	3	SKKT253/14E	Semikron
3RW2238-0DB15	3	TT425N14KOF	eupec
3RW2240-0DB15	3	TT425N14KOF	eupec
3RW2241-0DB15	3	TT500N14KOF	eupec
3RW2236-0DB16	3	TT215N22KOF	eupec
3RW2238-0DB16	3	TT430N22KOF	eupec
3RW2240-0DB16	3	TT430N22KOF	eupec

Tightening torque

- Tightening torque of the fixing screws:
  M6: 3.5 Nm to 4 Nm
- Tightening torque of the terminal screws (submodules):
  M6: 3.5 Nm to 4 Nm
  M8/M10: 9 Nm

Replacing the thyristor modules

➪ De-energize the SIKOSTART.

➪ Remove the cover plate.

➪ Disconnect the main terminals, L1 to T3.

➪ Remove the fixing screw at the top of the mounting plate.

➪ Tip the mounting plate forward.

➪ Disconnect the control terminals of the faulty thyristor module.

➪ Remove the fastening screws of the thyristor module.

➪ Dismantle the thyristor module.

➪ Install the new module.

➪ Carry out a high-voltage test (see Section 4.1).

SIKOSTART Type	Total per SIKOSTART	Disc-type thyristors	Manufacturer	Thyristor modules	Total per SIKOSTART
3RW2242-0DB14	6	SKT1000/12E	Semikron	3RW2920-6KC00	3
3RW2243-0DB14	6	SKT1000/12E	Semikron	3RW2920-6KC00	3
3RW2245-0DB14	6	SKT1200/12E-H2	Semikron	3RW2920-6KD00	3
3RW2247-0DB14	6	T1509N12TOF	eupec	3RW2920-6KE00	3
3RW2250-0DB14	6	DCR1474SY12	MITEL	3RW2920-6KH00	3
3RW2242-0DB15	6	SKT1000/16E	Semikron	3RW2920-6LC00	3
3RW2243-0DB15	6	SKT1000/16E	Semikron	3RW2920-6LC00	3
3RW2245-0DB15	6	SKT1200/16E-H2	Semikron	3RW2920-6LD00	3
3RW2247-0DB15	6	T1509N16TOF	eupec	3RW2920-6LE00	3
3RW2250-0DB15	6	DCR1474SY16	MITEL	3RW2920-6LH00	3
3RW2242-0DB16	6	SKT1000/22E	Semikron	3RW2920-6MC00	3
3RW2243-0DB16	6	SKT1000/22E	Semikron	3RW2920-6MC00	3
3RW2247-0DB16	6	DCR1475SY22	MITEL	3RW2920-6ME00	3
3RW2250-0DB16	6	N980CH20	Westcode	3RW2920-6MH00	3

Tightening torque

- Tightening torque of the fixing screws:
  M6: 3.5 Nm to 4 Nm

Fan selection

SIKOSTART Type	Fan	Total per SIKOSTART
3RW2234-....	3RW2920-3AC00	1
3RW2235-....	3RW2920-3AC00	1
3RW2236-....	3RW2920-3AC00	1
3RW2238-....	3RW2920-3AC00	1
3RW2240-....	3RW2920-3AC00	2
3RW2241-....	3RW2920-3AC00	2
3RW2242-....	3RW2920-3AF00	3
3RW2243-....	3RW2920-3AD00	3
3RW2245-....	3RW2920-3AD00	3
3RW2247-....	3RW2920-3AE00	3
3RW2250-....	3RW2920-3AE00	3

Further Accessories

SIKOSTART Type	Order No.	Spare part	Total per SIKOSTART
3RW2221-31/-1AA05	3RW2920-1AA05	Control electronics, standard series	1
3RW2221-31/-1AB05	3RW2920-1BA05	Control electronics with electronic protection	1
3RW2221-50/-.AB1.	3RW2920-1BB05	Control electronics with electronic protection and PC interface	1
3RW2234-50/-0DB14 3RW2234-50/-0DB15	3RW2920-1BC05	Control electronics with electronic protection and PC interface	1
3RW2234-50/-0DB16	3RW2920-1BC06	Control electronics with electronic protection and PC interface	1
3RW2221-3RW2231	3RW2900-3AA00	Thermistor	1
3RW2234-3RW2250	3RW2900-3BA00	Thermistor	1
3RW2236-42-0DB18	3RW2920-1BC08	Control electronics with electronic protection and PC interface	1
3RW2234-3RW2241	3RW2920-0BA00	Cover	1
3RW2242-3RW2245	3RW2920-0BB00	Cover	1
3RW2247	3RW2920-0BC00	Cover	1
3RW2250	3RW2920-0BD00	Cover	1
3RW2247-0BD16	3RW2920-0BD00	Cover	1

■ Tightening torque: 0.75 Nm to 0.85 Nm

Fuse for control electronics

Miniature fuse ∅ 6.3 x 32, 250 mA slow (widely available, not supplied)

➪ De-energize the SIKOSTART.

➪ Remove the upper section of the casing after loosening the 4 bolts.

➪ Slightly lift the upper section of the casing and turn it upside down to the left without damaging the wiring on the inside.

