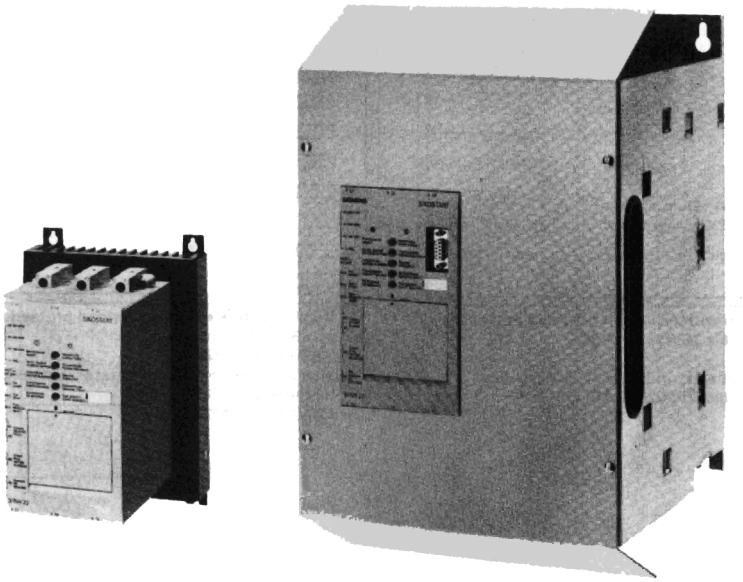
SIEMENS

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

GWA 4NEB 535 0477-10

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.

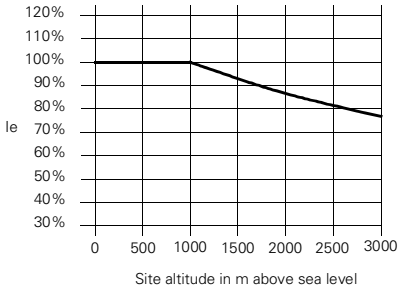


Fig. 1: Rated operating current I_e above 1,000 m above see level

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.

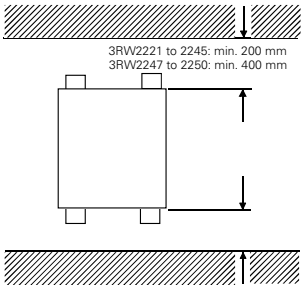


Fig. 2: Vertical clearance from other equipment

Fixing

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

English

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

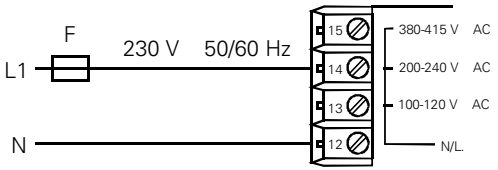


Fig. 3: Terminal connections

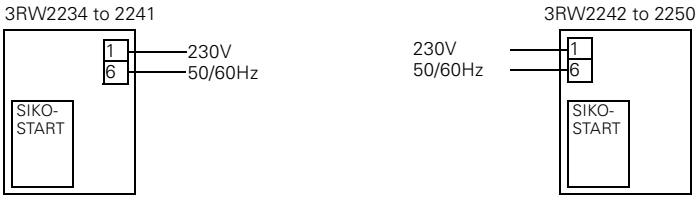


Fig. 4: Fan connection (only to 230 V AC ± 10%, 50/60 Hz)

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.

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.

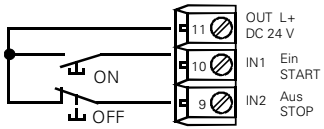


Fig. 5: Terminal connection

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.

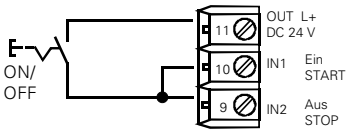


Fig. 6: Terminal connection

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.

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.

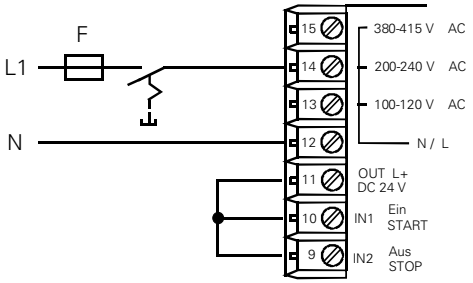


Fig. 7: Terminal connection for U=200 V to 240 V AC

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.

