

# OPERATING INSTRUCTIONS

## NORDAC Frequency Inverter

Type series SK 250/1 to SK 2.200/1

**BU 3300/94 E**

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## **GETRIEBEBAU NORD**

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## 2.0 Installation

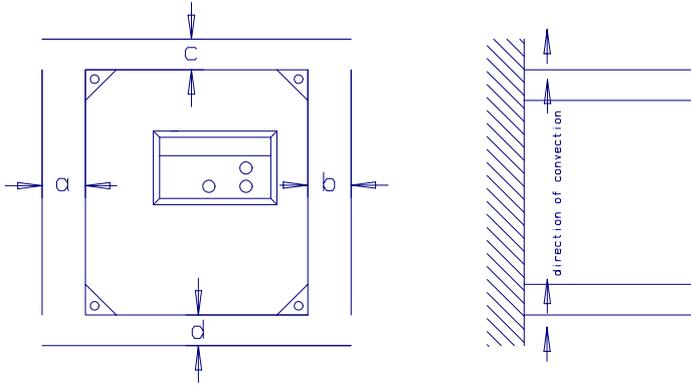
The equipment requires adequate ventilation. Minimum clearances between the individual units must be observed for this purpose.

**Make sure that the heated air is carried off above the devices!**

Front view

Side view

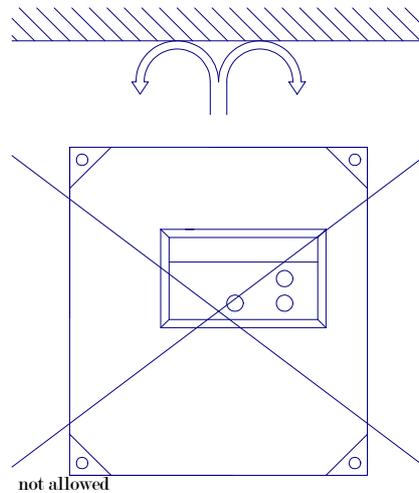
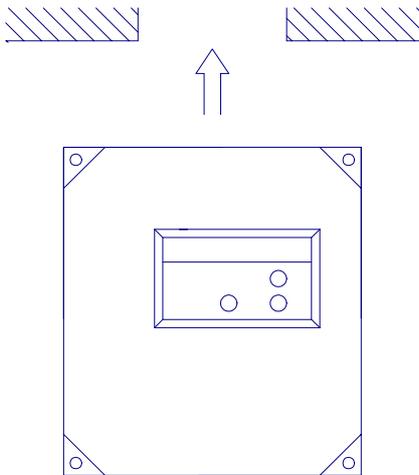
If the mounting surface does not form a rear surface --> fit a baseplate.



Type	a	b	c	d
SK 250/1 to SK 2200/1	50	50	100	100

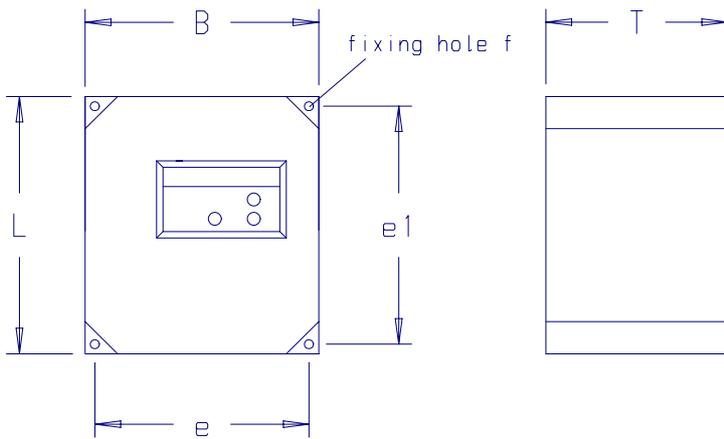
All dimensions in mm

If several inverters are installed one above the other, ensure that the temperature of the air drawn in remains within the allowable limits.



### 3.0 Frequency inverter dimensions

Version shown: IP 21



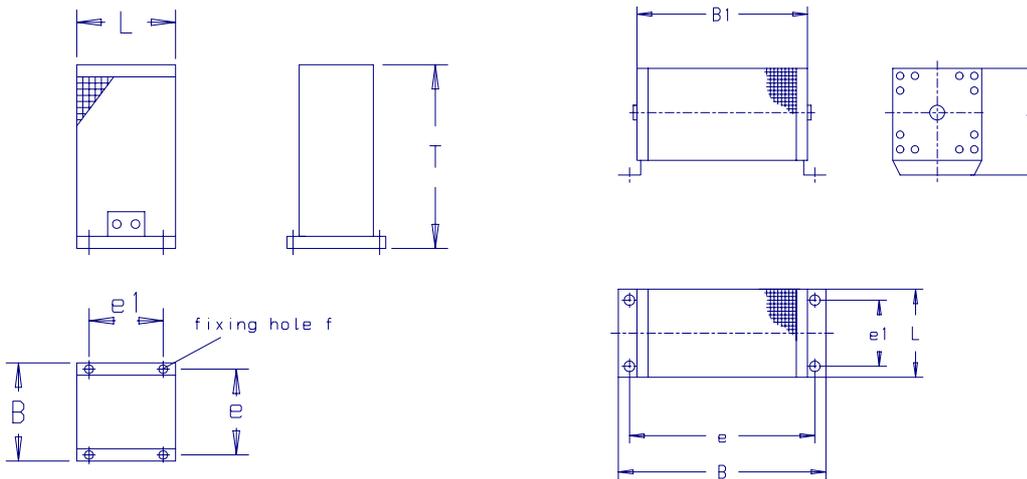
Type	T	B	L	e	e <sub>1</sub>	f	
SK 250/1							
to		130	150	185	138	174	4,8
SK 750/1							
SK 1100/1							
to		164	185	215	174	206	4,8
SK 2200/1							