4.5 Accessories

SIKOSTART Type	Accessories	Order No.	Total per SIKOSTART
3RW2221-50/-..B1.	3.5-inch disk with PC communications program COM SIKOSTART	3RW2701-0AA00	1
3RW2221-50/-..B1.	Cable for PC communication, 5 m long	3RW2920-1DA00	1
3RW2223-31	Casing for IP 54 degree of protection w x h x d= 416mm x 300mm x 313mm	3RW2920-0AB00	1

5 Technical Data

Relative humidity		To DIN 40040	15 to 95 %	No dewing
Mechanical ambient conditions	-Vibrations	To IEC 60068-2-6 10 Hz to 57 Hz 58 Hz to 150 Hz	 (const. amplitude 0.15 mm) (const. acceleration 2 g)	
	- Shock	To IEC 60068-2-27 semi-sinusoidal	 15 g/11 ms	
Electromagnetic compatibility (EMC)	- Noise immunity			
	- Burst acc. to IEC 60801-4	Test severity IV Supply voltage Load voltage Relay output Control inputs (24 V)	 4 kV 4 kV 4 kV 2 kV	 (tested to 4 kV)
	- Surge acc. to IEC 60801-5	1 kV symmetrical / 3 kV asymmetrical at supply and load voltage		
	- Electrostatic discharge acc. to IEC 60801-2	Test severity III	8 kV	
	- Field-related interference injection acc. to IEC 60801-3	Test severity III	10 V/m	
	- Emitted interference			
	- Conducted interference at supply voltage	Limit class	A	to IEC 60947-4-2, preliminary
	- Field-emitted interference	Limit class	A	to IEC 60947-4-2, preliminary

Parameter settings			
Start up	Starting voltage		20 % to 100 % U_n
	Ramp time		0.3 s to 180 s
	Start impulse		ON/OFF, impulse voltage = 20 % to 100 % U_n, t_L = 50 ms to 1s
	Starting current limiting		20 % to 100 % of motor starting current or 50 % to 600 % of I_e
	Emergency start		ON/OFF
Operation	Energy-saving		ON/OFF
Pump-stopping			ON/OFF
	Stopping time		5 s to 90 s
Soft-stopping			ON/OFF
	Stopping time		1 s to 20 s
	Starting voltage		90 % U_n
	Switch-off voltage		85 % of starting voltage of starting ramp
DC braking			ON/OFF
	Stopping time		Minimum stopping time to maximum stopping time
Ambient temperature			≤ 40 °C / ≤ 55 °C
RS232 interface			ON/OFF
Run-up detection			Automatic switching to full-on when motor has reached stalling torque on starting up
Status messages (constantly lit)	LED 1		Ready
	LED 2		Starting or stopping
	LED 3		Motor running
	LED 4		Energy-saving on
	LED 5		Braking
Alarms (flashing)	LED 1		Supply fault (phase failure, missing voltage/load, control supply voltage too low)
	LED 2		Thyristor fault (one or more thyristors shorted)
	LED 3		Overtemperature/overload shutdown
	LED 4		General fault (firing fault, EEPROM fault, bypass contactor open/not open, thermistor short-circuited/wire break, watchdog tripped)
	LED 5		Start inhibited, power section too hot
Control inputs	Input 1		ON
	Input 2		OFF
	Input 3		Alarm reset
	Operating current		approx. 10 mA to DIN 19240
	Rated voltage	V DC	+24 from built-in power supply via L+24 V DC terminal

Relay output	Output 1 Output 2 Output 3 Rated operating current Short-circuit protection		Group alarm (changeover contact) Motor running (NO) Braking contactor ON (NO)) 3 A, AC-15 at 240 V; 0.1 A, DC-13 at 240 V; 0.5 A, DC-13 at 24 V 4 A class gl; 6 A quick (not supplied)	all relays are wired with a varistor and a capacitor, the maximum switching voltage is 250 V
Max. cross-sections for conductors			**Power section**	**Control terminals**
	Solid	mm^2	1 to 16	0.5 to 2.5
	Finely stranded, without end-sleeve		2.5 to 16	- - -
	Finely stranded, with end-sleeve	max. 2 conduct.	1 to 16	0.5 to 1.5
	Stranded	max. 2 conduct.	2.5 to 25	- - -
	Solid or stranded	AWG	14 to 3	20 to 14
Tightening torque		Nm lb · in	2.5 to 3 22 to 26.5	0.8 to 1.4 7 to 12

Control electronics 3RW2221 to 2250

Control supply voltage		V	380 - 415, 200 - 240, 100 - 120 +10 %/ -15 %
Control supply current		mA mA mA	approx. 40 at 400 V to 415 V approx. 75 at 200 V to 240 V approx. 100 at 100 V to 120 V
Rated frequency	Operational range	Hz Hz	50/60 45 to 66
Short-circuit protection, control circuit			built-in fuse, 250 mA slow, 6.3 mm x 32 mm
Control times	Switch-on delay Switch-on delay Switch-on delay Recovery time	ms s s ms	≤ 50 separate ON/OFF commands with main circuit voltage and control supply voltage applied ≤ 1 with contactor operation, ON/OFF via switching the separate control supply voltages ≤ 1.1 automatic mode ≤ 440 after DC braking (depending on overload protection)

