Variable Frequency Inverters MOVITRAC® 1000 and 1100

Installation and Operating Instructions

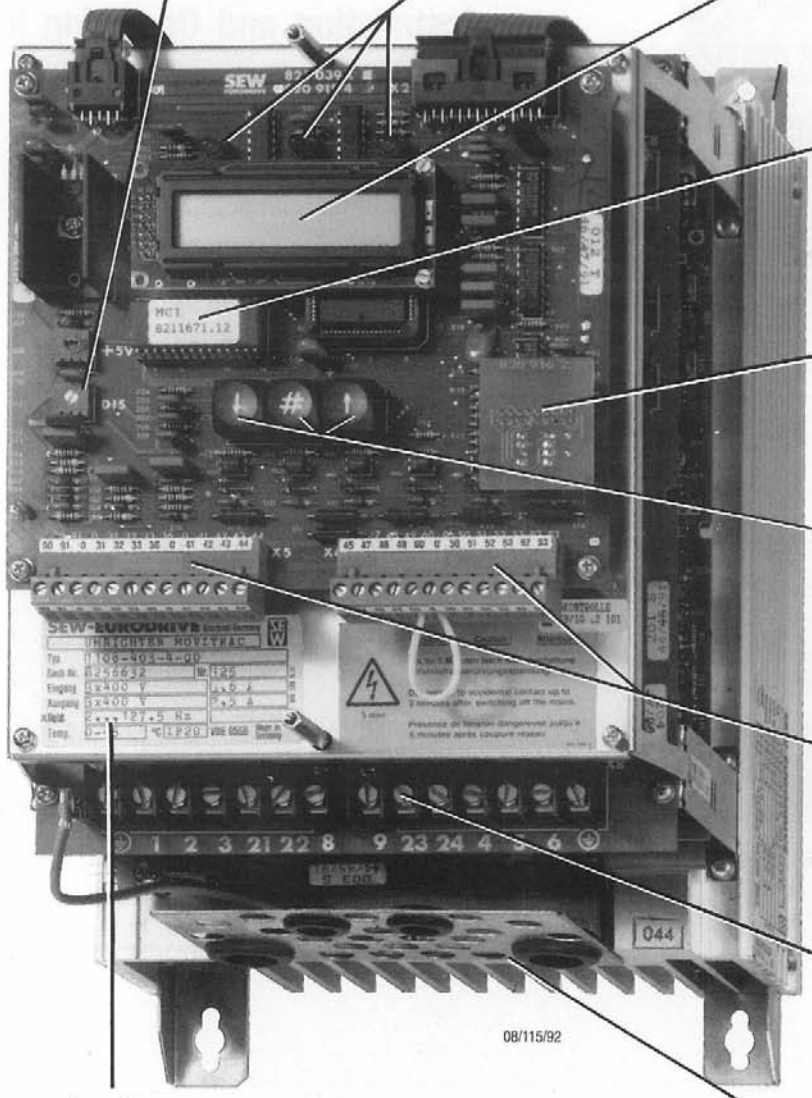
Version 11/94

08/097/91

TÜV CERT DIN ISO 9001 Zertifikat: QA - 404

SEW EURODRIVE

Unit construction



Example:

MOVITRAC®

1008-403-4-00

Feature	00 =	Standard
Quadrant feature	4 =	4 quadrant (with brake chopper)
	1 =	1 quadrant (without brake chopper)
Supply feature	3 =	three phase
Supply voltage	23 =	230 V } -30%...+15%
	40 =	400 V }
Useful motor power	06 =	0.55 kW
	08 =	0.75 kW
	15 =	1.5 kW
	22 =	2.2 kW
	30 =	3.0 kW
Development status	0 =	Clock frequency approx. 12-16 kHz
	1 =	Clock frequency approx. 4 kHz
Model series 1...		

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Contents

SEW Variable Frequency Inverters MOVITRAC®, with the interference suppression symbol, have been – in combination with a typical motor – successfully tested for conformity to radio noise limits B in accordance with EN 55011 respectively DIN VDE 0871 through VDE test laboratories.

The interference suppression symbol is valid only in connection with:

- the integrated **mains filter** → refer to Section 5 – Technical Data
- interference suppressive wiring → refer to Section 2 – Electrical Installation

Every inverter leaves our works after thorough inspection in a fully functional condition. Compliance with these instructions and references are prerequisite for trouble-free operation with all the claimed properties and for meeting possible warranty claims.
The operating instructions also contains important notes for service; it is therefore to be kept in the vicinity of the inverter.

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1 Mechanical Installation

When installing the MOVITRAC® inverter the following items have to be observed:

- Install in a switch cabinet with an appropriate enclosure suitable for the application to protect the unit against dust accumulation and condensation.
- If necessary allowance should be made for installation of ventilation filters or anti-condensation heaters in the switch cabinet.
- **Note:** Provide sufficient cooling!
  This requires among other measures at least 100 mm free space above and below the unit.
  Cable channels do not interfere with the cooling.
- Max. permissible ambient temperature
  with full inverter utilisation: 45 °C;
  with reduced utilisation: 60 °C.
- While the protective cover is removed, the top of the unit is to be covered to prevent objects (cable waste, metal shavings) from falling into the unit.
- Electronic signal relays (setpoint contacts, directional commands, etc.) and fixed-preselected-setpoint potentiometers are to be placed in the vicinity of the inverter, in the 100 mm clearance below (by no means further away).
- Optional mains chokes, mains input filters or output chokes are to be mounted directly below the MOVITRAC® unit observing the cooling clearance of 100 mm.
- Mains input filter and inverter must be earthed with regard to high frequencies as part of radio interference suppression measures: a widely spread metal-to-metal contact between the inverter housings and the switch cubicle sheet metal is a good prerequisite for this.

- **The inverters are to be installed *by qualified electrical personnel* in compliance with the relevant local standards and accident prevention regulations pertaining to installation.**
- **Without the plastic cover the inverter has the enclosure IP 00, i.e. it is not safe to touch. After installation, before normal operation the red cover is to be mounted on the inverter.**
- **During the installation and commissioning of the motor and brake the appropriate instructions are to be observed!**
- **The choice of protection measures and protection equipment has to follow local standards.**
  - **Necessary protection measures: Earthing of the units**
  - **Additional necessary protection measures: Overcurrent protection**
    Earth-leakage protection

Note: The voltage at the supply terminals 1/2/3 may not exceed 265 V_{AC} to earth (=PE)

2.1 Mains and motor supply wiring, input fuses

- Mains supply leads: The cross-sectional area is based on the input current at rated load, i.e. 1.5 mm² (Data: refer to section 5)
  The input of the inverter has fuses incorporated. Therefore the mains only need to be provided with fuses for the supply conductors, if the mains supply conductors (i.e. 1.5 mm²) have less cross-sectional area than the supply leads from the junction to the inverter.
- Motor supply leads: The cross-sectional area per output current (Data: refer to section 5)
  Minimum wire cross-sectional area for single strand insulated conductor: 1.5 mm².
  The voltage drop ΔV on the motor leads is to be limited:
  a) with single drives to $\Delta V \leq 10$ V
  b) with group drives (due to the common BOOST value: no individual compensation possible) and hoisting applications to $\Delta V \leq 5$ V
  The voltage drop ΔV can be determined from the following table: (with shorter leads the voltage drop can be calculated proportionally to the length).

Lead cross-section	Current load =						
	4 A_{AC}	5 A_{AC}	6 AAC	7 A_{AC}	8 A_{AC}	10 A_{AC}	12 A_{AC}
Copper	Voltage drop ΔV over length = 100 m and ΔT = 50 K						
1.5 mm²	5.3 V	6.7 V	8.0 V	9.3 V	10.6 V	13.3 V	16.0 V
2.5 mm²	3.2 V	4.0 V	4.8 V	5.6 V	6.4 V	8.1 V	9.7 V
4.0 mm²	1.9 V	2.3 V	2.8 V	3.3 V	3.8 V	4.7 V	5.6 V

- In case of **radio-interference-suppressed wiring** a shielded cable must be used as motor lead.
  The shield must be earthed at ***both ends*** (widely spread contact with the chassis is important).
  Maximum permissible length of the shielded lead for MOVITRAC® 1000: 150 m
  for MOVITRAC® 1100: 50 m.
  The inverters have as standard radio interference suppression level A resp. B (refer to section 5).
  Therefore no additional mains input filters are necessary.

- **Note** for the series **MOVITRAC® 1100:**
  This series are without output filters. With the use of metal-sheathed cables (as electrical shield or mechanical protection) the parasitic earth capacitance must not be too great. Therefore a **motor feed cable distance of max. 50 m**, for two parallel feed cables (multi-motor operation) max. 20 m, is recommended.
  Cables whose separate cores are shielded may not be used because of too high a capacitance to earth. Furthermore with this type of inverter the output conductors of several inverters may not be combined in a bus cable. For the motor supply leads only four core cables without the inclusion of the brake actuation is permissible.

  In principle this also applies to **MOVITRAC® 1008-231-**; for this type the max. motor feed cable distance is 100 m, for two parallel running motor feed cable distances 50 m (multi-motor operation).

- **Note** on the type series **MOVITRAC® 1000**:
  For inverters with output filters, i.e. **MOVITRAC® 1006-403/1015-403/1022-403, no wiring limitations exist.**

- **Jogging operation**:
  For this the commands of the terminals 41-43 are to be used. Switching the mains on and off to control the inverter should be avoided because it overloads the charging circuits and fuses on the input of the inverter. It is better practice to leave the inverter connected to the mains supply and use the direction and enable inputs (terminals 41, 42 and 43), to control the starting and stopping of the inverter.

- **Connecting to the mains:**
  Every MOVITRAC® 1000/1100 must be connected by its own mains contactor.
  The contactor rating depends on the phase input current of the inverters (refer to section 5).
  The contact rating selection is to be AC-3 (per IEC 158-1).
  Between the mains switch off and switch on again there should be a time lapse of 3 minutes or more, so as not to overload the input contactor unnecessarily. This does not apply to mains switch off and switch on again with fault reset.
  After switching on the mains to the inverter the self-test routine is to be observed. Within this time period (approx. 2.5 s) no actuation of the motor takes place.

2.2 Brake actuation

Apart from separate detailed operating instructions for the SEW brake system extensive instructions can also be found in the "Geared Motors" catalogue and in "Drive Engineering - Practical Implementation - Volume 4" of SEW:

The SEW brake system BM is a DC excited disc brake, that releases electro-magnetically and applies the brake by the force of springs.

A brake rectifier - standard type for frame sizes D63..DT100: BG; from frame size DV112: BGE - provides the brake with direct current. **It must have its own mains supply leads; taking a feed via the motor current supply is not permissible!**

Contacts of the MOVITRAC® 's output relay K2 "brake" must be connected in series with the other interlocking contacts of the installation, which control the auxiliary contactor K12 for brake actuation. **The relay K2 may not be used for direct switching of the brake coil power without the use of an auxiliary contactor!** The switching capacity of K2 is to be considered!

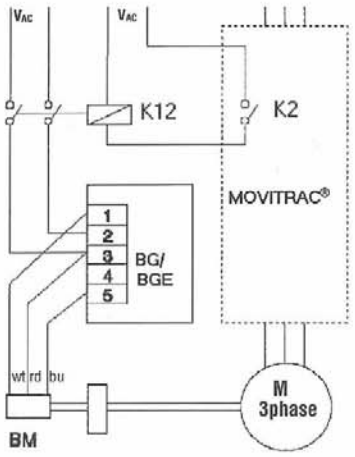
The switch off of the brake rectifier, which applies the brake, can be attained in two ways, by:

1. Switch off in the AC circuit — Brake reaction time: t1 = 20...60 ms (depending on the brake size)
2. Simultaneous switch off in the AC and DC circuits — Brake reaction time: t2 = 5...18 ms (depending on the brake size)

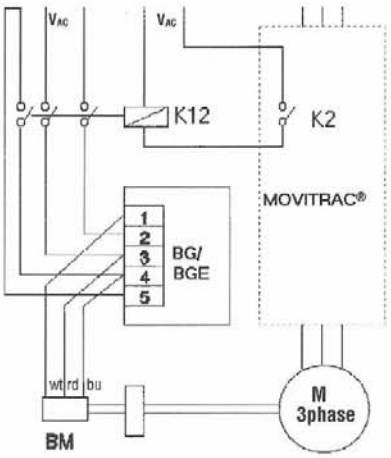
Note: On **hoists** the brakes must be applied with simultaneous switch off in the AC and DC circuits.

Basic circuit of AC squirrel-cage brake motors with brake rectifiers BGE

Switch off in the AC circuit



Simultaneous switch off in the AC and DC circuits



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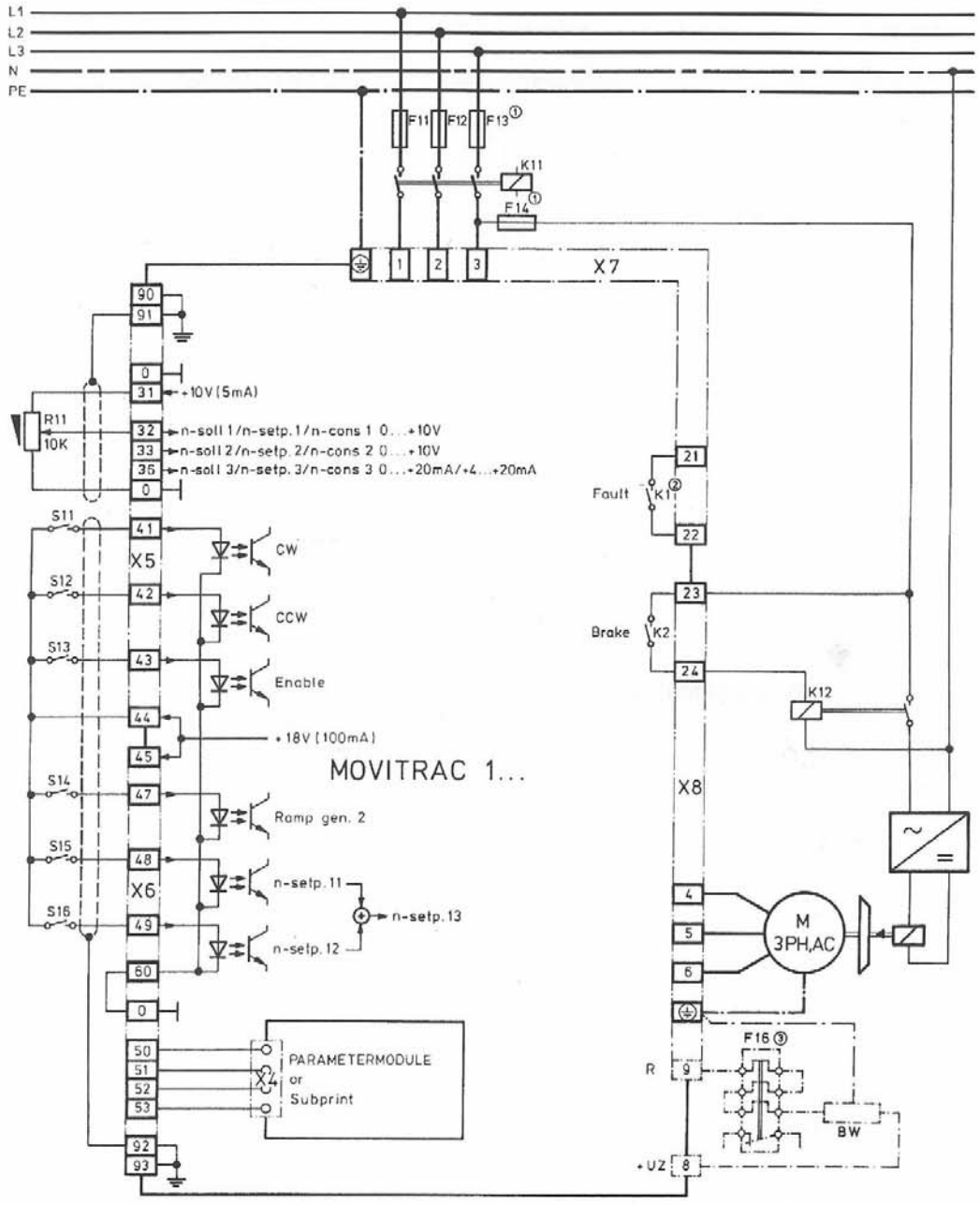
2.3 Electronic leads and signal generation