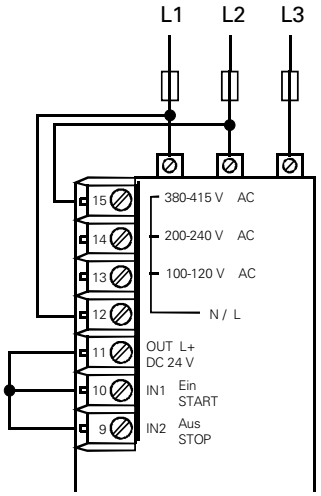


Fig. 8: Terminal connections for U=380 V - 415 V AC

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.

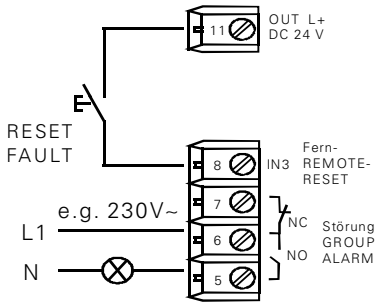


Fig. 9: Terminal connections

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

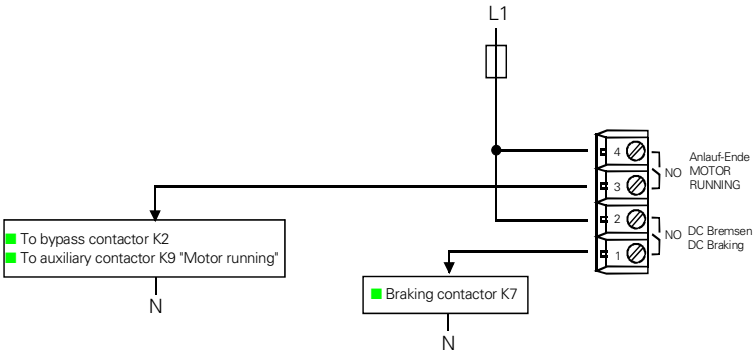


Fig. 10: Relay outputs MOTOR RUNNING and DC BRAKING

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.

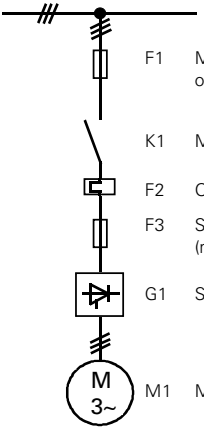
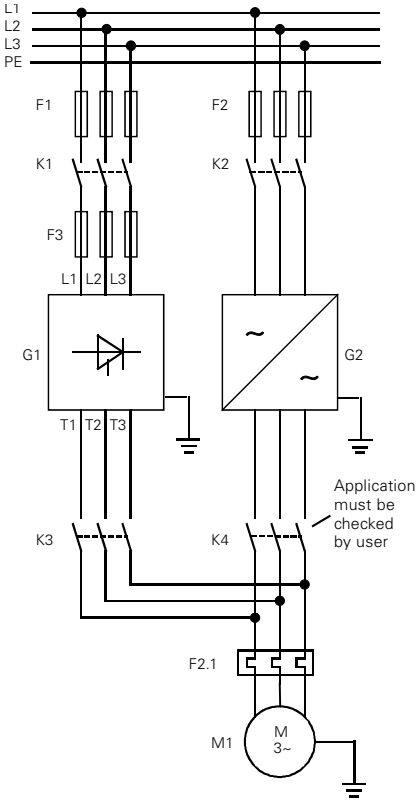


Fig. 11: Basic layout of a motor circuit

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

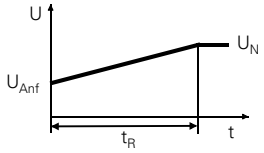
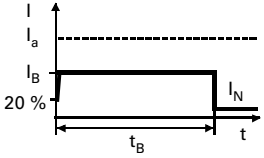
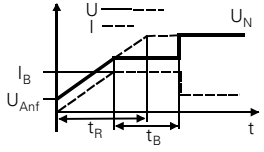
⇨ Set the DIL switches for the required operating mode combination (see Tables A, B and C).

⇨ 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.

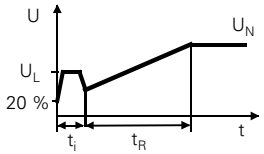
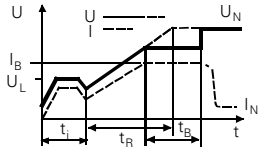
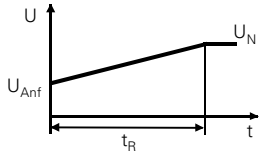
***** Limiting time t_B:

■ 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.