All dimensions in mm

### 3.1 Dimensions/data of braking resistor (optional)

A

B



resistor	acc.	T to	B	B1	L	e	e <sub>1</sub>	f	
44 W / 200 Ω	A		123	100	--	65	90	45	4,5
100 W / 82 Ω	B		77	172	135	66	157	44	4,5x9

All dimensions in mm

## 4.0 Electrical installation

To connect the electrical leads it is necessary to open the device. The housing cover is attached to the heatsink by four clips. Release the lower clips with the aid of a screwdriver introduced carefully between the clips and the heatsink. After that the cover can be lifted off the heatsink taking hold of the lower edge of the cover.

### CAUTION!

Please remember that the cover must on no account be canted or tilted sideways.

The printed circuit boards which will be exposed upon removal of the cover carry highly sensitive MOS components which are liable to being impaired by static electricity in particular. That is why you should be careful not to touch the conducting tracks or components with your hands or metal objects. When connecting the leads touch the terminal screws only using insulated screwdrivers for the procedure.

The leads are fed into the equipment from the bottom and connected to the power terminal block.

Make sure that the leads are connected correctly and that the equipment is properly earthed.

### 4.1 Power section SK 250/1 to SK 2200/1

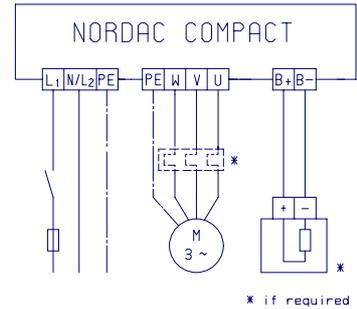
Connection for mains, braking chopper and motor:

- via screw-type push-lock terminal strips on the lower output stage board

Maximum line cross-sectional area: - 2,5 mm<sup>2</sup>

Motor lead: - 50 m max.

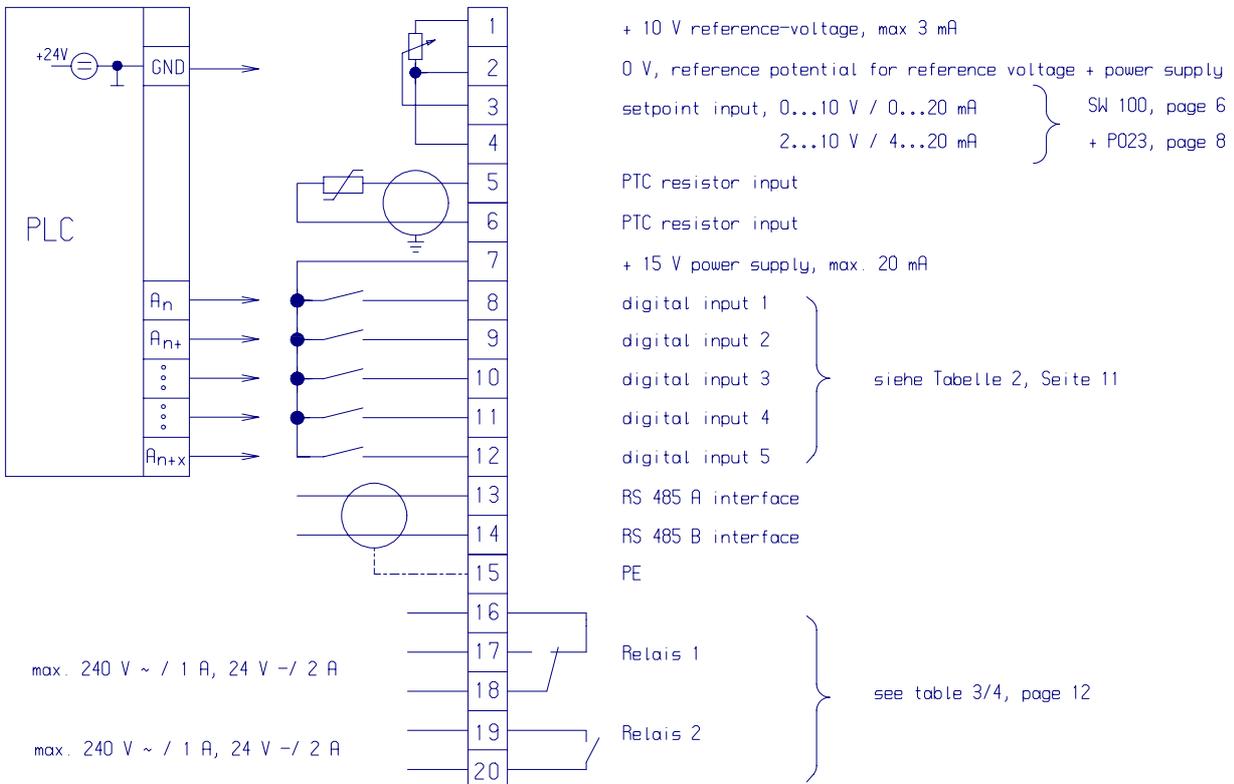
Screened motor lead: - 25 m max.