- Interference protected wiring is only possible with shielded leads (go-and-return leads in one shield, with the shield being connected only **at one end** to the inverter terminals 90 - 93).
- If **unshielded leads** are used, go-and-return lines must be intertwined and run in separate conduit channels from power-carrying and contactor control leads.
- Use enclosed, **dust-tight electronic relays**, that are suitable for the switching of low voltages (5 - 20 V) and currents (0.1 - 20 Ma).
- **OV leads** are, in principle, **not to be switched** for signal generation.
- External setpoints of max. 2 potentiometers are switched via the + 10 V voltage (terminal 31) (do not use the wiper lead wire itself)
- OV leads of several interconnected inverters are not to be linked from unit to unit, but are to be **wired in STAR connection.** That means:
  a) The inverters are not to be located in widely dispersed switchgear cubicle compartments but to be located in one or at least in adjacent compartments and
  b) The OV leads are to be connected by the shortest possible route, from one geometric central position, to the individual units with 1.5 mm^2 wire.

2.4 Wiring Diagram and function description of the terminals

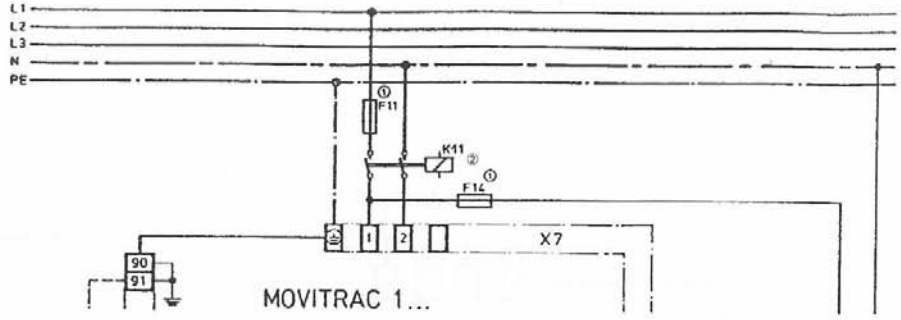
MOVITRAC® 1006-463-..., 1015-403-..., 1022-403



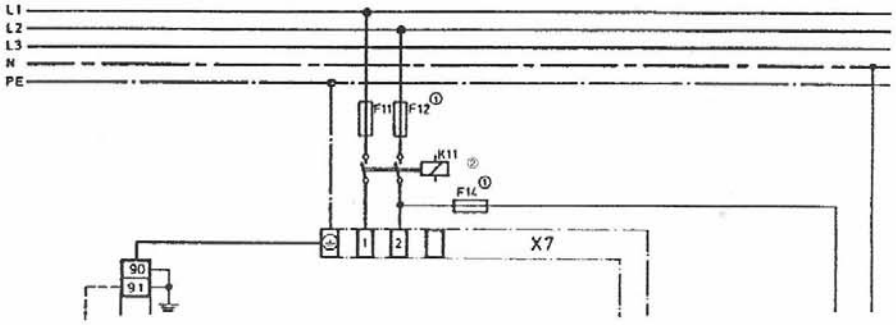
80 451 38 Sheet 1

① Fuses for conductor protection (compare section 2.1)
② Mains contactor must not bounce during switch on
③ Only with MOVITRAC® 1022-403-: F16 acts on K11

MOVITRAC® 1008-231-.-..
Mains voltage 3x400 V_{AC}



MOVITRAC® 1008-231-.-..
Mains voltage 3x230 V_{AC}



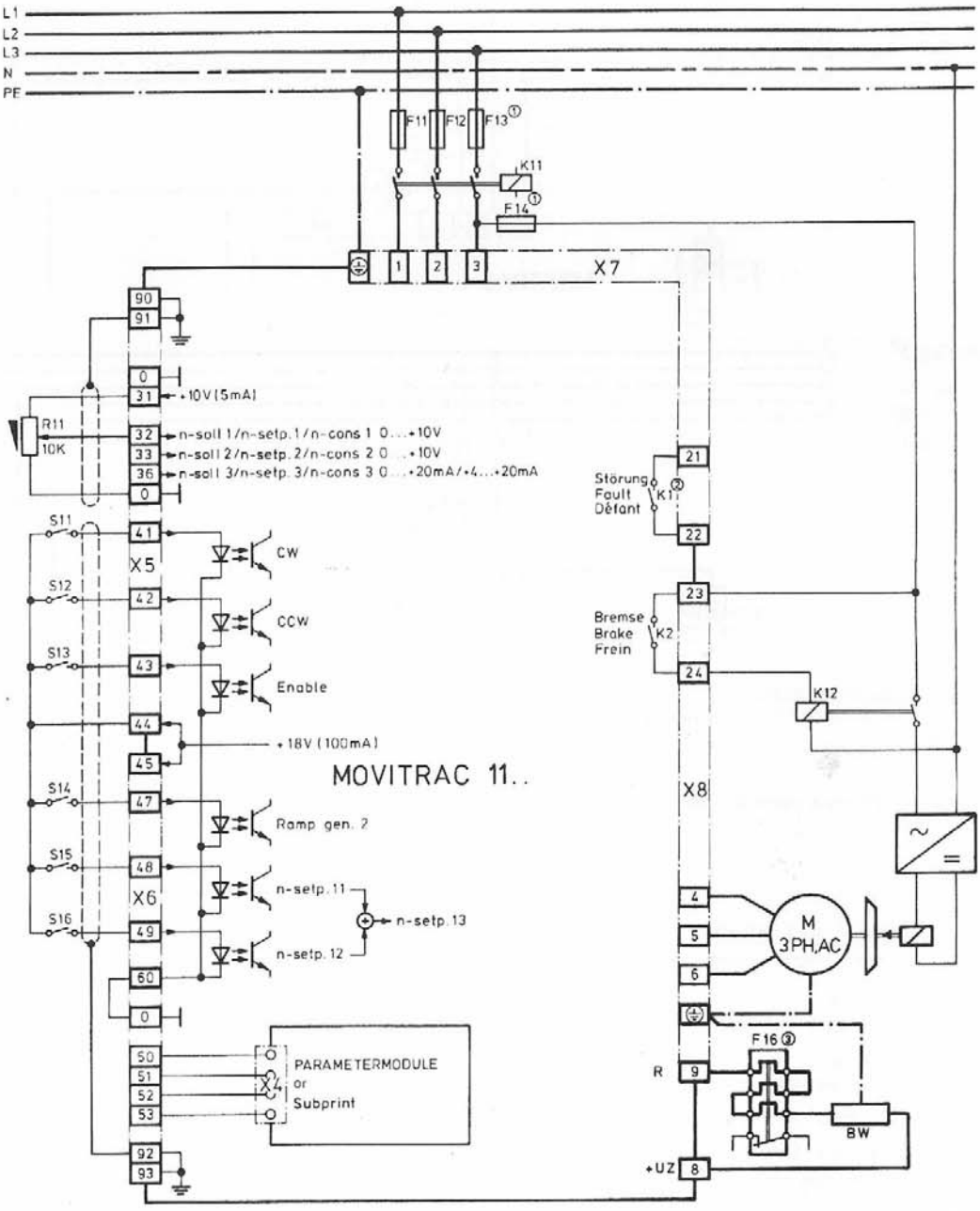
① Fuses for conductor protection
② Mains contactor must not bounce during switch on

80 451 18 Fig. 2

Terminal	Functions of inputs and outputs		
1/2/3	Mains connection	(on single phase inverters 1008-231: only terminals 1/2)	
4/5/6	Motor supply leads	(on MOVITRAC® 1008: max 100 m)	
21/22	Relay K1 opens upon fault signal.		
23/24	Relay K2 opens upon STOP/RAPID STOP/FAULT signal and $f_{outp} \leq 2$ Hz.		
31	+ 10 V for setpoint potentiometer (permissible 2 kOhm...10 kOhm)		
32	Input n_{setp} 1	0...+ 10 V	terminals 32/33/36 have a summing effect
33	Input n_{setp} 2	0...+ 10 V	
36	Input n_{setp} 3	0...20 mA / 4...20 mA	
41	S11 closed = CW DIRECTION [1]	S11 open = STOP	
42	S12 closed = CCW DIRECTION [1]	S12 open = STOP	
43	S13 closed = ENABLE [1]	S13 open = RAPID STOP	
44/45	+ 18 V; rating: 100 mA (as "1" signal for switches S11-16)		
47	S14 closed = t2 active [1]	S14 open = t1 active	
48	S15 closed = n_{setp} 11 active [1]	S15 open & S16 open	terminals 32/33/36 are effective
49	S16 closed = n_{setp} 12 active [1]		
48 + 49	S15+16 closed= n_{setp} 13 active		
60	Reference potential for terminals 41/42/43/47/48/49 (potential-free)		
0	0 V - reference potential (earthed)		
50-53	Optional terminals (in connection with optional PSA 11 p.c.b.)		
90-93	Terminals for shields of the control wiring		

[1] Instead of a switch (at terminal 44 = + 18 V) a 0/1 signal from a programmable controller may also be used:
"0" ≙ 3...+7 V "1" ≙ +13...+30 V

MOVITRAC® 1108-403-..., 1115-403-..., 1122-433-..., 1130-403-...



80 493 21

① Fuses for conductor protection (compare section 2.1)
② Mains contactor must not bounce during switch on
③ F16 acts on K11

Terminal	Functions of inputs and outputs		
1/2/3	Mains connection		
4/5/6	Motor supply leads	(MOVITRAC® 11..: max 50 m)	
8/9	Brake resistor supply leads	(only on MOVITRAC® 11.. 4Q inverters)	
21/22	Relay K1 opens upon fault signal.		
23/24	Relay K2 opens upon STOP/RAPID STOP/FAULT signal and $f_{outp} \leq 2$ Hz.		
31	+ 10 V for setpoint potentiometer (permissible 2 kOhm...10 kOhm)		
32	Input n_{setp} 1	0...+ 10 V	terminals 32/33/36 have a summing effect
33	Input n_{setp} 2	0...+ 10 V	
36	Input n_{setp} 3	0...20 mA / 4...20 mA	
41	S11 closed = CW DIRECTION [1]	S11 open = STOP	
42	S12 closed = CCW DIRECTION [1]	S12 open = STOP	
43	S13 closed = ENABLE [1]	S13 open = RAPID STOP	
44/45	+ 18 V; rating: 100 mA (as "1" signal for switches S11-16)		
47	S14 closed = t2 active [1]	S14 open = t1 active	
48	S15 closed = n_{setp} 11 active [1]	S15 open	terminals 32/33/36 are effective
49	S16 closed = n_{setp} 12 active [1]	& S16 open	
48 + 49	S15+16 closed= n_{setp} 13 active		
60	Reference potential for terminals 41/42/43/47/48/49 (potential-free)		
0	0 V - reference potential (earthed)		
50-53	Optional terminals (in connection with optional PSA 11 p.c.b.)		
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1) Instead of a switch (at terminal 44 = + 18 V) a 0/1 signal from a programmable controller may also be used:
"0" ≙ 3...+7 V "1" ≙ +13...+30 V

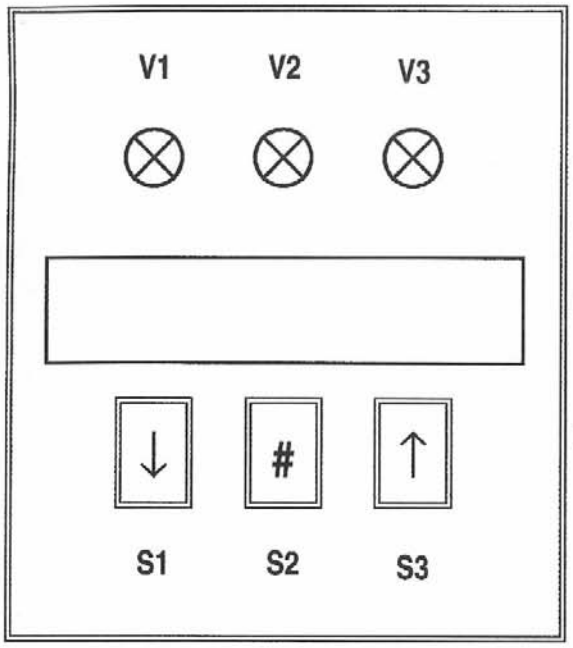
3.1 Safety Precautions

- Commissioning and servicing of the inverter may only be carried out by *qualified electrical personnel* conversant with accident prevention regulations.
- Before removing the plastic cover the inverter is to be disconnected from the mains. Dangerous voltages can still be present up to 5 minutes after switching off the mains.
- With the plastic cover removed the inverter has the enclosure IP 00. Only the front p.c.b. carries low voltage with the terminals strips X5/X6. The rear inverter section carries dangerous voltages.
- In the switched on condition dangerous voltages are present on the output terminals and on the connected cables and motor terminals. This is also the case, if the inverter is inhibited and the motor is at rest.
- The inoperation LED V1 and other display elements is not an indication that the inverter is disconnected from the mains and de-energised.