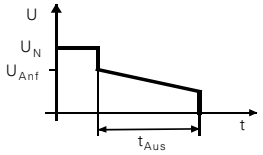
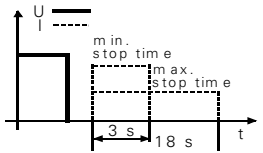
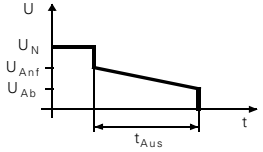
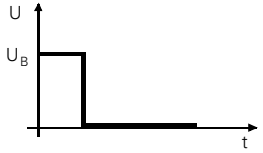
******Limiting current I_B:

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.

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

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

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		Group alarm (changeover contact) Motor running (NO) Braking contactor ON (NO))	all relays are wired with a varistor and a capacitor, the maximum switching voltage is 250 V
	Rated operating current		3 A, AC-15 at 240 V; 0.1 A, DC-13 at 240 V; 0.5 A, DC-13 at 24 V	
	Short-circuit protection		4 A class gl; 6 A quick (not supplied)	
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		Hz	50/60
	Operational range	Hz	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 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	3NE	3NE	3NE	3NE	3NE	3NE	2×3NE	2×3NE	2×3NE	3×3NE
(max. possible fuse rating, see projekt planning handbook)				3225	3227	3230-0B	3233	3335	3336	3338-8	3335	3336	3338-8	3338-8
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

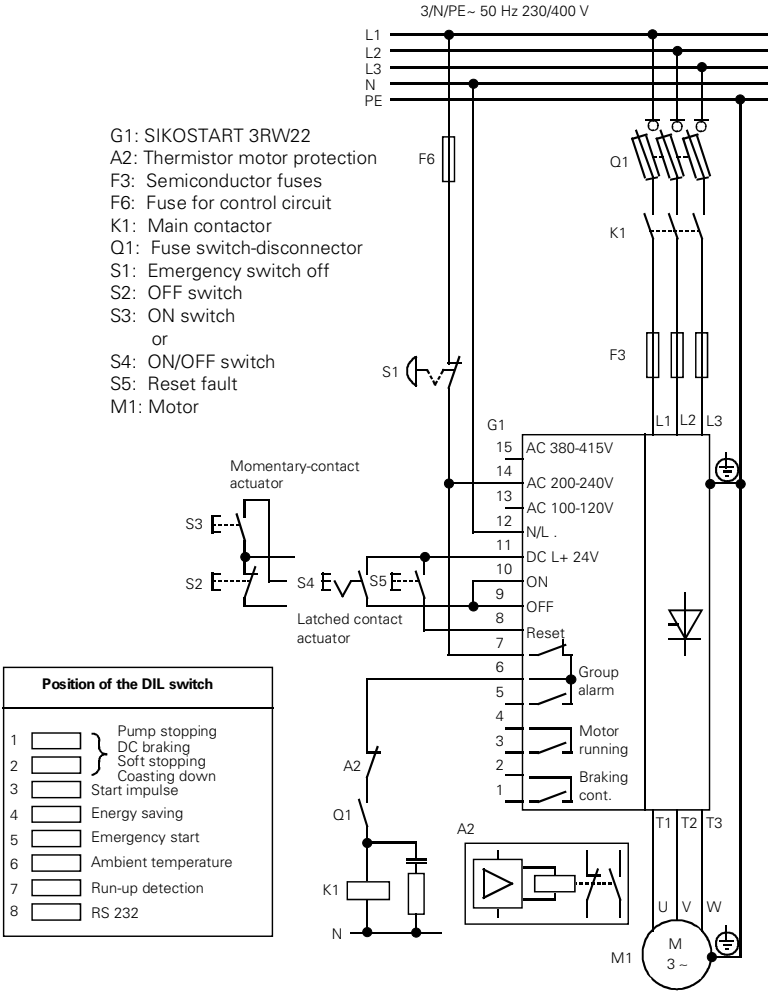
* Types from 3RW2242: Connection via flexible straps only

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

6 Circuit diagram proposal

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.



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Bestell-Nr./Order No.: 3ZX1012-0RW22-1AN1
Printed in the Federal Republic of Germany