### 4.2 Control section

Connection for the control lines: - 20-pole control terminal strip

Maximum connection cross-sectional area: - 1,5 mm<sup>2</sup>



### 4.3 Control inputs

Terminal	Function / Notes	Data	Suggested circuit
1	Reference voltage for setpoint supply	+ 10 V max. 3 mA	
2	Reference potential for cl.1 reference voltage + cl.7 power supply	0 V	
3/4	Setpoint input Differential amplifier input It is not allowed to switch the setpoint!  Selection of analogue signals via: P023 + SW100 (pages 6 + 8)	0 ... + 10 V 0 ... + 20 mA 2 ... + 10 V 4 ... + 20 mA	
5/6	Connection for temperature sensing element a) PTC-resistor b) floating thermal contact c) wire bridge Activate via : P087	Response level at 1 ... 2 KOhms	
7	Power supply for control inputs 8 ... 12	+ 15 V max. 20 mA	
8 to 12	Digital inputs 1 ... 5 see table 2, page 11 + P051 ... P055 Input resistance	+ 15 ... + 30V DC  $R_i \approx 4,5 \text{ KOhms}$	a)
13	RS 485 A Interface		
14	RS 485 B Interface		b)
15	PE, equipment - GND		
<u>Relay 1, center-zero relay</u>			
16	Contact closed	240 V ~ / 1 A	
17	Contact open	24 V = / 2 A	
18	Common connection For detailed info see Table 3, page 12		
<u>Relay 2, normally open</u>			
19	Contact open	240 V ~ / 1 A 24 V = / 2 A	
20	Common connection For detailed info see Table 3, page 12		

**5.0 Operation and displays**

On the control board you will find:

- a 4-digit 7-segment display (LED)
- an LED (REV)
- 3 keys (P, ↑, ↓)
- a toggle (SW 100)

These elements are used to display and enter the operating data (parameters).

**P ●** - Change-over between parameter number and parameter value  
 Display P000 ... P944 = parameter number  
 Display 0000 ... 9999 = parameter value

**↑ ○** - Key to set parameter numbers and parameter values to higher numerical values

**↓ ○** - Key to set parameter numbers and parameter values to lower numerical values

↑ or ↓ - Touching the key only briefly will make the values change step by step  
 Keeping the key pressed - the values run through fast

REV - Direction of rotation is displayed LED on and yellow - counter-clockwise  
 LED off - clockwise

Switch SW 100 - change-over switch for analogue input (including parameters P021 / P022)  
 Position V - voltage input (0.2 ... 10 V)  
 Position I - current input (0.4 ... 20 mA)

**5.1 Commissioning**

**NOTE**

Most of the displays on the NORDAC COMPACT have four digits. A convenient representation of the values including the units of measure is provided in the table of parameters.

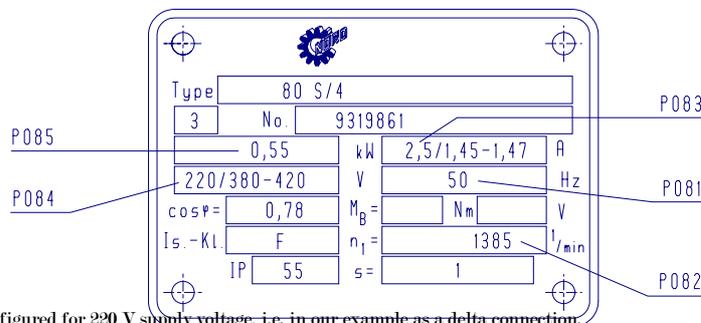
Example: Table 50.0 Hz - Display 050.0

As soon as a parameter value has been set it is automatically stored in the internal memory.

If the output frequency (P001-0) is selected to be displayed with parameter number P000, the corresponding setpoint is displayed approximately every 1,5 seconds when the drive is switched to stop.

**The equipment is programmed at the factory for standard applications on NORD four-pole standard motors.** When using other motors it is necessary to enter the specifications from the rating plate of the motor concerned into the internal memory according to parameters P081 through P085.

Example: Representation of the rating plate of a motor with all the data identified by parameters P081 through P085.



**NOTE**

Ensure that the motor is configured for 220 V supply voltage, i.e. in our example as a delta connection

All other parameters are already pre-assigned at the factory. The factory setting can be restored with parameter P944 (detailed information on how to proceed can be obtained from the section entitled "Explanation of parameters").

## 5.1.1 Control and operation

### **Switching the equipment on**

Since the equipment is not provided with a mains switch, it is turned on by being connected to the mains supply voltage. When this has been done, the inverter automatically carries out a self-checking programme to establish its readiness for operation. Any error detected as a result of this procedure will be shown in the display.

### **Standby mode**

The equipment waits with the output disabled for an "On"-command via terminal 8 (to the right) or terminal 9 (to the left). You can find the specifications for control commands for binary inputs under parameters P051-P055 "Selection of control functions".

### **Operational condition**

When the "On"-command is given the output is enabled. The motor runs up to the pre-selected frequency (P005) and can be adjusted with the up- and down-keys. In the as-delivered state of the equipment the frequency setpoint is 0,0 Hz which means that **the motor will not rotate**. To make it start up, a setpoint must be entered using the up-key or P005.