Power Electronics 3RW2221 to 2231			SIKOSTART machine-readable product designation (MLFB): 3RW..							
			..2221	..2223	..2225	..2226	..2227	..2228	..2230	..2231
Loading										
Rated current I_e	40 °C AC-3	A	7	10.5	22	28	35	45	50	70
Motor rating (**400 V**)	40 °C AC-3	kW	3	4	11	15	18,5	22	25	37
Rated current I_e	55 °C AC-3	A	5.5	9	16	22	32	37	45	63
Motor rating (**400 V**)	55 °C AC-3	kW	2,2	4	7,5	11	15	18,5	22	30
Continuous operation (% of I_e)			115 %							
Starting current / max. starting time		% I_e / s	Cold (40 °C or 55 °C): 600 %/2 s; 450 %/10 s; 300 %/60 s; 250 %/120 s; 200 %/200 s; Warm: 600 %/1 s; 450 %/ 5 s; 300 %/30 s; 250 %/ 60 s; 200 %/100 s;							
Permissible ambient temperature	Operation Storage	°C °C	0 to 40 or 55 (selectable) -40 to +80							
Operating range	Voltage Frequency	V Hz	200 -15 % to 500 +10 % 45 to 66							
Permissible starts per hour	350% I_e 5s	1/h	80	90	30	20	50	30	20	40
at S4 operation T_U= 40°C	300% I_e 10s	1/h	50	60	20	10	30	20	20	30
switch-on period ED=30%	250% I_e 15s	1/h	50	50	20	10	30	20	20	30
Overload protection			Thermistor on heatsink Electronic protection with thermal memory (type 3RW22..-1AB.5)							
Short-circuit protection	SILIZED	A	35	35	80	125	125	160	160	200
Fuse-links		Typ	5SD450	5SD450	5SD510	5SD530	5SD530	5SD540	5SD540	5SD550
(max. possible fuse rating,	SITOR	A	35	35	100	125	125	160	160	315
see project planning handbook)		Typ	3NE8003	3NE8003	3NE8021	3NE8022	3NE8022	3NE3224	3NE3224	3NE3230-0B
Power loss at rated current (40 °C)	approx.	W	30	40	70	80	105	130	140	220
Altitude			to 3,000 m above sea level; above 1,000 m above sea level reduction, see chapter 1, Figure 1							
Built-in fan			no	no	no	no	no	no	no	no
Recommended bypass contactor	AC-1		3RT1015	3RT1015	3RT1016	3RT1024	3RT1024	3RT1034	3RT1034	3RT1044
designed for DOL start	AC-3		3RT1015	3RT1017	3RT1026	3RT1034	3RT1035	3RT1036	3RT1036	3RT1045
Recommended braking cont.	2 contacts parallel		3RT151.	3RT1526	3RT1526	3RT1526	3RT1526	3RT1526	3RT1535	3RT1535
Weight		kg	1,5	2,9	2,9	3,4	4,8	4,8	8,1	8,1

Power Electronics 3RW2234 to 2250-0DB14/15			SIKOSTART machine-readable product designation (MLFB): 3RW..										
			..2234	..2235	..2236	..2238	..2240	..2241	..2242	..2243	..2245	..2247	..2250
Loading													
Rated current I_e	40 °C AC-3	A	100	135	160	235	300	355	450	560	700	865	1200
Motor rating (**400 V**)	40 °C AC-3	kW	55	75	90	132	160	200	250	315	400	500	710
Rated current I_e	55 °C AC-3	A	85	110	140	205	250	300	355	450	560	700	1000
Motor rating (**400 V**)	55 °C AC-3	kW	45	55	75	110	132	160	200	250	315	400	560
Continuous operation (% of I_e)			115 %										
Starting current / max. starting time		% I_e / s	Cold (40 °C or 55 °C): 600 %/2 s; 450 %/10 s; 300 %/60 s; 250 %/120 s; 200 %/200 s; Warm: 600 %/1 s; 450 %/ 5 s; 300 %/30 s; 250 %/ 60 s; 200 %/100 s;										
Permissible ambient temperature	Operation	°C	0 to 40 or 55 (selectable)										
	Storage	°C	-40 to + 80										
Operating range	Voltage	V	3RW22..-0.B15 200 - 15% to 500 + 10%						3RW22..-0.B14 200 - 15% to 415 + 10% 3RW22..-0.B15 200 - 15% to 500 + 10%				
	Frequency	Hz	45 to 66						45 to 66				
Permissible starts per hour	350% I_e 5s	1/h	120	100	90	90	30	40	180	90	100	120	60
at S4 operation, T_U=40°C	300% I_e 10s	1/h	80	60	60	60	20	20	100	60	60	80	40
switch-on period ED=30 %	250% I_e 15s	1/h	70	50	50	50	20	20	70	50	60	70	40
Overload protection			Thermistor on heatsink Electronic protection with thermal memory (type 3RW22..-B.5)										
Short-circuit protection	SITOR	A	200	250	315	450	560	630	800	2×560	2×630	2×800	3×800
Fuse-links		Typ	3NE 3225	3NE 3227	3NE 3230-0B	3NE 3233	3NE 3335	3NE 3336	3NE 3338-8	2×3NE 3335	2×3NE 3336	2×3NE 3338-8	3×3NE 3338-8
(max. possible fuse rating, see projekt planning handbook)													
Power loss at rated current (40 °C)	approx.	W	280	400	490	700	810	970	1550	1950	2060	2440	3560
Altitude			to 3,000 m above sea level; above 1,000 m above sea level, see Chapter 1, Figure 1										
Built-in fan			1 fan	1 fan	1 fan	1 fan	2 fans	2 fans	3 fans	3 fans	3 fans	3 fans	3 fans
Fan	Voltage	V	230 ± 10%										
	Frequency	Hz	45 to 66										
	Power	W	18	18	18	18	36	36	54	144	60	60	60

Power Electronics 3RW2234 to 2250-0DB14/15			SIKOSTART machine-readable product designation (MLFB): 3RW..										
			..2234	..2235	..2236	..2238	..2240	..2241	..2242	..2243	..2245	..2247	..2250
Max. cross-sections*		mm^2	95	120	150	240	240	240	40×10	40×10	40×10	40x10	60x20
Terminal screw			M10									M12	
Tightening torque			14 Nm to 24 Nm / 124 lb · in to 210 lb · in									45 Nm to 70 Nm / 390 to 610 lb · in	
Recommended bypass contactor	AC-1		3TF48..	3TF50..	3TF50..	3TF53..	3TF54..	3TF56..	3TF57..	3TF57..	3TF68..	3TF69..	2× 3TF68..
	AC-3		3TF50..	3TF51..	3TF52..	3TF54..	3TF55..	3TF56..	3TF57..	3TF68..	3TF69..	2× 3TF68..	2× 3TF69..**
Recommended braking cont. combination NC contact NO contact			3RT1034 3RT1034	3RT1035 3RT1044	3RT1044 3RT1044	3RT1044 3RT1046	3TF48 3TF51	3TF52 3TF54	3TF52 3TF54	3TF54 3TF55	3TF54 3TF56	3TF56 3TF57	3TF57 3TF58
Weight		kg	14	14	16	19	19	19	44	44	44	75	104