- The heat sink with prescribed use is not subject to manual contact, however, temperatures of up to 90 °C can be reached here during operation.
- Internal inverter safety functions or mechanical blocking can stop the motor. The removal of the fault can cause the drive to start on its own accord. If for reasons of safety, this is not permitted for the driven machine, then before the removing the fault the inverter must be disconnected from the mains.
- MOVITRAC® 1008-231-:
  The inverter output lead may not be switched after the inverter has been enabled. If a contactor disconnector between the inverter and motor is unavoidable due to plant specification, then the following interlocking switching sequence must be ensured:

Mains on:	1) contactor disconnector ON	2) K1 after $t_{delay} \geq 20$ ms ON
Mains off:	1) K1 OFF	2) contactor disconnector after $t_{delay} \geq 0.5$ ms OFF

3.2 Menu selection and using the push-buttons S1/S2/S3



LEDs

(refer to section 4.1)

Display

Push-buttons for menu selection

The menu items can be selected with the front plate push-buttons S1 / S2 / S3.

The hand operation of the inverter can also be actuated via the push-buttons without any external control unit.

With the arrow-headed push-buttons S1 [↓] and S3 [↑] it is possible to run through the menu in both directions. A single operation of a push-button moves the display further in the selected direction by one item; continuously pressing an arrowed push-button results in running through the menu with automatic stoppage at menu point P1.

The menu contains the following display types, that are shown on the LCD display:
- Parameter setting and indication ("#" left-hand top corner in the display),
- Display of measured values and commands,
- Fixed display.

The parameters are set in the following manner:
- Select the menu item with the arrow-headed push-buttons S1 [↓] or S3 [↑],
- then while continuously holding down the centre push-button S2 [#],
- press one of the push-buttons - S1 [↓] or S3 [↑] - until the desired parameter value appears on the display,
- then release the centre push-button S2 [#] and the selected value is automatically memorised.

Note:
All menu display items can be read in plain language on the 2x16 digit LCD display.
The contrast of the LCD display can be altered by means of the potentiometer DIS situated below.

3.3 Menu sequence

Menu item 19 = unassigned

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Menu sequence, Display and setting ranges of the parameters

Menu point	Menu Display	Display or setting range (***Works setting printed bold***)	Customer setting
[↓] [↑]	STANDSTILL NO RUN ENABLE		
P 1	FREQUENCY .... Hz CURRENT ...% In	2.0...127.5 Hz 0...150 % I_n	
P 2	# D,GB,F,I,P,S	***DEUTSCH***, ENGLISH, FRANCAIS, ITALIANO, PORTUGUES, SVENSKA	
P 3	# BOOST ... % ....Hz ...% In	0...***25***...100 %	

P 4	# CURRENT LIMIT
	Imax = ...% In
		75...***150*** % I_n	

P 5	# TYPE POINT SELECTION .... Hz	***50***/60/87/104 Hz	
P 6	# HIGH .... Hz LIMIT FREQUENCY	40...***60***...127.5 Hz	
P 7	# LOW .... Hz LIMIT FREQUENCY	***2***.0...25 Hz	
P 8	# RAMP GEN.1 RAMP UP ... s	0.2...***1***...5.0 s	
P 9	# RAMP GEN.1 RAMP DOWN ... s	0.2...***1***...5.0 s	
P 10	# RAMP GEN.2 UP/DOWN ... s	0.2..5.0/5..***10***..50/50..400 s	
P 11	# RAMP GEN. STOP RAMP DOWN ... s	0.2...***0.5***...1.0 s	
P 12	# SETPOINT 11 (48) .... Hz	***2.0***...127.5 Hz	
P 13	# SETPOINT 12 (49) .... Hz	***2.0***...127.5 Hz	
P 14	# SETPOINT 13 (48+49) .... Hz	***2.0***...127.5 Hz	
P 15	# SETPOINT 3 (36) ..-..mA	***0...20*** mA / 4...20 mA	
P 16	# SPEED MONITOR FUNCTION ...	***OFF*** / ON	
P 17	# CRANE/HOIST FUNCTION ...	***OFF*** / ON	
P 18	# STANDSTILL FUNCTION ...	***OFF*** / ON	
P 20	# ANALOG	***0*** = f_{setp} 1 = f_{mot} 2 = I_{mot} 3 = V_{mot} 4 = RAMP GEN.OUTP. 5 = TEMP. 6 = AVERAGE LOAD	
P 21	# PARAMETER BLOCKING ...	***OFF*** / ON	
P 22	# HISTORY t-	(Fault memory) ***0*** / 1 / 2 / 3 / 4	
P 23	# COPY FUNCTION	"DATA COPIED"	
P 24	# HAND OPERATION OFF	ON	
P 24a	DIRECTION CCW MENU CW		
P 24b	___% In ___Hz - STOP +		
P 25	FOR SERVICE CALL LOCAL REP.	-	
P 26	EPROM NUMBER	821 065 9. / 820 947 2. / 821 060 8.	
P 27	BRAKE CHOPPER INSTALLED ...	NO / YES	
P 28	MOTOR VOLTAGE ... V	0 V...V_{mains}	
P 29	DC LINK ... V	230..410 V / 400..700 V	
P 30	SUPPLY VOLTAGE ... V	160...265 V / 280...460 V	
P 31	HEAT SINK TEMP. ..DEG. C	-.. °C...+ 90 °C	
P 32	AVERAGE LOAD FACTOR ...% In	0 % I_n...109 % I_n	
P 33	47 48 49	0 / 1	
P 34	41 42 43	0 / 1	

3.4 Notes on the menu items (points) and on setting the parameters

P 1 FREQUENCY / MOTOR CURRENT

After switching on the inverter "SELF TEST" appears for a short duration on the display. Without any manipulation of the push-buttons S1/S2/S3 a status indication appears. In the enabled condition this is a measured actual frequency and motor current indication. With an inhibited inverter "NO ENABLE" appears on the display. When activating the P 18 = "ON" the display shows "STANDSTILL" if the setpoints $f_{setp} \leq f_{min}$ (refer to P 7) and the inverter stops (LED V3 = OFF).

P 2 D, GB, F, I, P, S

With these parameters the information on the display can be provided in the following languages:
D = German, GB = English, F = French, I = Italian, P = Portuguese or S = Swedish

P 3 BOOST

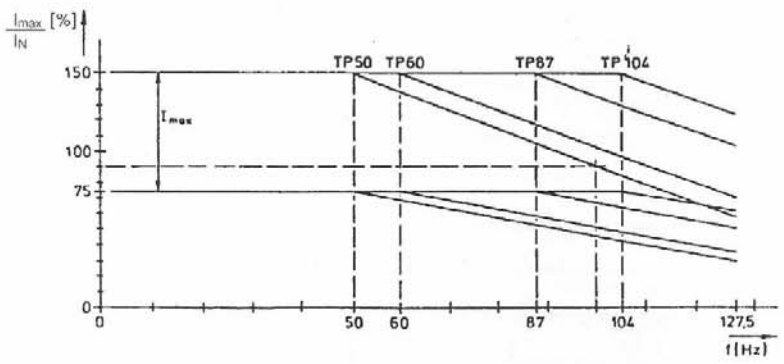
With BOOST a voltage increase is achieved. This adjustment alters the V/f relationship in the lower frequency range (refer to diagram under P 5).
The setting is used, to compensate the ohmic voltage drop in the motor windings and in the leads between the inverter and motor. Thus the BOOST setting provides sufficient excitation in the motor and therefore full torque development (important with low output frequency).
Note for operational setting:
The practical value for the BOOST setting is determined empirically during the running operation. That is why the operating frequency and the motor current are shown with this parameter in the second line. The setting is verified with the lowest operational frequency. The BOOST value is to be set in such a manner that the motor remains capable of torque at the lowest speed. It may only be set so high that the motor current does not become impermissibly great (heating, overexcitation, and consequential rough running). The BOOST range covers 0...100 %; which corresponds to 0...30 % of V_N.

P 4 CURRENT LIMIT

With the activation of the monitoring function **"SPEED MONITOR"** (P 16) the fault signal "SPEED MONITOR" occurs, should the inverter be operated for longer than 10s at the set I_{max} value. Due to the danger of torque pull-out in the field weakening range above the base frequency (f_{base} or Type Point) the current limit is automatically reduced.
Note: If small motors in relationship to the inverter power are operated far into the field weakening range, the setting of the current limit must be reduced, to avoid a torque pull-out of the motor.

Current limit curves for the various selectable V/f characteristics (TP50, TP60, TP87, TP104) with the setting range of the I_{max} parameter shown:

TP = Type Point
= base frequency



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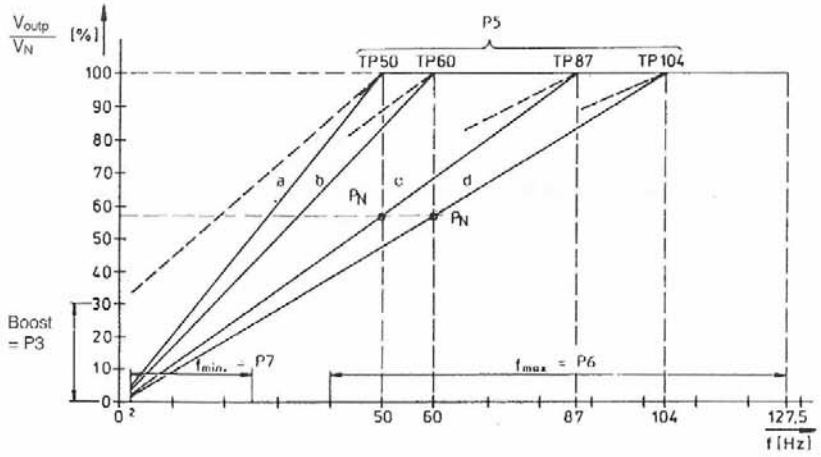
P 5 TYPE POINT (base frequency)

The TYPE POINT (base frequency) can only be changed with the inverter inhibited. The characteristic curves of the maximum BOOST setting end in each case at the Type Point, i.e. TP50, TP60, TP87 or TP104.

Voltage/frequency characteristics depicting the setting ranges of the parameters f_{min}, f_{max} and BOOST:

TP = TYPE POINT
= base frequency

P_N = operating point with rated power properties



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Notes on use for MOVITRAC® 1...-231-

Curve	Motor data	Notes	
a	230 V/50 Hz	Motor 230/400 V in DELTA	
b	230 V/60 Hz 230 V/50 Hz	Motor 230/400 V in DELTA Motor runs with 83 % M_N and n_{max} = 120% n_N	
c	132 V/50 Hz	DELTA (motor 132/230 V)	rising power above P_N
d	132 V/60 Hz 132 V/50 Hz	DELTA (motor 132/230 V) Motor runs with 83% M_N and n_{max} = 200% n_N	rising power above P_N

Notes on use for MOVITRAC® 1...-403-

Curve	Motor data	Notes	
a	400 V/50 Hz	STAR if motor 230/400 V;	DELTA if motor 400/693 V
b	400 V/60 Hz 400 V/50 Hz	STAR if motor 230/400 V; Motor runs with 83 % M_N and n_{max} = 120% n_N	DELTA if motor 400/693 V
c	230 V/50 Hz	DELTA (motor 230/400 V)	rising power above P_N
d	230 V/60 Hz 230 V/50 Hz	DELTA (motor 230/400 V) Motor runs with 83 % M_N and n_{max} = 200% n_N	rising power above P_N

P 6 HIGH LIMIT FREQUENCY FMAX

With the selection of f_{max} (range 40...127.5 Hz) the upper limit of the operating range is fixed. Thereby the full setpoint (+ 10 V at terminal 32 or 33 resp. 20 mA at terminal 36) is assigned to the selected f_{max}. The setting increments are Δf = 0.5 Hz.

P 7 LOW LIMIT FREQUENCY FMIN

With the selection of f_{min} (range 2...25 Hz) the lower limit of the operating range is fixed. The inverter operates in the enabled condition with f_{min}, as long as the setpoint remains smaller or equal to f_{min}/f_{max} x 10 V (resp. 20 mA) at the terminal 32 and/or 33 and/or 36. The setting increments are $\Delta f = 0.5$ Hz.

P 8 RAMP GENERATOR 1 RAMP UP
P 9 RAMP GENERATOR 1 RAMP DOWN

The ramp generator is activated if terminal 47 = "0". With this ramp generator acceleration (UP) and deceleration (DOWN) can separately be set via P 8 or P 9 in the range 0.2...5.0 s. **The ramp generator time is related to a frequency change of $\Delta f = 50$ Hz.** The appropriate time setting for the application is determined from the inertia to be accelerated and the counter torque of the driven machine. Values set too low in relationship to the possible deceleration/acceleration time (< 0.5 s) can trigger fault signals:

- for "RAMP-UP" fault "OVER-CURRENT" or fault "FINAL STAGE"
- for "RAMP-DOWN" fault "DC LINK", "FINAL STAGE" or "OVER-CURRENT"

P 10 RAMP GENERATOR 2 UP/DOWN

The ramp generator is activated if terminal 47 = "1". In this case the ramp times for UP and DOWN are identical, i.e. symmetrical, settable in the range 0.2...400 s. Otherwise the mode of operation corresponds to the parameters of P 8 / P 9. The setting increments are related to the selected range:

- for the range 0.2...5.0 s $\Delta t = 0.1$ s
- for the range 5 ...50 s $\Delta t = 1$ s
- for the range 50 ...400 s $\Delta t = 2$ s

P 11 RAMP GENERATOR STOP

With this setting the ramp time for the RAPID STOP command is fixed (terminal 43 = "0" - removal of the enable command). The time may only be reduced to the point that no fault signals occur. ("FINAL STAGE", "OVERCURRENT" or "DC LINK").

P 12/P 13/P 14 SETPOINTS 11/12/13

With these parameters random internal fixed setpoints in the range 2....127.5 Hz can be set, that can be called up via the terminals 48 for setpoint 11, 49 for setpoint 12, or 48 + 49 for setpoint 13. When activating the terminals 48 and/or 49 the external setpoints at the terminals 32, 33 and 36 are overridden.
The values of the setpoints 11/ 12/ 13 are to lie within f_{min} (P 7) and f_{max} (P 6). If one considers f_{min} and f_{max} as two further fixed setpoints, then in total there are 5 fixed setpoints.

P 15 SETPOINT 3

For the external setpoint 3 at terminal 36 a choice is available between current input signal types 0...20 mA and 4...20 mA ("zero live"). This serves as an alternative to the voltage signal 0...10 V (setpoints 1 and 2). The setpoints 1, 2 and 3 add together up to the maximum overall setpoint of 100%. All three setpoints provide external control of the speed between f_{min} and f_{max}.

P 16 SPEED MONITOR

With activated monitoring function "SPEED MONITOR" the fault signal "SPEED MONITOR" occurs, if the inverter is operated for over 10 s at the set I_{max} value.