### **Stop condition**

Stopping can be achieved in several ways:

- Going down to 0,0 Hz (lowering the setpoint to 0,0 with the down (↓) key will cause the motor to come to a slow, controlled standstill).
- Cancellation of the "On"-command will cause the inverter to ramp down at the selected ramp-down rate.
- OFF 2 - operation will cause the motor to coast to a standstill (see Table 2, page 11).
- OFF 3 - operation will cause rapid braking (see Table 2, page 11).
- D.C. injection braking up to 250 % will cause abrupt stopping (see P073).

## 5.1.2 If the motor does not start up

If the motor does not start up when the "On"-command has been given, please check whether a frequency setpoint has been entered and/or whether the motor specification has been correctly entered under parameters P081 through P085 (access to these parameters will only be possible however if P009 is first set accordingly as described on page 10). Use parameter number P005 to check the setting of the frequency setpoint as well.

Parameter settings and their significance:

P081	
P082	The nominal values specified on the nameplate
P083	of the motor should be entered in these parameters.
P084	
P085	
P005	indicates that the digital setpoint is at 0. The setpoint can be raised by changing P005 or by using the up/down keys to adjust P000.
P006	indicates that the digital setpoint is used as the setpoint.

If the motor does not run as a result of inadvertent alteration of parameters, it is advisable to reset the NORDAC COMPACT. This is carried out by setting parameter P944 = 1 and pressing key P afterwards. Go on by checking the motor specification in P081 through P085 and re-enter the data, if necessary.

5.2 Table of operational values (parameters)

Parameter no.	Function	Parameter value	Works setting	Setting after commissioning
P000	operating display			
P001 *	display mode	0 --> 4	0	
P002 *	ramp-up time	0 --> 400.0 s	10.0 s	
P003 *	ramp-down time	0 --> 400.0 s	10.0 s	
P004 *	smoothing	0 --> 40.0 s	0.0 s	
P005 **	frequency setpoint (digital)	0 --> 650.0 Hz	0.0 Hz	
P006	frequency setpoint selection	0 --> 2	0	
P009 *	key parameter	0 --> 3	0	
P011	frequency setpoint memory	0 --> 1	0	
P012 *	minimum motor frequency	0 --> 650.0 Hz	0.0 Hz	
P013 *	maximum motor frequency	0 --> 650.0 Hz	50.0 Hz	
P014 *	skip frequency	0.0 --> 650.0 Hz	0.0 Hz	
P015 *	automatic re-start	0 --> 1	0	
P016	flying start	0 --> 2	0	
P021 *	minimum analogue frequency	0 --> 650.0 Hz	0.0 Hz	
P022 *	maximum analogue frequency	0 --> 650.0 Hz	50.0 Hz	
P023 *	analogue setpoint selection	0 --> 1	0	
P024 *	analogue setpoint addition	0 --> 1	0	
P031 *	jog frequency right	0.0 --> 650.0 Hz	5.0 Hz	
P032 *	jog frequency left	0.0 --> 650.0 Hz	5.0 Hz	
P033 *	jog ramp-up time	0.0 --> 400.0 s	10.0 s	
P034 *	jog ramp-down time	0.0 --> 400.0 s	10.0 s	
P041 *	1st fixed frequency	0.0 --> 650.0 Hz	5.0 Hz	
P042 *	2nd fixed frequency	0.0 --> 650.0 Hz	10.0 Hz	
P043 *	3rd fixed frequency	0.0 --> 650.0 Hz	20.0 Hz	
P044 *	4th fixed frequency	0.0 --> 650.0 Hz	40.0 Hz	
P045	inversion fixed setpoints	0 --> 7	0	
P051	selection control function digital input 1 (terminal 8)	1 --> 2	1	
P052	selection control function digital input 2 (terminal 9)	0 --> 12	2	
P053	selection control function digital input 3 (terminal 10)	0 --> 12	6	
P054	selection control function digital input 4 (terminal 11)	0 --> 12	6	
P055	selection control function digital input 5 (terminal 12)	0 --> 12	6	

Changing of the parameters identified \* is possible even during operation.  
 Detailed information and comment regarding the parameters is provided on the following pages.  
 \*\* On-line changeable only if P011 is set to "1".

5.2 Table of operational values (parameters)

Parameter No.	Function	Parameter value	Works setting	Setting after commissioning
P061	selection relay output RL 1	0 --> 6	6	
P062	selection relay output RL 2	0 --> 8	8	
P063	external brake running time	0 --> 20.0 s 1.0 s		
P064	external brake stopping time	0 --> 20.0 s	1.0 s	
P071 *	slip compensation	0 --> 200%	0	
P072 *	slip limit	0 --> 500%	250%	
P073 *	DC injection braking	0 --> 250%	0	
P074 *	motor derating curve as temperature protection	0 --> 3	0	
P075 *	braking resistance	65 --> 500 Ω	0 Ω	
P076 *	pulse frequency	0 --> 10	0	
P077	control mode	0 --> 2	1	
P078 *	continuous boost	0 --> 250%	100%	
P079 *	starting boost	0 --> 250%	0%	
P081	motor nominal frequency	0 --> 650.0 Hz	50.0 Hz	
P082	motor nominal speed	0 --> 9999 RPM	*** RPM	
P083	motor nominal current	0.1 --> 100.0 A	*** A	
P084	motor nominal voltage	0 --> 500 V	220 V	
P085	motor nominal power	0.00 --> 20.00 kW	*** kW	
P086 *	motor current limit	0 --> 250% 150%		
P087 *	motor PTC enable	0 --> 1	0	
P088	automatic calibration	0 --> 1	0	
P089 *	stator resistance	0.1 --> 100.0 Ω	*** Ω	
P091 *	slave address	0 --> 30	0	
P092 *	baud rate	3 --> 6	6	
P093 *	time out	0 --> 240 s	0 s	
P094 *	nominal system setpoint	0 --> 650.0 Hz	50.0 Hz	
P101 *	operation EUROPE/USA	0 --> 1	0	
P910 *	local/remote mode	0 --> 1	0	
P922	software status	0 --> 9999	depending on software status	
P923 *	equipment system no.	0 --> 9999	0	
P930	fault code	0 --> 9999		
P931	warning code	0 --> 9999		
P944	re-set works setting	0 --> 1		