* Types from 3RW2242: Connection via flexible straps only

** Suitable as emergency contactor for occasional starts with $I_a \leq 6 \times I_e$

Power Electronics 3RW2236 to 2250-0DB16			SIKOSTART machine-readable product designation (MLFB): 3RW..						
			..2236	..2238	..2240	..2242	..2243	..2247	..2250
Loading									
Rated current I_e	40 °C AC-3	A	160	235	300	450	560	865	1200
Motor rating (**690 V**)	40 °C AC-3	kW	155	228	276	431	543	862	1225
Rated current I_e	55 °C AC-3	A	140	205	250	355	450	700	1000
Motor rating (**690 V**)	55 °C AC-3	kW	129	190	228	345	431	690	960
Continuous operation (% of I_e)			115 %						
Starting current / max. starting time		% I_e / s	Cold (40 °C or 55 °C): 600 %/2 s; 450 %/10 s; 300 %/60 s; 250 %/120 s; 200 %/200 s; Warm: 600 %/1 s; 450 %/ 5 s; 300 %/30 s; 250 %/ 60 s; 200 %/100 s;						
Permissible ambient temperature	Operation Storage	°C °C	0 to 40 or 55 (selectable) -40 to + 80						
Operating range	Voltage Frequency	V Hz	3RW22..-0DB16 500 - 15% to 690 + 10% 45 to 66						
Permissible starts per hour	350% I_e 5s	1/h	90	90	30	100	90	100	60
at S4 operation, T_U=40°C	300% I_e 10s	1/h	60	60	20	60	60	80	40
switch-on period ED=30 %	250% I_e 15s	1/h	50	50	20	50	50	70	40
Overload protection			Thermistor on heatsink Electronic protection with thermal memory (type 3RW22..-B.6)						
Short-circuit protection Fuse-links per phase	SITOR	A Typ	315 3NE 3230-0B	450 3NE 3233	560 3NE 3335	800 3NE 3338-8	2×560 2×3NE 3335	2x800 2x3NE 3338-8	3×800 3×3NE 3338-8
Power loss at rated current (40 °C)	approx.	W	490	700	810	1550	1950	2660	3560
Altitude			to 3,000 m above sea level; above 1,000 above sea level, see Chapter 1, Figure 1						
Fan voltage			1 fan	1 fan	2 fans	3 fans	3 fans	3 fans	3 fans
Fan	Voltage Frequency	V Hz	230 ± 10% 45 to 66						
	Power	W	18	18	36	54	144	60	60

Power Electronics 3RW2236 to 2250-0DB16			SIKOSTART machine-readable product designation (MLFB): 3RW..						
			..2236	..2238	..2240	..2242	..2243	..2247	..2250
Max. cross-sections*		mm^2	150	240	240	40×10	40×10	60x20	60x20
Terminal screw			M10					M12	
Tightening torque			14 Nm to 24 Nm / 124 lb · in to 210 lb · in					45 Nm to 70 Nm/ 390 lb · in to 610 lb · in	
Recommended bypass contactor	AC-1		3TF50..-	3TF53..-	3TF54..-	3TF57..-	3TF57..-	3TF69	2×3TF68..-
	AC-3		3TF52..-	3TF54..-	3TF56..-	3TF68..-	3TF68..-	2×3TF68..	2×3TF69..-
Recommended braking cont. combination NC contact NO contact			3TF46 3TF50	3TF48 3TF52	3TF50 3TF52	3TF52 3TF54	3TF54 3TF56	3TF56 3TF68	3TF57 3TF68
Weight		kg	16	19	19	44	44	104	104

* Types from 3RW2242: Connection via flexible straps only

Power Electronics 3RW2236 to 2242-0DB18				SIKOSTART machine-readable product designation (MLFB)		
				3RW2236-0DB18	**3RW2240-0DB18**	**3RW2242-0DB18**
Loading						
Rated current I_e	40 °C	AC-3	A	160	300	450
Motor rating (**1000 V**)	40 °C	AC-3	kW	200	400	630
Rated current I_e	55 °C	AC-3	A	140	250	355
Motor rating (**1000 V**)	55 °C	AC-3	kW	160	315	450
Continuous operation (% of I_e)				115 %		
Starting current / max. starting time		or 55 °C	% I_e/s	Cold: 600 %/2 s; 450 %/10 s; 300 %/60 s; 250 %/120 s; 200 %/200 s Warm: 600 %/1 s; 450 %/ 5 s; 300 %/30 s; 250 %/ 60 s; 200 %/100 s		
Permissible ambient temperature		Operation Storage	°C °C	0 to 40 or 55 (selectable) -40 to +60		
Operating range		Voltage Frequency	V Hz	1000 -20/+25% 45 to 66		
Starts per hour	350% I_e 5s		1/h	60	120	110
at S4 operation, T_U=55 °C	300% I_e 10s		1/h	40	80	70
Switch-on period ED=30 %	250% I_e 15s		1/h	40	70	70
Overload protection				Thermistor on heatsink Electronic protection with thermal memory		
Short-circuit protection		SITOR	A Type	315 3NE3230-0B	560 3NE3335	450 3NE3233 (2 pieces parallel)
I^2t tyristor		Tj = Tjmax	A^2s	151000	845000	1445000
Power loss at rated current (55 °C)		approx.	W	550	1100	1190
Altitude				3000 m above sea level; over 1000 m current reducing		
Built-in fan				2 fans	3 fans	3 fans
Fan		Voltage Frequency	V Hz	230 ± 10% 45 to 66		
		Power	W	36	54	135