P 17 CRANE/HOIST

On hoisting equipment **without counterweights** this parameter is to be set "ON". Thereby certain monitoring functions are activated:

Fault::	"START CONDITIONS" and "OUTPUT OPEN"	(see section 4.3)
Fault : (also if P 16 = "ON"):	"MOTOR PULLED OUT"	(see section 4.3)

With the "CRANE/HOIST" FUNCTION the **BOOST** (P 3) is set **automatically with each enable.** To avoid fault functions (e.g. sagging down during low speed), it should also not be altered within an operating phase (between the enables). If the "CRANE/HOIST" function is switched off, then the BOOST value of the "CRANE/HOIST" function is not memorised when the mains are switched off. When switching on the mains again, the BOOST value that was active before the "CRANE/HOIST" function was switched on becomes effective.

Notes on hoisting equipment::
For hoisting equipment it is absolutely necessary to assign CLOCKWISE (terminal 41 = "1") to the hoisting motion "UP" (motor driving mode).
A correctly selected hoisting unit in accordance with SEW selection procedures incorporates the following features:

- A 50 Hz motor is operated with f_{base} = 50 Hz and f_{max} = 70 Hz with reference to v_{max}. The gear ratio is to take this into account.
- A 60 Hz motor is operated with f_{base} = 60 Hz and f_{max} = 90 Hz with reference to v_{max}.
- The motor is to be selected one size rating higher than the necessary hoisting power required. The inverter, however, is selected according to the required hoisting power.
- The variable speed range is to be limited to ≤ 10:1, i.e. the lowest operating setpoint is not to be lower than 7 Hz (P 7 = 7 Hz).
- The ramp generator time (P 8 or P 10) is to be set to ≤ 3 s.
- The "CRANE/HOIST" setting effects a starting preparation time of approx. 200 ms.
- The motor leads are to have sufficient cross-section so as to limit the resistive voltage drop (refer to section 2.1 as well as → 113 FAULT "START-CONDITIONS").

P 18 STANDSTILL

If this function is set "ON", then the inverter with the setpoints

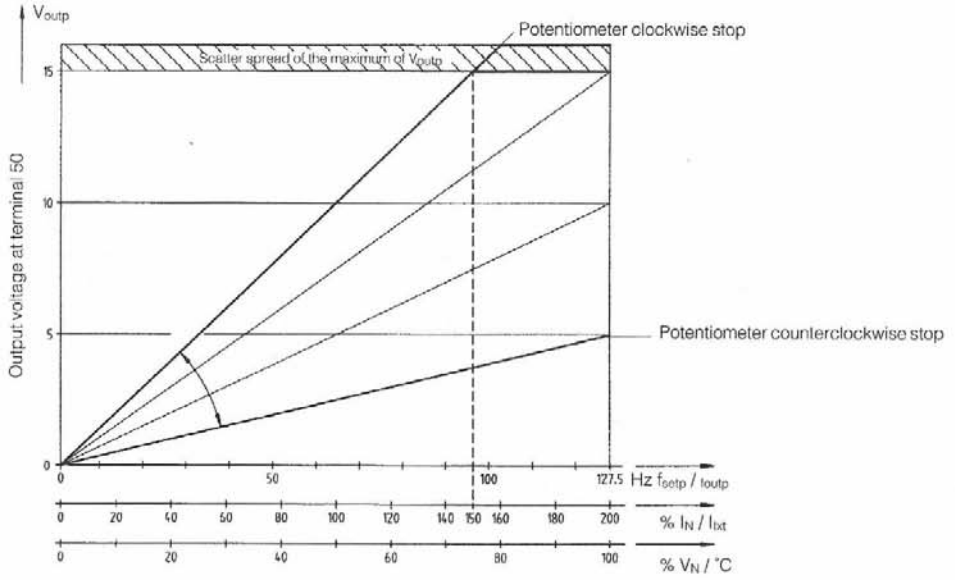
- $f \geq 2$ Hz + f_{min} is enabled (output relay K 2 is energised);
- $f \leq f_{min}$ is inhibited (output relay K 2 is de-energised) and STANDSTILL appears on the display. With the setting "OFF" the inverter would continue to operate at f_{min}.

P 20 ANALOG

With the use of the option PSA 11 p.c.b. (mounted in the inverter in place of the standard parameter module) an output signal of 0...15 V is provided for display purposes at terminal 50 (load rating 10 mA). The type of signal can be determined via P 20 :

P20 Value	Type of signal at terminal 50	
0	FREQUENCY SETPOINT	f_{setp} (in front of the ramp generator)
1	MOTOR FREQUENCY	f_{outp}
2	MOTOR CURRENT	I_{mot}
3	MOTOR VOLTAGE	V_{mot}
4	RAMP GENERATOR OUTPUT	f_{setp} (behind the ramp generator)
5	TEMPERATURE	Heat sink temperature ϑ
6	AVERAGE LOAD	Ixt

The level of the output voltage can be set at the potentiometer V50 per the following diagram:



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The sampling of the output signal is approx. 8 ms, i.e. this signal is suitable for recording purposes (x/t diagram). The potentiometer V 51 is for use in combination with special EPROMs.

Caution: The optional PSA 11 p.c.b. may not be plugged in while the inverter is under power.

P 21 PARAMETER BLOCKING

If the value is set to "ON", then in this condition no parameter can be altered (useful after commissioning has been completed).

P 22 HISTORY t-0

The fault memory stores the last 5 fault signals. For the last fault (t-0) the measured values of P 3 and P 28 to P 34 are stored, as long as the inverter remains switched on to the mains.

P 23 COPY FUNCTION

The copy function makes it possible to copy the entire set of parameters (P 2...P 21) via push-button command on to a new parameter module. This is brought about by pressing the centre push-button **as well as** either the left-hand or the right-hand arrow-headed push-button. The same procedure can also be used for clearing the fault memory (P 22) of the installed parameter module.
The copying on to a second parameter module is carried out by withdrawing the module from the switched on, but inhibited, inverter and plugging in another parameter module.
This copying procedure is carried out as per the above mentioned push-button command and can be repeated as often as required with new parameter modules.

Note: The optional PSA 11 p.c.b., however, may not be plugged in while the inverter is under power!

Caution: Work with the inverter opened may only be carried out by **qualified electrical personnel!**

P 24 HAND OPERATION

The inverter can be controlled manually by operating the three push-buttons, i.e. without external commands from the control unit (terminals 32...49). For this purpose with the **inverter inhibited** in the menu P 24 "HAND OPERATION" the centre push-button [#] **as well as** an arrow-head push-button [↑] or [↓] is pressed.
The display changes to the menu depiction **P 24a**:

P 24a		Effect	
Left-hand arrow-head push-button S1	[↓]	Selects the rotational direction COUNTERCLOCKWISE	
Right-hand arrow-head push-button S3	[↑]	Selects the rotational direction CLOCKWISE	
Centre push-button S2	[#]	Returns back to the main menu	Display changes back to P 24

After selecting a direction the enable of the hand operation becomes effective.
The display changes to the menu depiction **P 24b**:

P 24b		Effect	
Left-hand arrow-head push-button S1	[↓]	Speed setpoint reduction n_{setp}	Ramp generator time: • using the push-buttons as "motorised potentiometers": t = 10s for Δf = 50 Hz • otherwise ramp generator 1 resp. 2
Right-hand arrow-head push-button S3	[↑]	Speed setpoint increase n_{setp}	
Centre push-button S2	[#]	Stop command (ramp generator 1 or 2);	Display changes back to P 24a

In the status "HAND OPERATION" it is not possible to adjust the parameters P 2...P 21.
Possible existing external setpoints are ineffective during the hand operation, likewise the input commands at the terminals 48 and 49.
The ramp generators 1 and 2 are selectable.

Caution: The frequency setpoint set in the menu P 24b is memorised when the mains is switched off in the status "HAND OPERATION".

Note: With a "1" signal (enable) at terminals 43 optionally at 41 or 42 the status "HAND OPERATION" can be locked, i.e., from P 24a it is not possible to jump back into the main menu. The hand operation can only be switched off by removing the enable signal. This can be useful when commissioning machines, in order to block any external control commands or parameter changes.

P 25 SEW-SERVICE

SEW Service Centre reference in the language selected per P 2.

P 26 EPROM IDENTIFICATION NUMBER

MOVITRAC® 10..**-231-** 821 065 9. --
MOVITRAC® 10..**-403-** 821 060 8. --
MOVITRAC® 11..**-403-** 821 167 1. --
-- = Version numbers; higher versions are compatible with the lower

P 27 BRAKE CHOPPER

This display indicates whether the inverter is equipped for 4Q operation:
on MOVITRAC® 1008-231-4-../1006-403-4.../1015-403-4-..: with incorporated brake chopper and brake resistor
on MOVITRAC® 1022-403-4-../ all MOVITRAC® 11.. -403-4-..: with incorporated brake chopper; additional external brake resistors (refer to section 8).

P 28 MOTOR VOLTAGE

The actual output voltage is indicated (refer also to output signal at terminal 50 when using optional PSA 11 p.c.b., when P 20 = "MOTOR VOLTAGE").

P 29 DC LINK voltage

The actual DC link voltage is indicated. The possible display values are:

Type	V_N	approx. DC link voltage value at			
		V_N -30%	V_N	VN +15%	Regeneration
MOVITRAC® 1...-231-	230 V	225 V_{DC}	325 V_{DC}	375 V_{DC}	410 V_{DC}
MOVITRAC® 1...-403-	400 V	395 V_{DC}	565 V_{DC}	650 V_{DC}	700 V_{DC}

P 30 SUPPLY VOLTAGE

The actual supply voltage between two terminals is indicated.

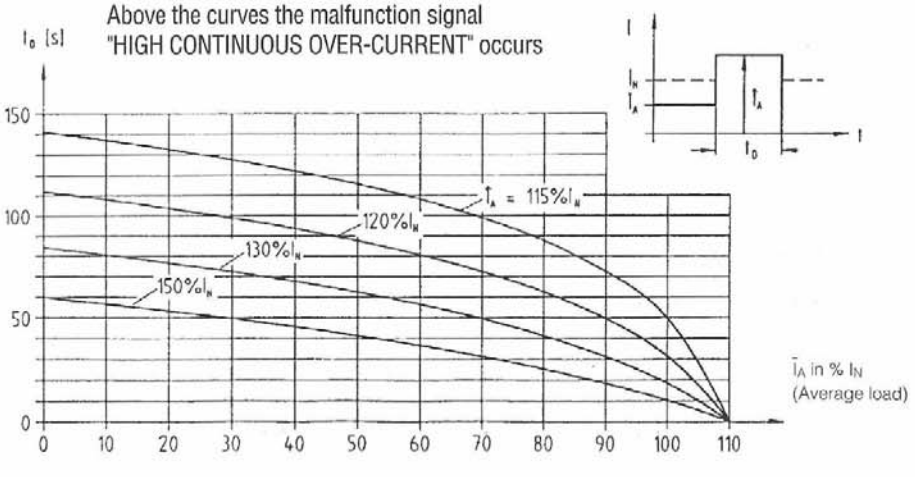
Type	V_N	Possible mains voltage range
MOVITRAC® 1...-231-	230 V	160...265 V_{AC}
MOVITRAC® 1...-403-	400 V	280...460 V_{AC}

P 31 HEAT SINK

The actual temperature of the inverter heat sink is indicated.
At the value $\vartheta \geq 90$ °C (for MOVITRAC® 1008-231-.-.. at $\vartheta \geq 75$ °C) the "OVER-TEMPERATURE" fault is triggered, the inverter blocks and the output relays K 1 + K 2 are de-energised (refer also to the output signal at terminal 50 when using the optional PSA 11 p.c.b., when P 20 = "TEMPERATURE").
If the inverter in the blocked state is enabled, with a heat sink temperature of $\vartheta \geq 88$ °C (for MOVITRAC® 1008-231-.-.. at $\vartheta \geq 70$ °C) then it remains blocked and the "START-TEMPERATURE" fault is triggered:
Note: The accuracy of the measured values is sufficient for the monitoring temperature (70...90C), however, in the lower range (-10...+20 °C) deviations of approx. 15 K are possible.

P 32 AVERAGE LOAD FACTOR (utilisation)

The average load factor (refer also to the output signal at terminal 50 with the use of the option PSA 11 p.c.b., when P 20 = "AVERAGE LOAD") shows the present average load of the inverter. Indications above 100% designate overload.



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P 33 / P 34

The binary command condition of the terminals 41/42/43 resp. 47/48/49 is indicated:
"0" = low, terminal is open
"1" = high, terminal is activated

4.1 Indication functions of the LEDs (light-emitting diodes)

The inverter is provided with three LEDs and an LCD display.

The LEDs signal the following operating conditions:

LED V1 (green):

ON = The basic prerequisite for service readiness, i.e. mains voltage at terminals 1/2/3 switched on and within the permissible limits.

OFF =
- The inverter not switched on from the mains side or
- The input fuses F1/F2/F3 (power section) blown.

LED V2 (red):

OFF = The basic prerequisite for service readiness,
(signal relay "Fault" K 1 energised, i.e. contact closed).

ON = Inverter electronically inhibited due to a fault
(For detail information refer to section 4.2.)

RESET: A fault signal is cancelled by switching the mains off and - after the display has gone off - switching on again.

LED V3 (green):

ON = Inverter in operation, i.e. rotating field running. The motor connected to the MOVITRAC® is receiving frequency and voltage (available frequency and output current can be read on the display).

OFF = The inverter is ready for service, however, electronically inhibited due
- to the absence of an enable signal at the terminals 41/42/43 (verifiable at the display: depress the push-button S3 [↑] once) or
- a fault, i.e. LED V2 (red) = ON or
- too low setpoint at "STANDSTILL" = "ON".

4.2 Fault Information

The safety precautions (section 3.1) must also be observed when searching for faults!

With a fault the display automatically switches from the operating indication to one of the possible **fault indications** shown alongside. The switching to the various operational information indications is still possible by the push-buttons S1 and S3.

101	FAULT FINAL STAGE
102	FAULT OVER-CURRENT
103	FAULT HIGH CONT. OVER-CURRENT
104	FAULT LOW LINE VOLTAGE
105	FAULT OPEN-PHASE
106	FAULT HIGH LINE VOLTAGE
107	FAULT DC LINK
108	FAULT OVER-TEMPERATURE
109	FAULT START-TEMPERATURE
110	FAULT SPEED MONITORING
111	FAULT BRAKE-CHOPPER
112	FAULT OUTPUT OPEN
113	FAULT START-CONDITION
114	FAULT MOTOR PULLED OUT
115	FAULT PARAMETER MODULE
116	FAULT WATCHDOG-TIMER
117	FAULT INTERNAL NO.1

For the last fault indication all the measured information values are frozen at the time of the fault, as long as the inverter remains connected to the mains. This applies to the indications P 1 and P 28... P 34. These measured information values can be called up via the push-buttons S1 [↓] and S3 [↑].