\*\*\* The value of the works setting depends on the rating of the inverter.

Changing of the parameters identified \* is possible even during operation.  
Detailed information and comment regarding the parameters are provided on the following pages.





5.3 Explanation of the operating values (parameters) and settings

Parameter no.	Settings and notes																																																								
	<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p><b>Table 3: Relay output 1 (P061)</b></p> <p>Configuration of the relay outputs</p> <table border="1"> <thead> <tr> <th>Value set</th> <th>Output assignment</th> <th>active</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>no output assigned</td> <td>low</td> </tr> <tr> <td>1</td> <td>inverter delivers output signal</td> <td>high</td> </tr> <tr> <td>2</td> <td>inverter frequency 0.0 Hz</td> <td>low</td> </tr> <tr> <td>3</td> <td>motor running direction clockwise</td> <td>high</td> </tr> <tr> <td>4</td> <td>brake on (see parameters P063/P064)</td> <td>low</td> </tr> <tr> <td>5</td> <td>inverter frequency = minimum frequency</td> <td>low</td> </tr> <tr> <td>6</td> <td>failure</td> <td>low</td> </tr> </tbody> </table> </div> <div style="width: 45%;"> <p><b>Table 4: Relay output 2 (P062)</b></p> <table border="1"> <thead> <tr> <th>Value set</th> <th>Output assignment</th> <th>active</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>no output assigned</td> <td>low</td> </tr> <tr> <td>1</td> <td>inverter delivers output signal</td> <td>high</td> </tr> <tr> <td>2</td> <td>inverter frequency 0.0 Hz</td> <td>low</td> </tr> <tr> <td>3</td> <td>motor running direction clockwise</td> <td>high</td> </tr> <tr> <td>4</td> <td>brake on (see parameters P063/P064)</td> <td>low</td> </tr> <tr> <td>5</td> <td>inverter frequency minimum frequency</td> <td>low</td> </tr> <tr> <td>6</td> <td>motor current limit (warning)</td> <td>low</td> </tr> <tr> <td>7</td> <td>motor overtemperature (warning)</td> <td>low</td> </tr> <tr> <td>8</td> <td>overall warning (motor current limit and overtemperature)</td> <td>low</td> </tr> </tbody> </table> </div> </div> <p>active low: In the state to be signalled the relay is de-energized  active high: In the state to be signalled the relay is energized (tripped)</p> <p>P063 Any period of time between 0 and 20 seconds is set after which the external brake is controlled via the braking relay after the drive has been switched on and the motor is operating at the minimum frequency set in P012.</p> <p>P064 Any period of time between 0 and 20 seconds is set during which the motor continues to be operated at the minimum frequency set in P012 after the external brake has been activated.</p> <p>P071 With this parameter the slip of an asynchronous motor when loaded can be compensated within the range of 0 % to 200 % of the nominal slip.</p> <p style="text-align: center;"><b>WARNING!!</b></p> <p>When operating synchronous motors and motors connected in parallel (group drives) the compensation is to be set to 0 to disable it.</p> <p>P072 With his parameter the slip can be limited within the "pull-out" of the drive can thus be prevented. When the slip limit is reached, the inverter will reduce the output frequency.</p> <p>range of 0% to 500% of the nominal slip. A</p> <p>P073 For DC injection braking, a current of between 0 and 250 % of the motor current rating is entered here. If 0 is entered, the DC injection brake is disabled. The duration of braking by DC injection corresponds to the ramp down time in parameter P003.</p> <p>P074 To prevent the overheating of self-cooling motors running at low speeds, a reduction of the output power can be selected.</p> <p style="text-align: right;">In = motor nominal current (P083) fn = motor nominal frequency (P081)</p> <p>P075 If a braking resistor is used, its resistance between 65 Ω and 500 Ω must be entered here.</p> <p>P076 The pulse frequency in the range from 2 to 16 kHz as well as the PWM mode for the output voltage is set with this parameter. If silent operation is not absolutely necessary, the losses in the inverter and motor as well as the RFI emission can be reduced by selecting lower pulse frequencies. Modulation mode 1 causes the motor to run more smoothly at very small frequencies, while modulation mode 2 causes lower losses in motor and inverter.</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>0</b> 16 kHz modulation mode 1</p> <p><b>1</b> 16 kHz modulation mode 2</p> <p><b>2</b> 8 kHz modulation mode 1</p> <p><b>3</b> 8 kHz modulation mode 2</p> <p><b>4</b> 4 kHz modulation mode 1</p> <p><b>5</b> 4 kHz modulation mode 2</p> </td> <td style="width: 50%; vertical-align: top;"> <p><b>6</b> 2 kHz modulation mode 1</p> <p><b>7</b> 2 kHz modulation mode 2</p> <p><b>8</b> 8-16 kHz modulation mode 3</p> <p><b>9</b> 4-8 kHz modulation mode 3</p> <p><b>10</b> 2-4 kHz modulation mode 3</p> </td> </tr> </table> <p><b>NOTE</b> When operated at 16 kHz, the display of the current, at frequencies less than 10 Hz, is inaccurate.</p> <p>P077 You can choose whether to operate the NORDAC COMPACT current-controlled (FCC) or with a voltage/frequency curve.</p> <p><b>NOTE</b> When operating synchronous machines and motors connected in parallel (group drives), a voltage/frequency curve must be selected.</p> <p style="text-align: center;">0 linear U/f-curve 1 FCC (current control) 2 quadratic U/f-curve (suitable for fans)</p>	Value set	Output assignment	active	0	no output assigned	low	1	inverter delivers output signal	high	2	inverter frequency 0.0 Hz	low	3	motor running direction clockwise	high	4	brake on (see parameters P063/P064)	low	5	inverter frequency = minimum frequency	low	6	failure	low	Value set	Output assignment	active	0	no output assigned	low	1	inverter delivers output signal	high	2	inverter frequency 0.0 Hz	low	3	motor running direction clockwise	high	4	brake on (see parameters P063/P064)	low	5	inverter frequency minimum frequency	low	6	motor current limit (warning)	low	7	motor overtemperature (warning)	low	8	overall warning (motor current limit and overtemperature)	low	<p><b>0</b> 16 kHz modulation mode 1</p> <p><b>1</b> 16 kHz modulation mode 2</p> <p><b>2</b> 8 kHz modulation mode 1</p> <p><b>3</b> 8 kHz modulation mode 2</p> <p><b>4</b> 4 kHz modulation mode 1</p> <p><b>5</b> 4 kHz modulation mode 2</p>	<p><b>6</b> 2 kHz modulation mode 1</p> <p><b>7</b> 2 kHz modulation mode 2</p> <p><b>8</b> 8-16 kHz modulation mode 3</p> <p><b>9</b> 4-8 kHz modulation mode 3</p> <p><b>10</b> 2-4 kHz modulation mode 3</p>
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## 6.0 Control