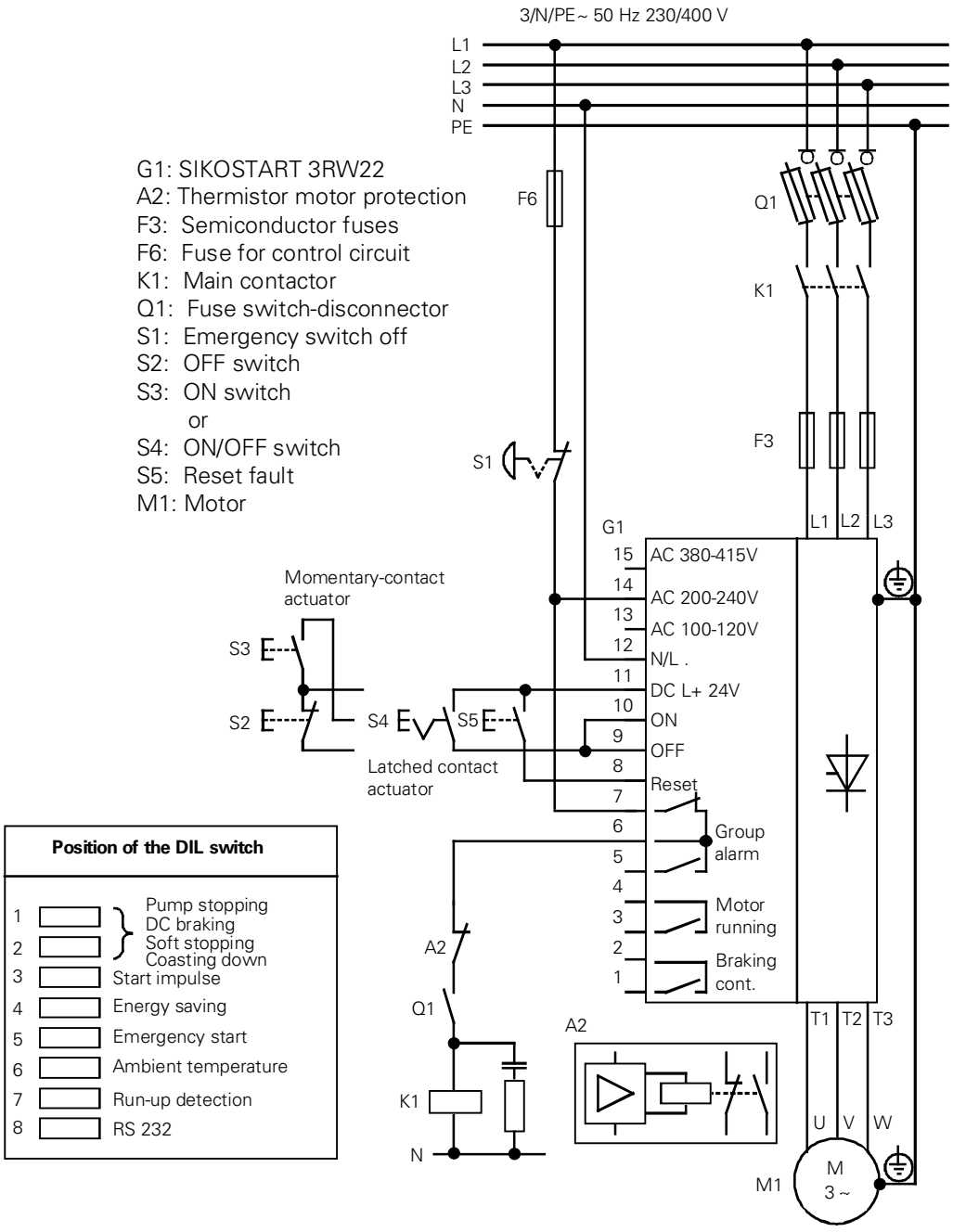
Power Electronics 3RW2236 to 2242-0DB18		SIKOSTART machine-readable product designation (MLFB)		
		3RW2236-0DB18	**3RW2240-0DB18**	**3RW2242-0DB18**
Max. cross-sections *	mm^2	150	40 x 10	40 x 10
Weight	kg	19	44	44
Main contactor		3TF56	3TF68	3TF68
Bypass contactor	AC-1	3TF54	3TF68	3TF68
	AC-3	3TF56	3TF68	3TF68

6 Circuit diagram proposal

English

Independent control with control input voltage applied.

Fuse switch-disconnector and contactor in main motor circuit. Control inputs by momentary or latched contact switch. Motor protection also possible with overload relay.



7 Addresses of suppliers

For spare parts: thyristor module, disk-type thyristor

SEMIKRON

SEMIKRON
Sigmundstrasse 200
P.O. Box 820251
D-90431 Nuremberg
Germany

Tel.: +49 (0) 911 6559 0
Fax: +49 (0) 911 6559 262

e-mail: sales.skd@semikron.com
internet: http://www.semikron.com

eupec

eupec
Max-Plank-Strasse 5
D-59581 Warstein
Germany

Tel.: +49 (0) 2902 764 0
Fax Sales: +49 (0) 2902 764 738 / 510

e-mail: info@eupec.com und info@eupec.de
internet: http://www.eupec.com und http://www.eupec.de

WESTCODE SEMICONDUCTORS LIMITED

WESTCODE SEMICONDUCTORS LIMITED
P.O. Box 57
Langley Road
Chippenham, Wiltshire
England. SN15 1JL