After a fault recognition the inverter blocks, i.e.
- it sets the output voltage V_{outp} = "0",
- the two output relays - "fault" K1 and "brake" K2 – are de-energised.

If the fault already exists when switching on, then relay K1 is briefly energised within the self-test time (approx. 2.5 s) and after the fault is recognised the contact opens again within the self-test time.

After switching on, **no indication on display and LEDs**:
1) The DC link is charged.
   Switch the inverter off, after 3 minutes on again.
2) If the measure 1) does not help then the inverter is defective.

RESET:
A fault signal is cancelled by switching the mains off and - after the display has gone off - switching the inverter on again.

Notes on **RESET**:
The HISTORY (P 22) memorises each new fault signal and at the sametime deletes the respective oldest memorised fault.
If the last fault reoccurs again and again, then with repeated shut downs and switching on again, all five history memory positions are taken up by this fault signal.

Notes on evaluation of the fault memory:
If, with a persistent fault or a defect, the previous memory content is to be preserved, then the following procedure is recommended:
1) Disconnect the motor or dismount the inverter
2) Remove the parameter module
3) Plug in a spare parameter module
4) Switch on the inverter,
5) Plug in the old parameter module and interrogate the HISTORY (P 22).

This procedure is not permissible for the optional PSA 11 p.c.b (PSA 11 p.c.b may not be plugged under power)!

When a problem may not be solved please address to your SEW-Service (see the attached list "Service and Spare parts).

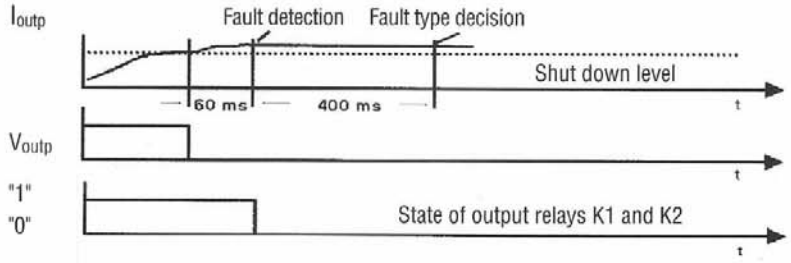
When you will return the unit for repair please inform the service about the following:

- Kind of fault
- Special circumstances for the unit when the failure occured
- Your suggestions about the reason of the fault
- Unusual events before the fault occured

4.3 Notes on the fault indications

101 FAULT FINAL STAGE

The output current exceeds the internal switch off level. Despite immediate blocking of the output (0 V) the current is, after a further interrogation time (400 ms), still above the switch off level (hardware shutdown).

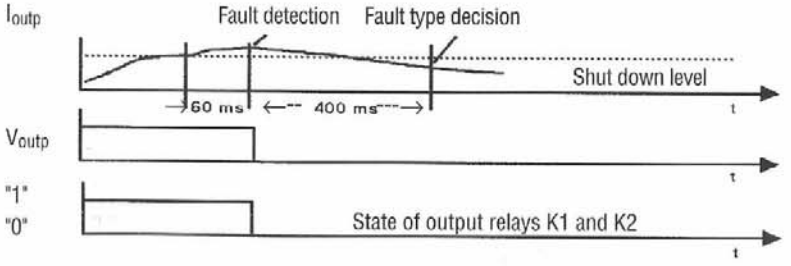


Causes:

- Phase-to-phase short circuit
  (Test the inverter without the motor cables connected)
- Earth fault/ground fault (= short circuit phase-to-earth "PE")
- Blocked motor (e.g. due to applied brake from high speed)
- Switching a motor into the circuit of an enabled inverter
- Incorrect setting of the base frequency/TYPE POINT (P5) or wrong motor connection (STAR or DELTA) or incorrect motor voltage (compare parameter P5)
- Inverter settings not optimised (P3/P8...P11)
- Inverter internal defect (inverter short circuit or internal logic voltage < 15 V)
- Ramp generator time too short in relation to possible deceleration/acceleration time.

102 FAULT OVER-CURRENT

The output current exceeds the internal switch off level. After blocking the output (0 V; 1:1 switching) the current dropped below the level within a further interrogation time (400 ms), that was relevant for the switch off (software shutdown).



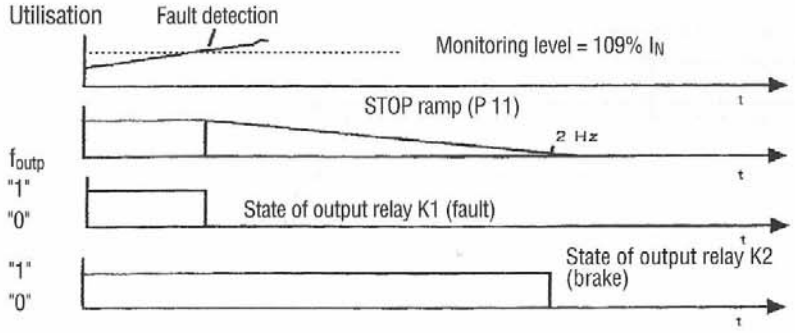
Causes:

- Blocked motor (e.g. due to applied brake from high speed)
- Incorrect setting of the TYPE POINT (P5) or wrong motor connection (STAR or DELTA) or incorrect motor voltage (compare parameter P5)
- Inverter settings not optimised (P3/P8...P11)
- Inverter internal defect (internal logic voltage (< 15 V)
- Ramp generator time too short in relation to possible deceleration/acceleration time.

103 FAULT HIGH CONTINUOUS OVER-CURRENT

The inverter utilisation has exceeded the value 109%.
(To verify, refer to memorised value of P 32).
This fault cannot occur, if the setting of P 4 → $I_{max} \leq 108\%$.

The functioning of the inverter after fault detection:



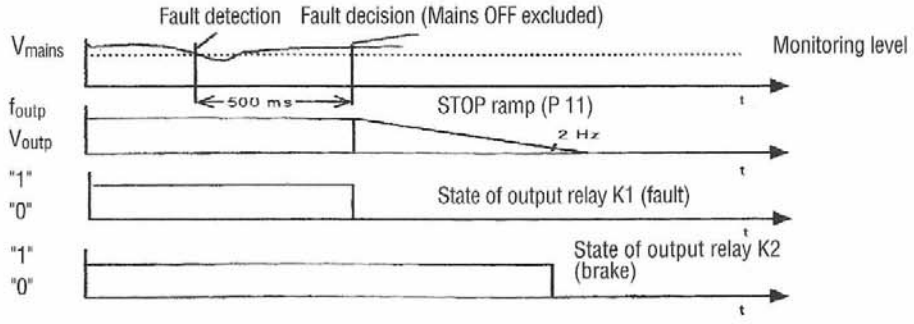
Causes:

- Motor was overloaded (refer to diagram of parameter P 32)
- BOOST (P 3) set too high.
  Result: Motor draws I = 150% I_N and does not run higher than 6 Hz
- BOOST (P 3) set too low and motor was subjected to torque pull-out due to overload (particularly in the lower speed range)
  Result: Motor draws high current even without full load.

104 FAULT LOW LINE VOLTAGE

- The r.m.s. value of the mains voltage has fallen below this monitoring level:
- on MOVITRAC® 1...-231: $V_{mains} \leq 140\ V_{AC}$
- on MOVITRAC® 1...-403: $V_{mains} \leq 270\ V_{AC}$

The functioning of the inverter after fault detection:



Causes:

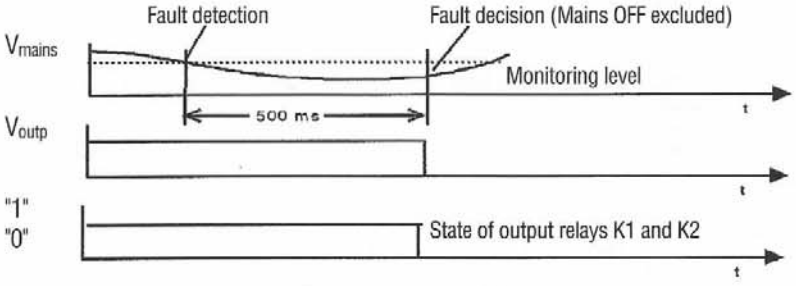
- Mains with large load fluctuations (e.g. long mains leads, to which large consumers are additionally being switched in)
- The inverter is connected to the wrong mains voltage
- Mains voltage interruption, duration 0.5...1.5 s (e.g. also impermissible jogging of the inverter via the mains contactor).
- Internal inverter defect (internal measured-value acquisition).

105 FAULT OPEN-PHASE

The instantaneous value of the mains voltage has fallen below the monitoring level:

- on MOVITRAC® 1...-403: $V_{mains} \leq 340\ V_{AC}$
- on MOVITRAC® 1008-231 (single phase connection) this fault cannot occur.

The functioning of the inverter after fault detection:



Causes:

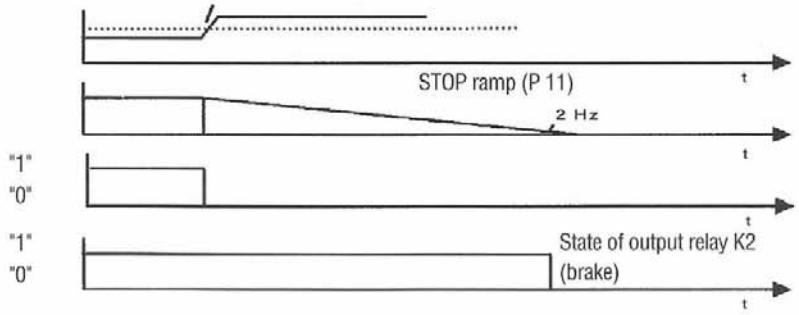
- Broken wire or loose contact of a supply phase
- Fuse blown in a phase (back-up fuse or within the inverter)
- Burnt or fouled switch contacts of the input contactor
- Impermissible jogging of the mains contactor
- Internal inverter defect.

106 FAULT HIGH LINE VOLTAGE

The supply voltage has exceeded the following monitoring level:

- on MOVITRAC® 1...-231: $V_{mains} \geq 275\ V_{AC}$
- on MOVITRAC® 1...-403: $V_{mains} \geq 480\ V_{AC}$

The functioning of the inverter after fault detection:



Causes:

- The inverter is connected to the wrong mains voltage
- Mains has transient overvoltage (e.g. reactive effects from P.F. correction equipment)
- Internal inverter defect.

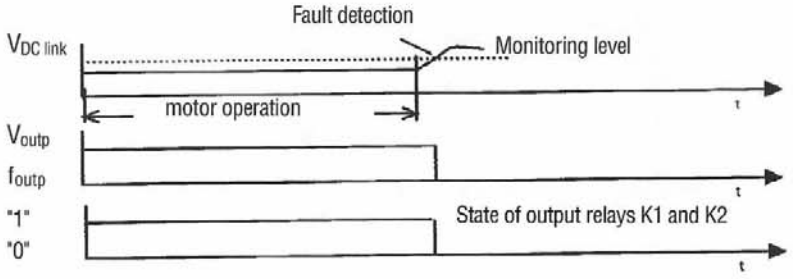
107 FAULT DC LINK

The DC link voltage ($V_{DC\ link}$) has exceeded the following monitoring level:

- on MOVITRAC® 1...-231-1- $V_{DC\ link} \geq 455\ V_{DC}$
- on MOVITRAC® 1...-403-1- $V_{DC\ link} \geq 820\ V_{DC}$

Note: On inverters with brake choppers the fault signal FAULT BRAKE CHOPPER is produced before attaining the monitoring level, i.e. inverters with brake choppers the "FAULT DC LINK" cannot occur.

The functioning of the inverter after fault detection:



Causes:

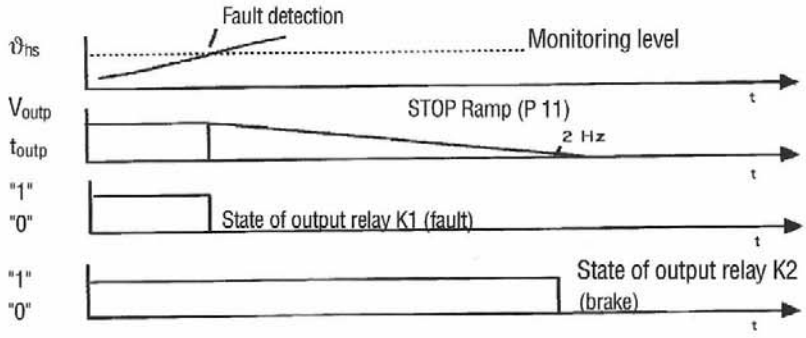
- Inverters without brake choppers: Ramp generator times P 9 resp. P 10 set too short
- Internal inverter defect.

108 FAULT OVER-TEMPERATURE

During operation the temperature of the heat sink (hs) has exceeded the following monitoring level:

- on MOVITRAC® 1008 $\vartheta_{hs} \geq 75\ °C$
- on MOVITRAC® 1... $\vartheta_{hs} \geq 90\ °C$

The functioning of the inverter after fault detection:



Causes:

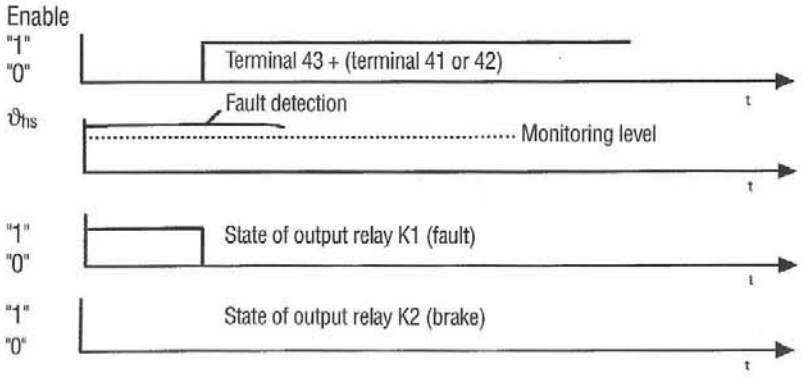
- The switch cabinet has insufficient cooling (Check filter mats, fan of the switch cabinet)
- Inverter is not installed according to SEW installation stipulation (check necessary free space above/below and on the sides)
- Inverter loaded with too much braking power (refer to technical data)
- With ambient temperature > 45 °C the necessary output power reduction was not considered.