Control of the NORDAC COMPACT can either be local which implies using the control keys or remote (automation type) via a data line connected to the interface A/B terminals (terminals 13/14). Local control is set at the works.

### 6.1 Local control (in situ)

When the local data processing mode is selected, the microprocessor will respond to the keys of the control panel only. Within this mode alterations to the parameter values are carried out using the P, ↑ or ↓ keys.

While control commands which are received via the RS 485 interface have no effect, the complete status information is transmitted to the microprocessor.

### 6.2 Remote control (automation)

In the remote control mode the NORDAC COMPACT is operated via an RS 485 serial interface. The RS 485 serial interface is designed as a 2-wire connection for bidirectional data transmission.

Several NORDAC COMPACT devices can be connected to an external control unit at the same time. Since the drives can be addressed individually, it is possible to assign the respective instructions for programme execution in a very precise manner.

Serial data transmission via the RS 485 interface is carried out using the USS protocol.

When the NORDAC COMPACT is operated by remote control, internal control pulses are not accepted unless the OFF 2 and OFF 3 inputs are activated. This is done by setting the control functions specified in parameter numbers P051 to P055 (please refer to Table 2 on page 11).

### 6.3 Frequency setpoint

There are five different ways to enter and control the inverter's output frequency and hence the speed of the motor which are described below:

#### **1. Digital frequency setpoint**

The digital setpoint is set in parameter P005 anywhere between 0 and 650 Hz.

#### **2. Analogue setpoint**

The analogue frequency setpoint depends on an external setpoint voltage signal determining the frequency minimum at 0V/0mA or 2 V/4mA and the frequency maximum at 10V/20mA. The analogue input is configured using the parameters P021 to P024.

#### **3. Motorpotentiometer**

With the motor potentiometer function the setpoint can be increased or decreased via the binary inputs. The function is enabled using the parameters P052 to P055. The motorpotentiometer setpoint can either be used alone or added to other setpoints (fixed frequencies) or the analogue setpoint (see P024).

#### **4. Fixed frequency setpoint**

Fixed frequencies are set with the parameters P041 to P045 on the basis of the information provided in the relevant table. The fixed frequencies are enabled via digital inputs (terminals 9-12) (see parameterisation P052-P055 and Table 2 on page 11).

#### **5. Setpoint via remote data transmission (automation)**

A setpoint of 0 to 100% (see parameter P094) is transmitted in the data telegram.

## 7.0 Fault and error messages

In the event of a fault the inverter effects a safety switch-off and an error code appears in the display. The last error that has occurred is stored in parameter no. P930 and can be called up at this location. For instance if 0004 is shown in the display, this means that the last error was F004 in the list of errors.