Tel.: (Sales) +44 (0) 1249 444524
Fax: +44 (0) 1249 659448

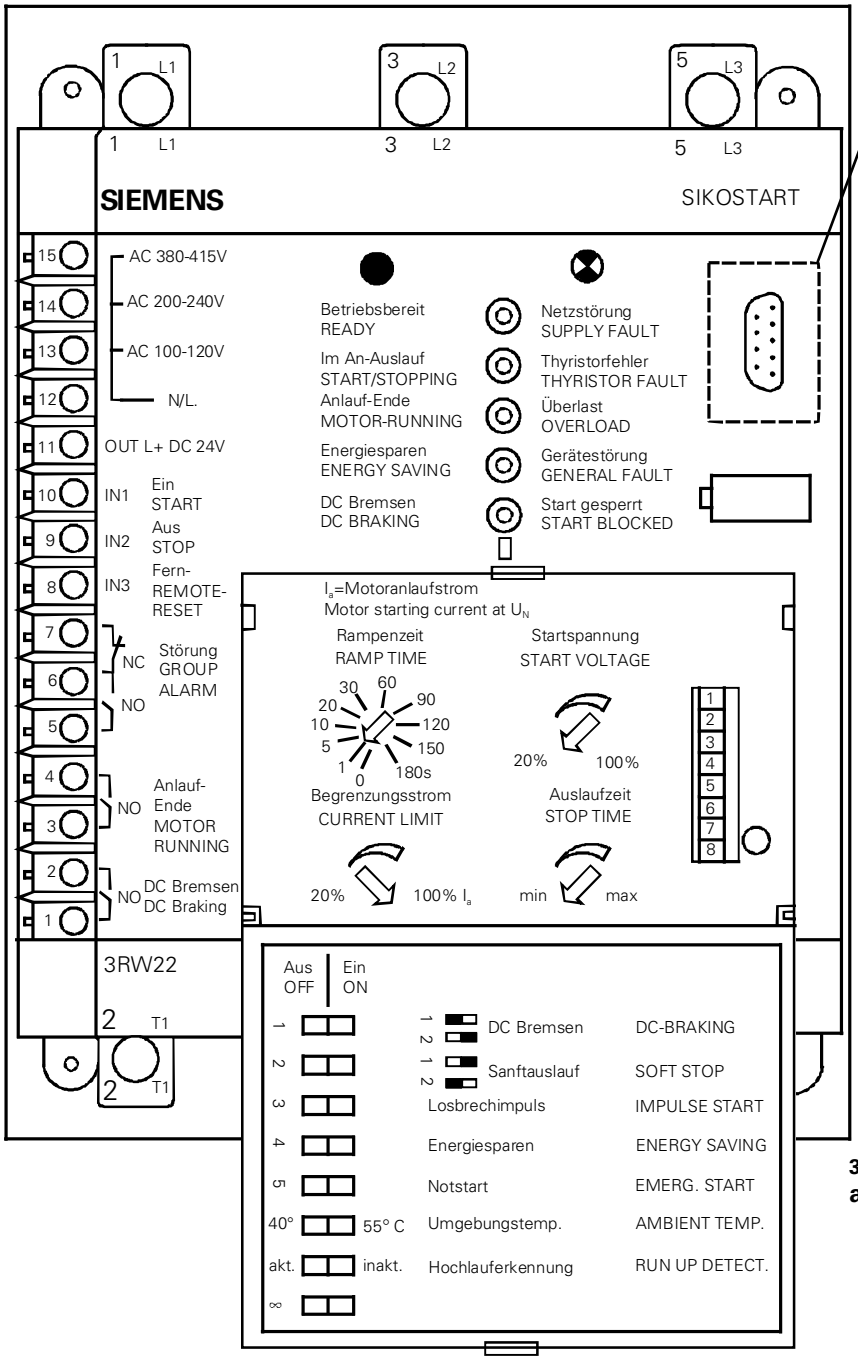
e-mail: WSL.sales@btrinc.com
internet: http://www.westcode.com

MITEL Semiconductor

MITEL Semiconductor
Hubert Berg
Sales Manager Central and Eastern Europe - Power
Raustrasse 17/1
D-88400 Biberach
Germany

Tel.: +49 (0) 7351 827723
Fax: +49 (0) 7351 827723

internet: http://lincoln.mitelsemi.com



bei/on/sur/en/in/no 3RW22..-..B1.

Anschluss PC-Schnittstelle
Connection for PC interface
Connecteur d'interface PC
Conector de interface PC
Allacciamento interfaccia PC
Terminal interface de PC

LED No. / N. LED / LED n.°

1

2

3

4

5

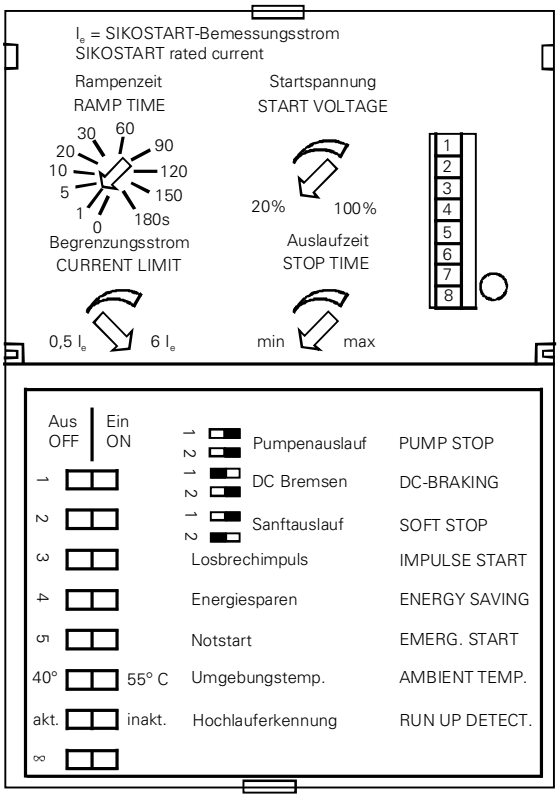
Potentiometer No. / Potentiomètre-No. Potenciómetro No. / N. potenziometro/ Potenciómetro n.°