109 FAULT START TEMPERATURE

The temperature of the heat sink at the time of the enabled inverter (terminal 43 = "1" and terminal 41 or 42 = "1") is above the following monitoring level

- on MOVITRAC® 1008 $\vartheta_{hs} \geq 70$ °C
- on MOVITRAC® 1... $\vartheta_{hs} \geq 88$ °C

The functioning of the inverter after fault detection:



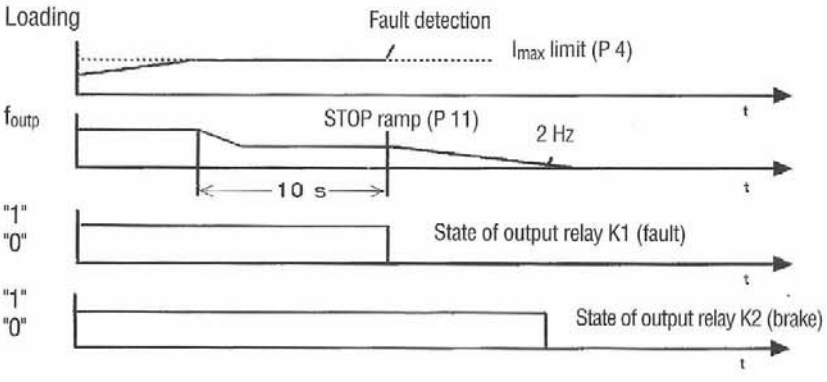
Causes:

- The switch cabinet has insufficient cooling (Check filter mats, fan of the switch cabinet)
- The inverter has, due to self-heating (under load), come close to the temperature switch off limit (fault 108).

110 FAULT SPEED MONITORING

The function "FAULT SPEED MONITORING" (P 16) has been activated in the inverter. Due to drive overloading the inverter reaches the current limit, so that under circumstances the output frequency (speed) is reduced ($n_{actual} < n_{setpoint}$). If this condition continues for at least 10 s, then a fault signal is given.

The functioning of the inverter after fault detection:



Causes:

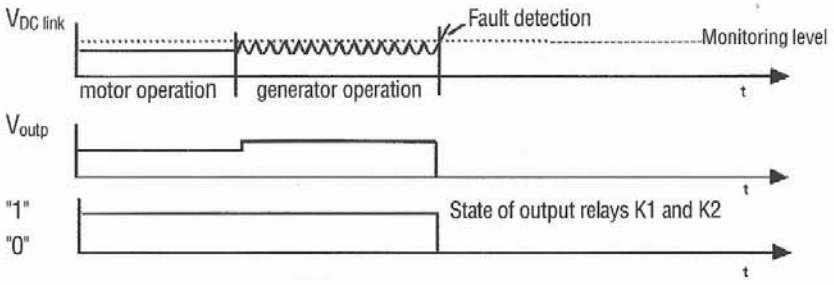
- Drive is overloaded (during running operation or heavy starting)
- BOOST is set too high
  Result: Motor draws I = 150% resp. the value P 4 and does not run beyond 6 Hz
- BOOST is set too low and motor was subjected to torque pull-out due to overload (particularly in the lower speed range)
  Result: Motor draws high current even without full load.
  (Check storage value of P 1: MOTOR CURRENT value)

111 FAULT BRAKE CHOPPER

On inverters with brake choppers: The DC link voltage ($V_{DC\ link}$) has exceeded the following monitoring level:

- on MOVITRAC® 1...-231-4- $V_{DC\ link} \geq 455\ V_{DC}$
- on MOVITRAC® 1...-403-4- $V_{DC\ link} \geq 820\ V_{DC}$

The functioning of the inverter after fault detection:



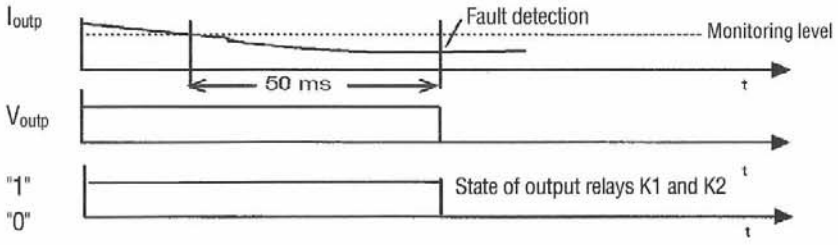
Causes:

- Internal inverter defect, i.e.: defective brake chopper fuses due to overloading of the brake chopper or breakdown of the brake chopper transistor or faulty internal measured-value acquisition of the mains or DC link voltage

112 FAULT OUTPUT OPEN

On the inverter the function P 17 "CRANE/HOIST ON" has been activated. The output current drops below the lower monitoring level for a time period of at least 50 ms.

The functioning of the inverter after fault detection:

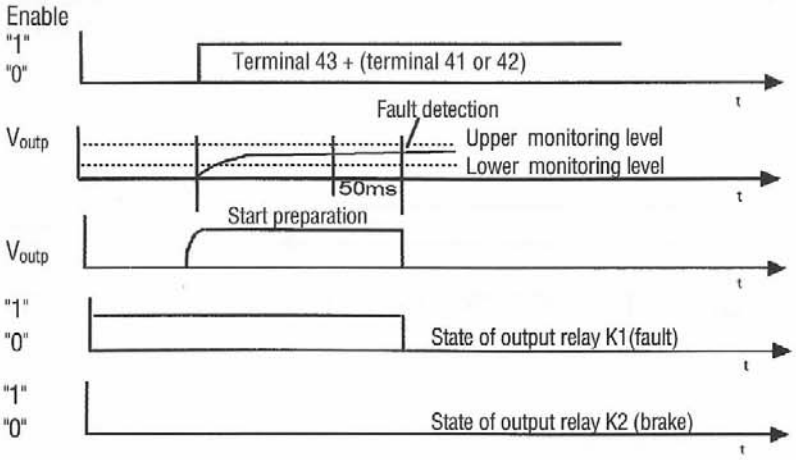


Causes:

- The hoist motor operating under no-load:
  - regenerative downward operation without load
  - weight balanced hoist operating in the field weakening range, i.e. between f_{outp} > 50 Hz to 70 Hz (under circumstances switch the CRANE/HOIST FUNCTION P 17 off again)
- Motor leads interrupted
  (Note: An output contactor device may not be used!)
- Motor power in relation to inverter power too small
  (Caution: Motor is **not to be smaller** than one rating size lower than the inverter power, e.g. not smaller than DT80K4 for inverter MOVITRAC® 1008. The normal selection: Motor 1 rating size **greater** than the inverter power rating
- Motor lead resistance too high (too long or cross-section too small) refer to section 2.1.

113 FAULT START CONDITION

On the inverter the function P 17 "CRANE/HOIST ON" has been activated. The output current after the inverter enable command lies between a lower and an upper monitoring level for a period of at least 50 ms.

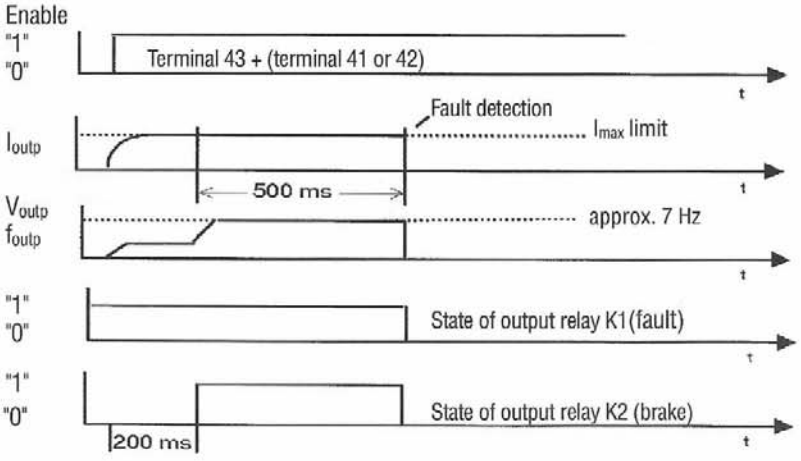


Causes:

- One motor phase missing (interrupted)
- Motor power in relation to the inverter power too small (refer to fault 112)
- Motor lead resistance too high (refer to fault 112)

114 FAULT MOTOR PULLED OUT (torque pull-out)

On the inverter the functions P 16 "SPEED MONITOR ON" **and** P 17 "CRANE/HOIST ON" have been activated. The output current is stuck at the current limit (for at least 500 ms) and the output frequency does not exceed 7 Hz. The functioning of the inverter after fault detection:



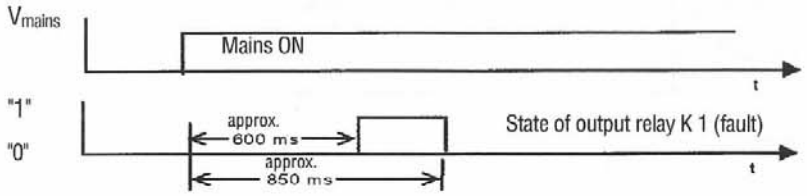
Causes:

- Motor overloaded and therefore a motor torque pull-out resulted
- Motor brake did not release
- Ramp generator (P 8 or P 10) set too slow (on hoists: t ≤ 3 s is necessary)
- Setpoint < corresponding to 7 Hz necessary, i.e. set P 7 = 7 Hz.

115 FAULT PARAMETER MODULE

The parameter module is plugged in incorrectly or missing or defective. When switching on the inverter the fault is detected after approx. 600 ms.
If the parameter module is plugged-in during operation, then the fault is detected with parameter change after releasing the [#] push-button. The fault signal in this case does not lead to a blocking, but appears only briefly on the display.

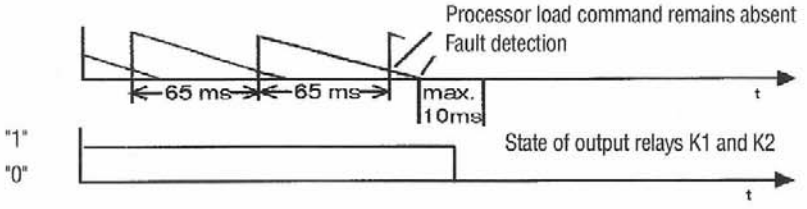
The functioning of the inverter after fault detection:



116 FAULT WATCHDOG TIMER

The inverter internal processing program is disturbed, so that at the end of a cyclic recurring monitoring time (65 ms) the fault WATCHDOG TIMER is triggered.

The functioning of the inverter after fault detection:



Causes:

- The inverter is interfered with due to external influences, e.g.
  - Unshielded control leads that have been ducted together with contactor leads or power cables
  - Contactor, without RC element interference suppression, installed in the immediate vicinity of the inverter
  - Inverter installed with poor earthing (high frequency earthing requires widely spread metal-to-metal contact between inverter and switch cabinet).

117 FAULT INTERNAL NO. 1

The inverter internal measured value of the DC link voltage is absent or too small.

118 FAULT INTERNAL NO. 2

During the self-test time the inverter internal measured value of the mains voltage is absent or too small.

The functioning of the inverter after fault detection for **all internal faults**:
- Immediate blocking of the output voltage
- Instantaneous switch off command of the output relays K1 and K2

Cause: Internal inverter defect.

MOVITRAC® 1000

MOVITRAC® 1000		1008-231-	1006-403-	1015-403-	1022-403-
Inverter Part. No.	1Q	825 534 2	825 532 6	825 528 8	825 774 4
with brake chopper	4Q	825 535 0 *)	825 527 X *)	825 529 *)	825 775 2 **)
Output rated power	P_N	1.6 kVA	1.4 kVA	2.8 kVA	3.8 kVA
Rated supply voltage	V_{mains}	Voltage at terminals 1/2/3 max. 265 V_{AC} to earth (PE)			
Permissible range		1 x 230 V_{AC} -30% / +15%	3 x 400 V_{AC} -30% / +15%		
Mains frequency	f_{mains}	50 Hz ... 60 Hz ± 10%			
Mains rated current	I_{mains}	8 A_{AC}	2.8 A_{AC}	5.2 A_{AC}	8.0 A_{AC}
Output voltage	$V_{outp.}$	Continuously up to V_{mains} (3phase)			
Output frequency	$f_{outp.}$	2 ... 127.5 Hz	f_{min} = 2 ... 25 Hz	f_{max} = 40 ... 127.5 Hz	
Resolution	$\Delta f_{outp.}$	0.5 Hz over the entire range			
Field weakening range	f_{base}	settable in steps 50/60/87/104 Hz			
Useful motor power	P_{mot}	0.75 kW	0.55 kW	1.5 kW	2.2 kW
Output rated current	I_N	4.0 A_{AC}	2.0 A_{AC}	4.0 A_{AC}	5.5 A_{AC}
Dynamic current limit	I_{max}	Motor operating mode: 150% I_N for 60s Regenerative mode (on 4Q inverters): 150% I_N (t refer to ED value)			
Short-time brake rating (on 4Q inverters)		100 % ED $\hat{=}$ Continuously: 100 W 50 % ED $\hat{=}$ 60 s: 180 W 25 % ED $\hat{=}$ 30 s: 320 W		12 % ED $\hat{=}$ 14 s: 600 W 6 % ED $\hat{=}$ 7 s: 950 W	Refer to values of external brake resistor
Internal current limit		I_{max} = 75 ... 150 % adjustable via the menu (Resolution: Δ = 1 %)			
Ambient temperature	ϑ_{amb}	0° ... +45° C (P_N reduction: 2.0 % I_N per K from 46° C to max. 60° C)			
Output sine filter		–	●	●	●
Max. motor conductor leads		max. 100 m			
Leakage current of the inverter without output load		< 1.5 mA			
Interference voltage level with interference suppression measures (VDE 0871 / EN 55011)		A	B	B	A
Enclosure / Duty type		IP 20 (DIN 40 050) / Continuous duty (DIN 57 558 Part 1)			
Power loss @ P_N	P_{loss}	85 W	105 W	160 W	210 W
add. P_{loss} during braking (4Q inverters)		100 W	100 W	100 W	
Type of cooling (DIN 41 751) / Altitude above sea level		Natural convection h ≤ 1000 m (P_N reduction: 1 % per 100 m from 1000 m - max. 2000 m)			

*) Brake chopper and Brake resistor incorporated.