Display	Message	Possible cause
F001	Overvoltage	Mains voltage too high Braking too fast (P003) Operating without brake chopper Braking chopper defective
F002	Overcurrent	Motor rating too high Output short-circuit or GND fault Ramp-up time too short (P002) Check motor specification (P081-P086) Boost too high (P078 + P079) Motor obstructed or overloaded
F003	Overload	Motor overloaded Motor with high slip --> increase $f_{max}$
F004	Overtemperature motor	Motor overloaded PTC or wire bridge are disconnected P087 set to "1" without a PTC being connected
F005	Overtemperature inverter	Ambient temperature too high Air inlet and outlet obstructed
F008	USS protocol timeout	Check serial interface Check the settings of the bus master and P091- P093
F009	Undervoltage	Mains voltage too low
F010	Initialization fault	Check the entire parameter set
F011	Internal interface fault	Switch OFF power and switch ON again
F012	Serial interface fault	Check the interface leads for faults Telegram timeout too short (P093)
F013	Fault in program	Switch OFF power and switch On again
F106	Parameterisation fault P006	Multiple or incomplete parameterisation of motorpotentiometer function on binary inputs
F112	Parameterisation fault P012	Set parameter P012 smaller than P013
F151 - F154	Parameterisation fault binary inputs	Change the setting of the binary inputs P052-P055 in a way that a particular function is not selected by two inputs. This applies to the contents of the parameters 2, 3 and 6 to 12.

When the fault has been corrected, the failure memory of the unit can be erased. To do this press key P twice or acknowledge fault correction via a binary input programmed on resetting the fault code (for erasion of fault message see Table 2 on page 11).

## 8.0 Mains filter

Standard version comprising: - capacitors --- to protect the inverter against normal  
 - varistors mains voltage peaks

Special applications:  
 - Installation of a standard mains filter --- to ensure protection against high-frequency voltage peaks  
 (specification on request) (e.g. in power-factor correction systems, welding systems etc.)

## 8.1 Radio interference suppression

R.F.I. suppression can be provided if required.

Reducing the emitted interference to the values of limit value class B in accordance with VDE 0871:  
 - with mains-circuit coupling --- by use of standard RFI suppression filters  
 - with interference emitted by motor lead --- by use of a screened cable or laying the cable in earthed heavy-gauge steel conduit

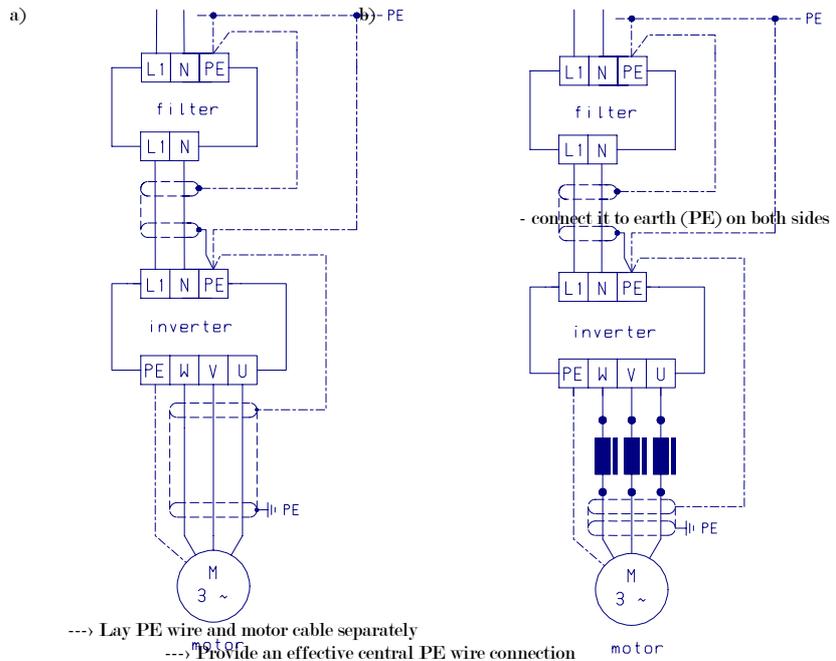
a) Arrange GND connection (PE) according to wiring diagram  
 - ensure very low resistance  
 - arrange connection/transition with large cross-section

Screening  
 - make it come up as closely as possible to the inverter and the motor (< 0,2 m)  
 - let it be continuous

If a) is not sufficient to suppress interference  
 --> try b).

b) as a), but with additional equipment such as line compensation choke or standard output filters with increased attenuation capacity

(Chokes and filters available on request at extra charge)



## 8.2 Effect on other consumers

Main cause: capacitive coupling to earth potential

--- Lay PE wire and motor cable separately  
 --- Provide an effective central PE wire connection

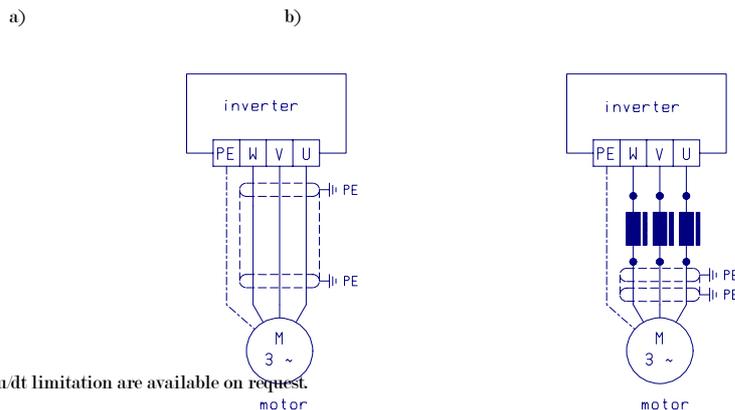
To improve electromagnetic compatibility of sensitive equipment (e.g. PLC control units or capacitive transmitters), the following steps can be taken:

a) Arrange earth connection (PE):

- ensure very low resistance  
 - arrange connection/transition with large cross-section

Screening  
 - make it come up as closely as possible to the inverter and the motor (< 0,2 m)  
 - let it be continuous  
 - connect it to earth (PE) on both sides

b) as a), but with extra equipment, if required, and with additional line compensation (chokes available on request at extra charge)



## 8.3 Output filters

- Special filters for sinusoidal output voltage or du/dt limitation are available on request.