1 **2**

3 **4**

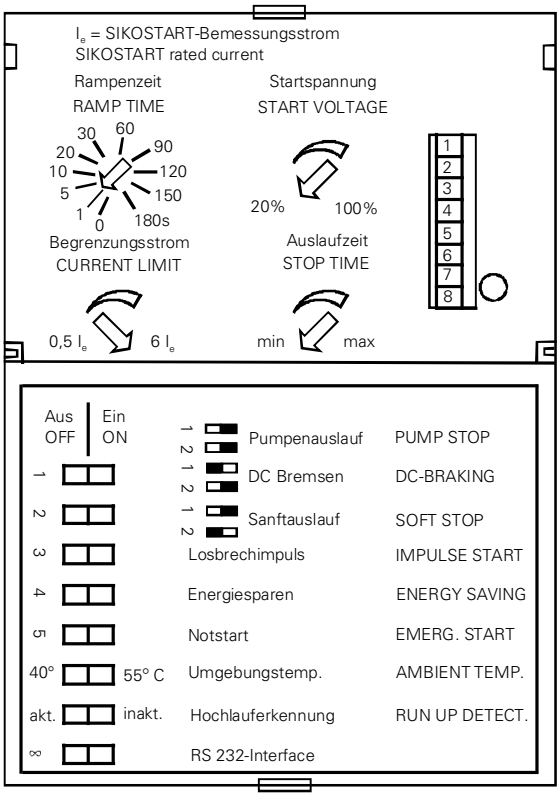
3RW2221 bis/to/à/a/até 3RW2231-1AA05

a. Grundgerät
Basic unit
Appareil de base
Aparato base
Apparecchio base
Aparelho base



3RW2221 bis/to/à/a/até 3RW2231-1AB05

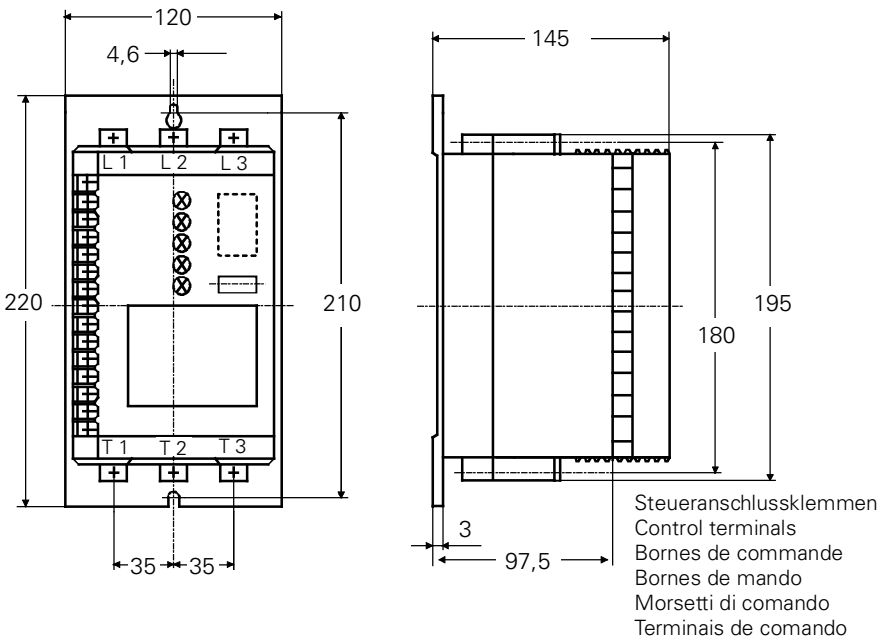
b. Version mit elektronischem Geräteschutz
Version with electronic overload protection
avec protection contre les surcharges
Versión con protección electrónica de sobrecarga
Versione con protezione elettronica
Versão com protecção electrónica de aparelho



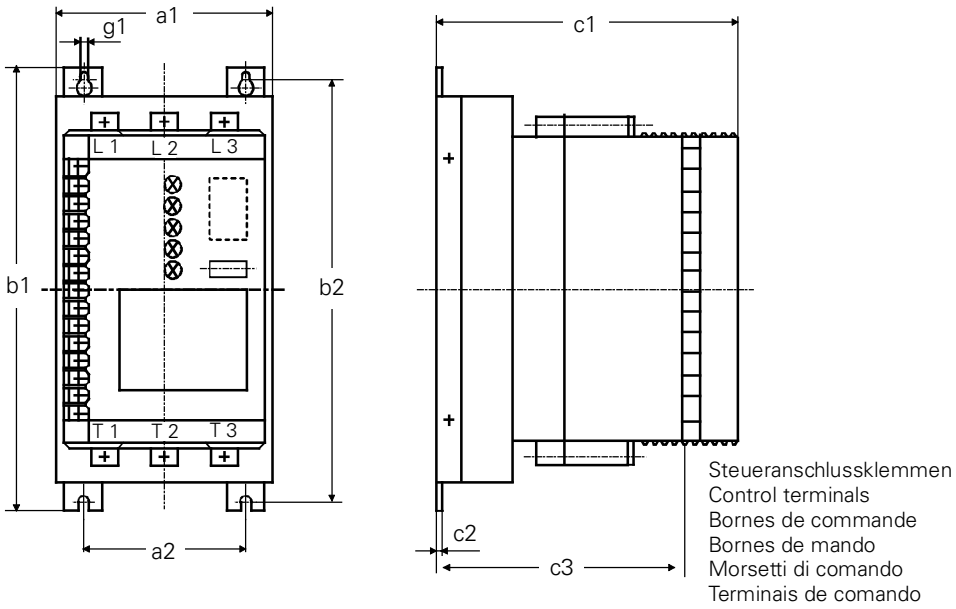
3RW2221 bis/to/à/a/até 3RW2250-..B1.