**) Brake chopper incorporated, Brake resistor externally (refer to accessory equipment).

MOVITRAC® 1100

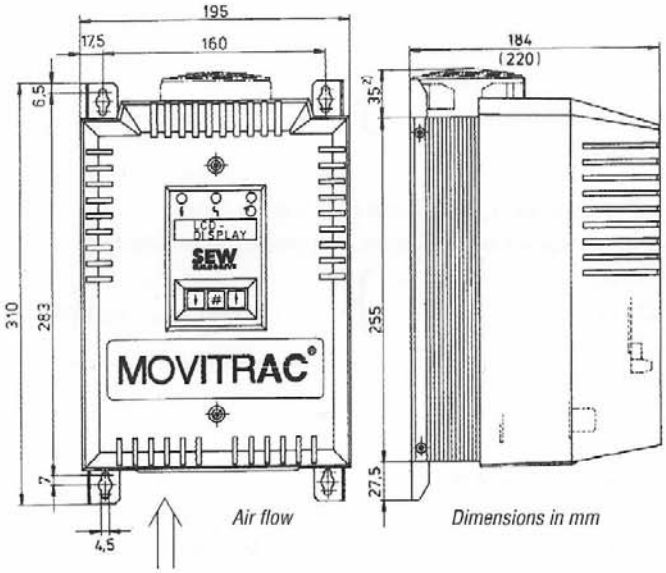
MOVITRAC® 1100		1108-403-	1115-403-	1122-403-	1130-403-
Inverter Part. No.	1Q	825 662 4	825 666 7	825 668 3	825 695 0
with brake chopper	4Q *)	825 663 2	825 667 5	825 669 1	825 696 9
Output rated power	P_N	1.7 kVA	2.75 kVA	3.9 kVA	5.0 kVA
Rated supplly voltage	V_{mains}	Voltage at terminals 1/2/3 max. 265 V to earth (PE)			
Permissible range		3 x 400 V_{AC} -30% / +15%			
Mains frequency	f_{mains}	50 Hz ... 60 Hz ± 10%			
Mains rated current	I_{mains}	3.6 A_{AC}	5.2 A_{AC}	8.0 A_{AC}	9.0 A_{AC}
Output voltage	$V_{outp.}$	Continuously up to V_{mains} (3phase)			
Output frequency	$f_{outp.}$	2 ... 127.5 Hz	f_{min} = 2 ... 25 Hz		f_{max} = 40 ... 127.5 Hz
Resolution	$\Delta f_{outp.}$	0.5 Hz over the entire range			
Field weakening range	f_{base}	settable in steps 50/60/87/104 Hz			
Useful motor power	P_{mot}	0.75 kW	1.5 kW	2.2 kW	3.0 kW
Output rated current	I_N	2.5 A_{AC}	4.0 A_{AC}	5.5 A_{AC}	7.3 A_{AC}
Dynamic current limit	I_{max}	Motor operating mode: 150% I_N for 60s Regenerative mode (on 4Q inverters): 150% I_N for 60s			
Brake resistor with 4 Q inverters		68 Ω ≤ R_{BW} ≤ 100 Ω			
Internal current limit		I_{max} = 75 ... 150 % adjustable via the menu (Resolution: Δ = 1 %)			
Ambient temperature	ϑ_{amb}	0° ... +45°C (P_N reduction: 2.0 % I_N per K from 46°C to max. 60°C)			
Output sine filter		–	–	–	–
Max. motor conductor leads		max. 50 m			
Leakage current of the inverter without output load		< 2 mA			< 3.5 mA
Interference voltage level with interference suppression measures (VDE 0871 / EN 55011)		B	B	B	B
Enclosure / Duty type		IP 20 (DIN 40 050) / Continuous duty (DIN 57 558 Part 1)			
Power loss @ P_N	P_{loss}	95 W	130 W	160 W	210 W
Type of cooling (DIN 41 751) /		Natural convection			Forced cooling
Altitude above sea level		h ≤ 1000 m (P_N reduction: 1 % per 100 m from 1000 m - max. 2000 m)			

*) Brake chopper incorporated; Brake resistor external (refer to accessory equipment).

MOVITRAC® 1000 and 1100

MOVITRAC® Type Series 1000/1100		General electronic data	
Speed setpoints:		Effective for both rotational directions:	
External setpoints:		Summation effect of the inputs terminals 32 / 33 / 36:	
Setpoint 1	**terminal 32**	n1 = 0 ... + 10V (Ri = 100 Ω)	Resolution $f_{outp.}$: Δ = 0.5 Hz
Setpoint 2	**terminal 33**	n2 = 0 ... + 10V (Ri = 100 Ω)	
Setpoint 3	**terminal 36**	n3 = 0 ... 20 mA / 4 ... 20 mA	
Setpoint supply voltage	**terminal 31**	+ 10 V ± 2 % loadable with I_{max} = 3 mA (Drift ≤ 0.6 % @ Δ ϑ = 10 K)	
Internal setpoints:		Internal setpoints suppress external setpoints when selecting the terminals 48/49	
Setpoint 11	**terminal 48**	2.0 ... 127.5 Hz	Resolution $f_{outp.}$: Δ = 0.5 Hz
Setpoint 12	**terminal 49**	2.0 ... 127.5 Hz	
Setpoint 13	**terminals 48+49**	2.0 ... 127.5	
Selection of rotational direction:		Interlocked internally	
CW/Stop	**terminal 41**	= 1/0	
CCW/Stop	**terminal 42**	= 1/0	
Freq. ramp generator time ranges		The times apply to Δ $f_{outp.}$ = 50 Hz	
Ramp 1	**term. 47 = "0"**	Up: 0.2 ... 5.0 s	Resolution: Δ = 0.1 s
		Down: 0.2 ... 5.0 s	Resolution: Δ = 0.1 s
Ramp 2	**term. 47 = "1"**	Up=Down: 0.2 ... 5.0 s / 5 ... 50 s / 50 ... 400 s	Resolution: Δ = 0.1 s / 1 s / 2 s
Rapid stop ramp	**term. 43 = "0"**	Down: 0.2 ... 1.0 s	Resolution: Δ = 0.1 s
Binary inputs:	**term. 41-43, 47-49**	These inputs are isolated via optocouplers	Test voltage: 500 V_{AC}
		Common reference point: terminal 60	
		If the reference potential is to be = 0 V, then link terminal 60 with terminal 0.	
Signal torm		Command input via contact (for low voltage) or via an external binary signal:	
		"1" = +13 V ... +30 V ≙ contact closed	
		"0" = -3 V ... +7 V ≙ contact open	
Current per input		for V = +18 V_{DC} I_{inp} = 12 mA	
		for V = +24 V_{DC} I_{inp} = 18 mA	
Binary signal auxiliary supply	**terminals 44/45**	for V = +18 V_{DC} -5 % Current carrying capacity I_{max} = 100 mA	
Output relay - contact data:		The relay contacts isolated from one another as well as against other circuits.	Test voltage: 1500 V_{AC}
Fault K1	**terminals 21/22**		
Brake K2	**terminals 23/24**		
Contact rating:		250 V_{AC} / 0.25 A_{AC} / AC11 or 24 V_{DC} / 0.6 A_{DC} / DC11 (per IEC 337-1)	
		with service life of 5 · 10^5 switching cycles	

MOVITRAC® 1006/1008/1015/1022 and MOVITRAC® 1108/1115/1122/1130



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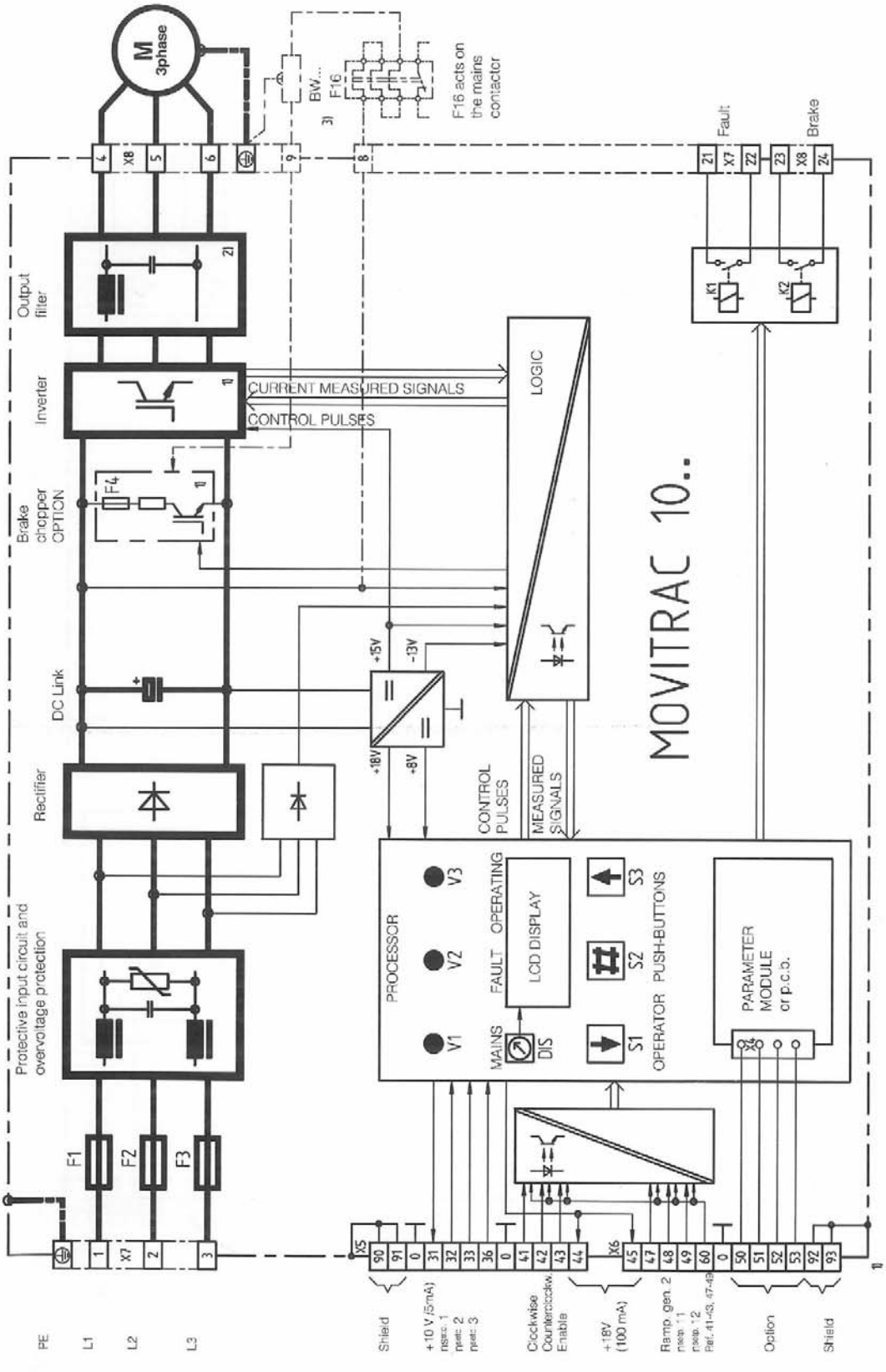
For adequate cooling at least 100 mm clearance above and below the unit must be provided.
The sideward space between two units must be at least 30 mm.
Cable entry below (2 x for PG 9 and 2 x for PG 11)

MOVITRAC® Typ	B x H x D [mm]	Weight [kg]
1008-231-1-..	195 x 255 x 184	5.4
1008-231-4-..		5.5
1006-403-1-..	195 x 255 x 220	7.1
1006-403-4-..		7.3
1015-403-1-..		8.4
1015-404-4-..		8.8
1022-403-1-..	195 x 290 x 220	8.4
1022-404-4-..		8.4
1108-403-1-..	195 x 255 x 184	4.6
1108-403-4-..		4.8
1115-403-1-..		4.6
1115-403-4-..		4.8
1122-403-1-..		4.6
1122-403-4-..		4.8
1130-403-1-..	195 x 290 x 184	4.7
1130-403-4-..		4.9

MOVITRAC® 1000



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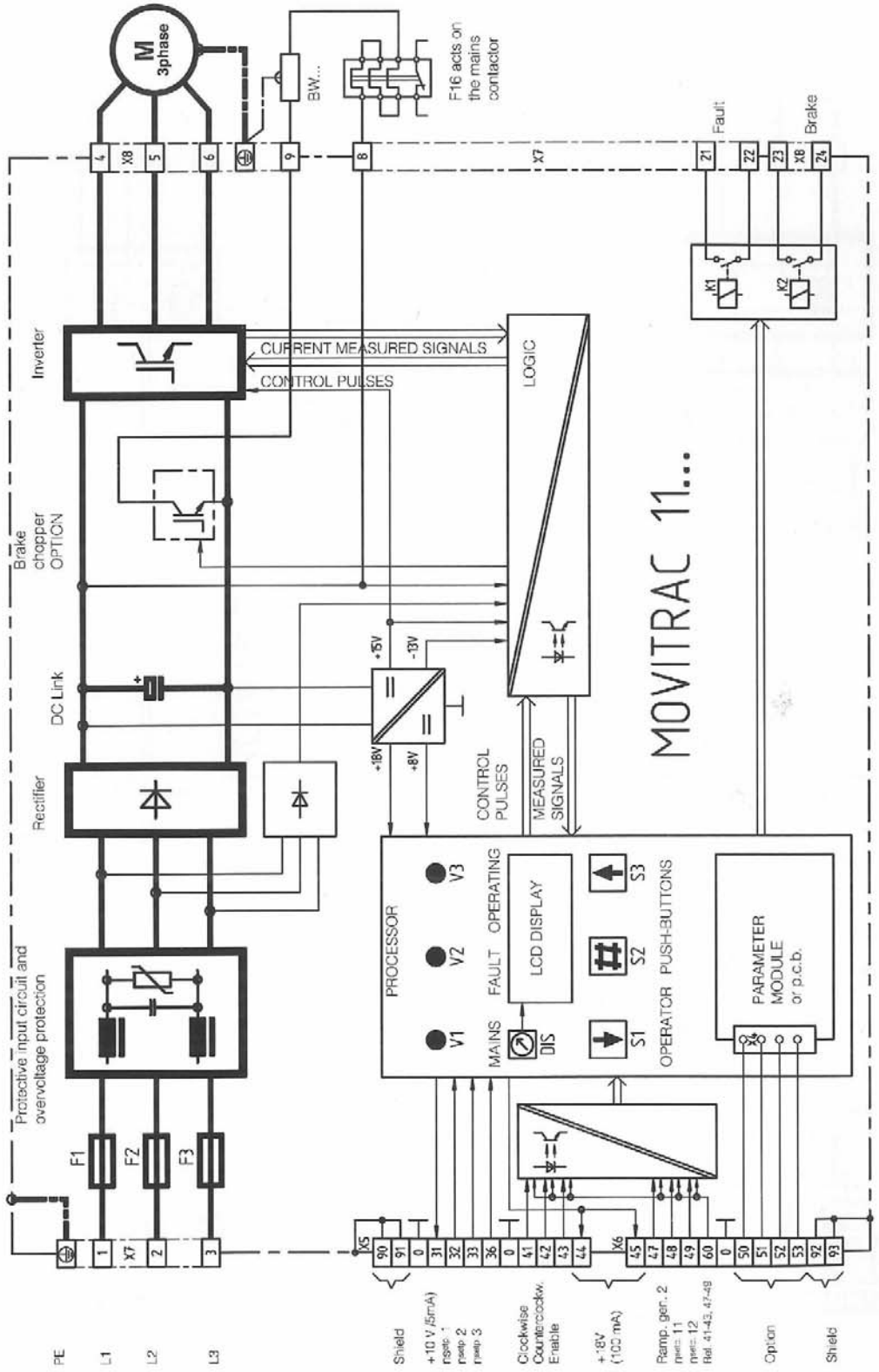
MOVITRAC® 1100



Brake Resistors BW..