## 8.4 Regulations

- Note the local safety regulations  
 - Observe the accident prevention regulations  
 - Comply with the regulations applicable to installation of electrical switchgear and control systems including or not including electronic components such as (in Germany) VDE 0110, VDE 0160, VDE 660, VDE 0113 or any other relevant provisions.

### CAUTION !!

The discharge time of the DC-link capacitors after being disconnected from the power supply can in some circumstances be **more than 5 minutes ! High voltage ! Very dangerous !!**

## 9.0 Technical data

Type SK...	250/1	370/1	550/1	750/1	1100/1	1500/1	2200/1	
Output power VA	690	880		1270	1500	2100	2800	4000
max. motor power W	250	370		550	750	1100	1500	2200
Rated current A	1,5	2,0		2,6	3,4	4,8	6,4	9,0
Overload current for 60 seconds A	2,25	3,0		3,9	5,1	7,2	9,8	14
Mains voltage 47-63 Hz	1 AC 230 V ± 15 %, 2 AC 208 V ± 10%							
Output voltage	3 x 230 V ± 15 %, 3x 208 V ± 10%							
Efficiency of the inverter	97 %							
Recommended mains fusing A (slow-blow)	10 A slow-blow							
Convection cooling	X	X		X	X	X	X	fan
Weight approx. kgs	2,2	2,2		2,2	2,2	4,3	4,3	4,3
Clock-rate frequency kHz	2 ... 16							

### Data applicable to all versions

Output frequency	0 - 650 Hz
Setpoint accuracy	analogue < 1%, digital < 0,02%
Power factor of mains fundamental wave	> 0,7
Coolant temperature	0°C bis +40°C no moisture or aggressive gases ; without cover + 50°C
Storage temperature	-20°C bis +70°C no moisture or aggressive gases
Relative humidity	90 % , no condensation
Installation altitude	up to 1000 m above sea level with no loss of performance
Degree of protection	NEMA 1 (IP 21)
Electrical protection	earth-fault-resistant and short-circuit-proof
Degree of R.F.I. suppression	limit value class B according to VDE 0871 (with mains filter)
Motor temperature monitoring	PTC input, I <sup>2</sup> . t control

Subject to technical modification

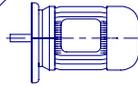
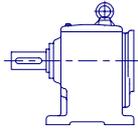
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GEARBOX

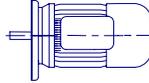
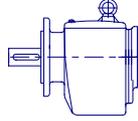
MODULAR COMPONENTS

HELICAL GEARBOX  
(FOOT MOUNTED)



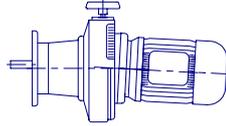
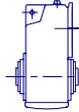
ELECTRIC MOTOR

HELICAL GEARBOX  
(FLANGE MOUNTED)



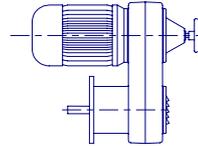
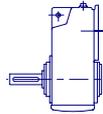
BRAKE MOTOR

WHEEL VARIABLE



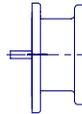
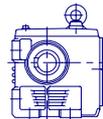
FRICTION-

SHAFT MOUNT REDUCER  
WITH HOLLOW SHAFT



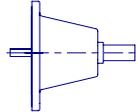
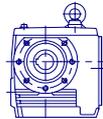
SPEED GEARED MOTOR

SHAFT MOUNT REDUCER  
WITH SOLID SHAFT



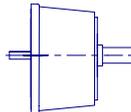
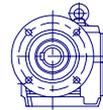
VARIABLE SPEED GEARED  
MOTOR

WORM GEAR UNIT  
(FOOT MOUNTED)



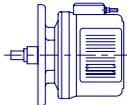
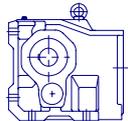
IEC ATTACHMENT CYLINDER

WORM GEAR UNIT  
(SHAFT MOUNTED)



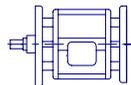
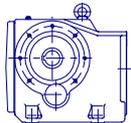
FREE INPUT SHAFT HOUSING

WORM GEAR UNIT  
(FLANGE MOUNTED)



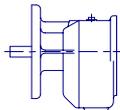
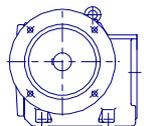
FLANGE AT INPUT SIDE

HELICAL-BEVEL GEAR UNIT  
(FOOT MOUNTED)



HYDRAULIC COUPLING WITH  
OR WITHOUT BRAKE

HELICAL-BEVEL GEAR UNIT  
(SHAFT MOUNTED)



COMBINED COUPLING-CLUTCH  
AND BRAKE

HELICAL-BEVEL GEAR UNIT  
(FLANGE MOUNTED)

HELICAL SPEED REDUCER  
FOR EXTREMELY  
LOW SPEEDS