c. Version mit elektronischem Geräteschutz und serieller PC-Schnittstelle RS232
Version with electronic overload protection and a serial RS232 PC interface
avec protection contre les surcharges et interface série RS232 pour PC
Versión con protección electrónica de sobrecarga e interface para PC serie RS232
Versione con protezione elettronica e interfaccia seriale RS232 per PC
Versão com protecção electrónica de aparelho e interface serial de PC RS232

3RW2221

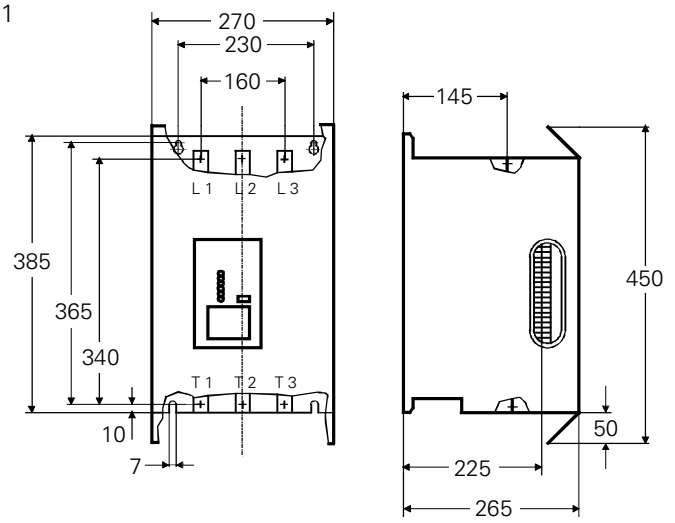


3RW2223 bis/to/à/a/
até 3RW2231



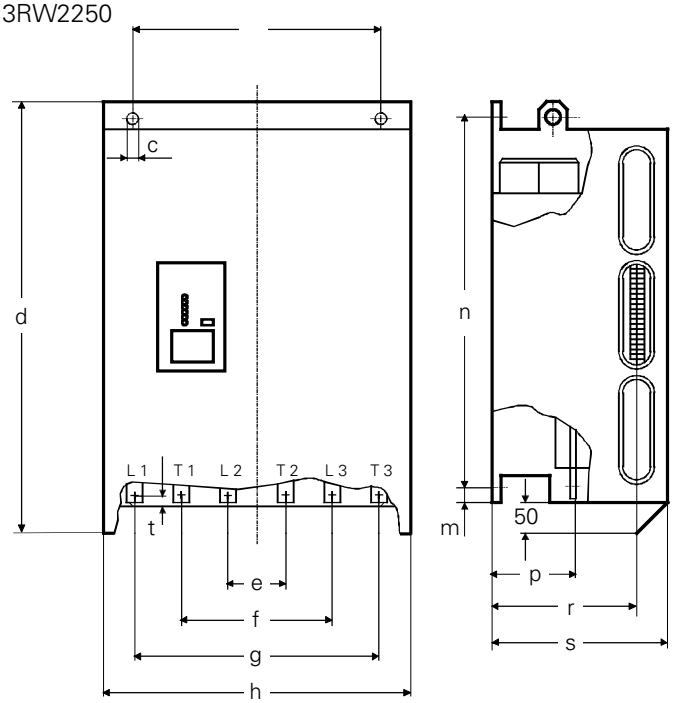
TYPE/TIPO/TIPI	a1	a2	b1	b2	c1	c2	c3	g1
3RW2223-...	125	95	240	230	177,5	2	130	4,6
3RW2225-...	125	95	240	230	177,5	2	130	4,6
3RW2226-...	165	135	240	230	180	2	132,5	4,6
3RW2227-...	205	175	280	270	180	2	132,5	4,6
3RW2228-...	205	175	280	270	180	2	132,5	4,6
3RW2230-...	222,5	185	290	275	225	2,5	175	6,6
3RW2231-...	222,5	185	290	275	225	2,5	175	6,6

3RW2234/35/36/38/40/41
3RW2236-0DB18



Steueranschlussklemmen
Control terminals
Bornes de commande
Bornes de mando
Morsetti di comando
Terminais de comando

3RW2242 bis/to/à/a/até 3RW2250
3RW2240/2242-0DB18



Steueranschlussklemmen
Control terminals
Bornes de commande
Bornes de mando
Morsetti di comando
Terminais de comando

TYPE/TIPO/TIPI	a	c	d	e	f	g	h	m	n	p	r	s	t
3RW2240/2242-0DB18 3RW2242/43/45	400	11	655	80	210	370	465	15	570	145	215	255	20
3RW2247	480	11	730	100	260	460	560	20	645	230	295	340	25
3RW2247-0DB16 3RW2250	520	13	875	105	275	485	600	20	790	220	285	330	25

Technical Assistance:
Telephone: +49 (0) 9131-7-43833 (8°° - 17°° MEZ) Fax: +49 (0) 9131-7-42899
E-mail: nst.technical-assistance@siemens.com
Internet: www.siemens.de/lowvoltage/technical-assistance

Technical Support:
Telephone: +49 (0) 180 50 50 222

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Geschäftsgebiet
Niederspannungs-Schalttechnik
D-92220 Amberg

Automations & Drives
Low Voltage Controls and Distribution
D-92220 Amberg

Änderungen vorbehalten
Subject to change without prior notice
Siemens Aktiengesellschaft

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