MOVITRAC® 1008-231-4, 1006-403-4, 1015-403-4:

Brake chopper and brake resistor are built-in in the inverter (Resistor power ratings, please refer to Technical Data, section 5).

MOVITRAC® 1022-403-4; MOVITRAC® 1108-403-4, 1115-403-4, 1122-403-4, 1130-403-4:

When connecting the brake resistor the following has to be observed:

- Connect to the terminals 8 and 9 of the MOVITRAC®.
- Use two close lying conductors (e.g. intertwined) or 2 core sheathed power cable of max. 3 m in length.
- Protect via bimetallic relay F16, this is to protect the brake resistor against too high ON periods in ED (intermittent) operation and must therefore be set to the tripping current of the brake resistor (refer to table). The bimetallic relay F16 acts on the mains contact K11.
- Conductor cross-section is to be selected in accordance with the rated current of the MOVITRAC® (refer to section 5 - Technical Data).
- **Caution:** The conductor leads to the brake resistors carry in case of fault up to 820 V_{DC}!
- The resistor surface reaches high temperatures when operated at rated power. The location must therefore take this into account. For this reason the brake resistors (with enclosures IP 20) are normally mounted on top of the switch cabinet.

Regenerative Power Limit

In the following tables you will find power values of the brake resistors only depending on their cyclic duration factor ED in % related to a cyclic duration ≤ 120 s.

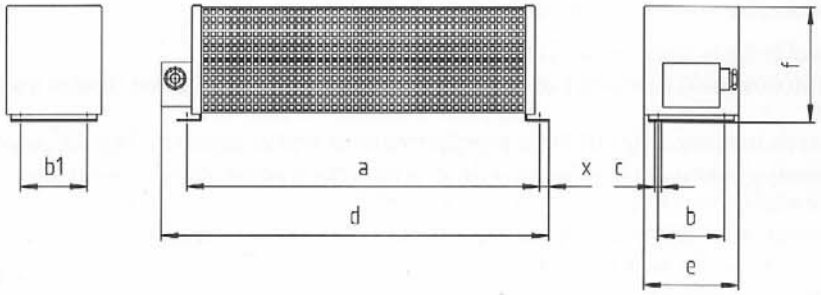
The upper power limit for the application will be found by the regenerative power limit of each inverter type (i.e. 150% of the recommended motor power, see section 5, Technical Data).

Type		BW100-002	BW100-006	BW068-002	BW068-004	BW168	BW368
Part no.		821 700 9	821 701 7	821 692 4	821 693 2	820 604 X	820 716 X
Load capability at	100 % ED [1]	0.2 kW	0.6 kW	0.2 kW	0.4 kW	0.8 kW	2.0 kW
	50 % ED	0.4 kW	1.1 kW	0.4 kW	0.7 kW	1.4 kW	3.6 kW
	25 % ED	0.6 kW	1.9 kW	0.6 kW	1.2 kW	2.6 kW	6.4 kW
	12 % ED	1.2 kW	3.5 kW	1.2 kW	2.4 kW	4.7 kW	11.8 kW
	6 % ED	1.9 kW	5.7 kW	1.9 kW	3.8 kW	7.6 kW	19 kW
		Observe the regenerative power limit of the inverter types (i.e. 150% of the recommended motor power, see Technical Data)					
Resistance value		100 Ω ± 10 %		60 Ω ± 10 %			
Tripping current		1.5 A_{AC}	2.5 A_{AC}	1.7 A_{AC}	2.4 A_{AC}	3.6 A_{AC}	5.5 A_{AC}
Design		Wire-wound resistor on ceramic tube					
Electrical connections		Ceramic terminals for 2.5 mm^2					
Enclosure		IP 20 (in the installed condition)					
Operating ambient temperature		-20 ... +45° C					
Cooling		Natural convection					
Utilisation for MOVITRAC® size		**1022-403-4** **1108-403-4, 1115-403-4, 1122-403-4, 1130-403-4:**					

1) ED = cyclic duration factor of brake resistor, with reference to a cyclic duration t_D ≤ 120 s.

Dimensions of Brake Resistors BW..

Wire-wound resistor on ceramic tube



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Type	Dimensions in mm							Weight
Part no.	a	b / b1	c	d (Breadth)	e (Depth)	f (Height)	x	[kg]
BW 100-002	260	48 / 35	5.8	286	75	87	10	0.8
BW100-006	426	64	5.8	486	92	120	10	2.2
BW068-002	260	48 / 35	5.8	286	75	87	10	0.8
BW068-004	326	64	5.8	386	92	120	10	1.9
BW168	326	150	5.8	365	185	120	10	3.6
BW368	626	150	5.8	665	185	120	10	6.1

Optional PSA 11 p.c.b (Part No. 820 976 6)

(Please also refer to separate accompanying sheet "Option p.c.b. PSA 11")

The inverters MOVITRAC® 1000 and 1100 can be provided with the option PSA 11 p.c.b., to obtain an output signal of 0...15 V at the terminal 50 (with reference to terminal 0 = 0 V) for measuring purposes. The p.c.b. provides a signal selection of 7 possibilities, via the standard menu selection (menu point P 20):

Value:	0 : f_{setp}	"FREQUENCY SETPOINT"	(setpoint before ramp generator)
	1 : f_{outp}	"MOTOR FREQUENCY"	
	2 : I_{mot}	"MOTOR CURRENT"	
	3 : V_{mot}	"MOTOR VOLTAGE"	
	4 : f_{setp}	"RAMP GENERATOR OUTPUT"	(setpoint after ramp generator)
	5 : ϑ_K	"TEMPERATURE"	(heat sink)
	6 : I x t	"AVERAGE LOAD"	

Caution: The optional PSA 11 p.c.b. may not be inserted or removed while under power into/from the inverter!

Service and spare parts

SEW EURODRIVE

Germany	**Headquarters Manufacture Sales/Service**	**Bruchsal**	SEW-EURODRIVE GmbH & Co D-76646 Bruchsal · Ernst-Blickle-Straße 42 Post-office box address: D-76642 Bruchsal · Postfach 30 23	Tel. (0 72 51) 75-0 Telefax (0 72 51) 75-1970 Telex 7 822 391
	Manufacture	**Graben**	SEW-EURODRIVE GmbH & Co D-76676 Graben-Neudorf · Ernst-Blickle-Straße 1 Post-office box address: D-76671 Graben-Neudorf · Postfach 12 20	Tel. (0 72 51) 75-0 Telefax (0 72 51) 75-2970 Telex 7 822 276
	Assembly Service	**Hanover**	SEW-EURODRIVE GmbH & Co D-30823 Garbsen · Alte Ricklinger Straße 40-42 Post-office box address: D-30804 Garbsen · Postfach 11 04 53	Tel. (0 51 37) 87 98-30 Telefax (0 51 37) 87 98-55
		Langenfeld	SEW-EURODRIVE GmbH & Co D-40764 Langenfeld · Siemensstraße 1	Tel. (0 21 73) 85 07-10+30 Telefax (0 21 73) 85 07-50 Telex 8 515 719
France	**Manufacture Sales Service/Spare Parts**	**Haguenau**	SEW-USOCOME S.A. 48-54, route de Soufflenheim, B.P. 185 F-67506 Haguenau Cedex	Tel. 88 73 67 00 Telefax 88 73 06 39 Telex 870 033
	Assembly Service Technical Offices	**Bordeaux**	SEW-USOCOME Parc d'activités de PESSAC-MAGELLAN Avenue de Magellan F-33606 Pessac Cedex	Tel. 56 36 65 22 Telefax 56 36 62 81
		Paris	SEW-USOCOME Zone Industrielle, Rue Denis PAPIN F-77390 Verneuil l'Etang	Tel. (1) 64 06 02 61 Telefax (1) 64 06 37 08 Minitelex 219 423
Australia	**Assembly Sales Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. Beverage Drive Tullamarine, Victoria 3043	Tel. (03) 3 38-79 11 Telefax (03) 3 30-32 31 Telex 35 515
		Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park Sydney N.S.W. 2164	Tel. (02) 756-10 55 Telefax (02) 756-10 05
Austria	**Assembly Sales Service**	**Vienna**	SEW-EURODRIVE Ges.m.b.H. Industriestraße B 4 A-2345 Brunn a. Geb. bei Wien	Tel. (0 22 36) 3 16 31-3 16 35 Telefax (0 22 36) 3 33 85 Telex 79 123
Belgium	**Assembly Sales Service**	**Brussels**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. (010) 23 13 11 Telefax (010) 23 13 36 Telex 59 509
Brazil	**Manufacture Sales Service**	**Sao Paulo**	SEW DO BRASIL Motores-Redutores Ltda. Caixa Postal 201 Rodovia Presidente Dutra km 213 07210 Guarulhos-SP	Tel. (011) 9 12 41 11 Telefax (011) 9 12 04 49 Telex 66 135
Canada	**Assembly Sales Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, Ontario L6T 3W1	Tel. (416) 7 91-15 53 Telefax (416) 7 91-29 99
		Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta. B.C. V4G 1E2	Tel. (604) 2 72 42 88 + 9 46 55 35 Telefax (604) 946-2513
		Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger Street LaSalle, Quebec H8N 2V9	Tel. (514) 367-1124 Telefax (514) 367-3677
Chile	**Assembly Sales Service**	**Santiago de Chile**	SEW-EURODRIVE Chile Motores-Reductores LTDA. Panamericana Norte N° 9261 Casilla 23 - Correo Quilicura RCH-Santiago de Chile	Tel.(02) 6 23 82 03 + 6 23 81 63 Telefax (02) 6 23 81 79
Denmark	**Assembly Sales Service**	**Kopenhagen**	SEW-EURODRIVE A/S Geminivej 28-30, P.O. Box 100 DK-2670 Greve	Tel. (42) 90 75 00 Telefax (42) 90 95 58 Telex 33 309
Finland	**Assembly Sales Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4 SF-15860 Hollola 2	Tel. (0 03 58)-18-7 80 42 11 Telefax (0 03 58)-18-7 80 62 11
Great Britain	**Assembly Sales Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No. 1 GB-Normanton, West-Yorkshire WF6 1QR	Tel. 09 24 89 38 55 Telefax 09 24 89 37 02 Telex 557 409
Hong Kong	**Assembly**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No. 801-806, 8 th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. 7 96-04 77 Telefax7 95-91 29
Korea	**Assembly Sales Service**	**Ansan-City, Kyungki-do**	SEW-EURODRIVE Co., Ltd. R601-4, Banweol Industrial Estate Unit 1048-4, Shingil-Dong Ansan-City, Kyunki-do	Tel. (03 45)-4 92-80 51 Telefax (03 45)-4 92-80-56

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Italy	**Assembly** **Sales** **Service**	**Milano**	SEW-EURODRIVE di R. Blickle & C. SAS Via Bernini 14 I-20020 Solaro (Milano)	Tel. (02) 96 79 97 71 Telefax (02) 96 79 97 81 Telex 322 823
Japan	**Assembly** **Sales** **Service**	**Hamamatsu**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no Toyoda-cho, Iwata-gun Shizuoka prefecture, 438	Tel. (0 53 83) 7 38 11-13 Telefax (0 53 83) 7 38 14
Malaysia	**Assembly** **Sales** **Service**	**Johore**	SEW-EURODRIVE Sdn. Bhd. 95, Jalan Seroja 39 81100 Johore Barhru Johore	Tel. (07) 54 14 04 + 54 64 04 + 54 57 07 + 54 94 09
Netherlands	**Assembly** **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085, NL-3004 AB Rotterdam	Tel. (010) 4 46 37 00 Telefax (010) 4 15 55 52
New Zealand	**Assembly** **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. 1 Nandina-Avenue East Tamaki, Auckland P.O. Box 58-428, Greenmount, Auckland	Tel. (09) 2 74 56 27 + 2 74 00 77 Telefax (09) 2 74 01 65
Norway	**Assembly** **Sales** **Service**	**Oslo**	SEW-EURODRIVE A/S Solgaard skog 71 N-1539 Moss	Tel. (069) 25 08 08 Telefax (069) 25 08 18
Portugal	**Assembly** **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050 Mealhada	Tel. (031) 2 36 84 Telefax (031) 2 36 85
Singapore	**Assembly** **Sales** **Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. N° 9, Tuas Drive 2 Jurong Industrial Estate Singapore 2263 Boon Lay, P.O. Box 813, Singapore 9164	Tel. 86 21 701-705 Telefax 8 61 28 27 Telex 38 659
South Africa	**Assembly** **Sales** **Service**	**Johannesburg**	Gearedmotors of South Africa Pty. Ltd. Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext.2 Johannesburg 2013 P.O. Box 27032 2011 Benrose, Johannesburg	Tel. (27 11) 4 94 43 80 Telefax (27 11) 4 94 23 00
		Capetown	Gearedmotors of South Africa Pty. Ltd. No. 1 Cor. Voortrekker & Beach Roads P.O. Box 28, 7405 Maitland, Cape	Tel. (021) 51 09 87 Telex 576 062
		Durban	Gearedmotors of South Africa Pty. Ltd. 39 Circuit Road Westmead, Pinetown P.O. Box 10433, Ashwood 3605	Tel. (031) 7 00 34 51 Telex 622 407
Spain	**Assembly** **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Oficinas Centrales, Talleres y Almacen E-48015 Bilbao	Tel. (9) 44 75 40 00 Telefax (9) 44 75 55 42
Sweden	**Assembly** **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping	Tel. (036) 16 50 70 Telefax (036) 16 44 69 Telex 70 162
Switzerland	**Assembly** **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein / Basel	Tel. (061) 4 11 92 96 Telefax (061) 4 11 92 91 Telex 963 231
USA	**Manufacture** **Assembly** **Sales** **Service**	**Greenville**	SEW-EURODRIVE INC. 1275 Old Spartanburg Highway Lyman, S.C. 29365 P.O. Box 518 Lyman, S.C. 29365	Tel. (803) 4 39-87 92 + 75 37 Telefax Manuf. (803) 9 49-30 39 Telefax Ass. (803) 4 39-05 66 Telex 805 550
	Assembly **Sales** **Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio Road P.O. Box 3910 Hayward, California 94544	Tel. (510) 4 87-35 60 Telefax (510) 4 87-63 81
		Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 200 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08 014	Tel. (609) 4 67-22 77 Telefax (609) 8 45-31 79
		Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. (513) 3 35-00 36 Telefax (513) 2 22-41 04 Telex 6 874 204
		Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. (214) 3 30-48 24 Telefax (214) 3 30-47 24
Venezuela	**Assembly** **Sales** **Service**	**Caracas**	Edif. Asea Brown Boveri Av. Diego Cisneros Los Ruices	Tel. (02) 2 39 64 33 + 2 38 24 22 + 2 38 24 11 Telefax(02)2 39 63 83+2 39 58 34 Telex 25 249 + 25 265

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