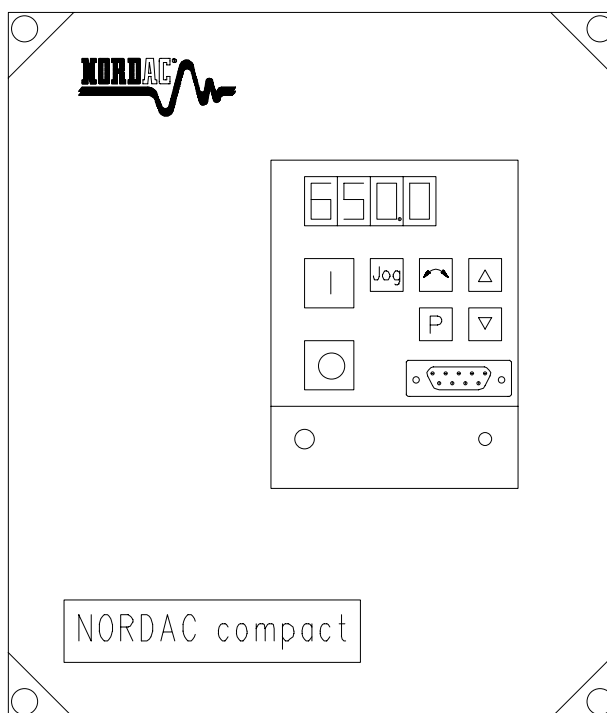


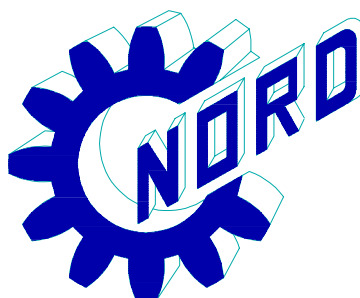
OPERATING INSTRUCTIONS

NORDAC compact Frequency Inverter

SK 250/1 FNC	...	SK 2200/1 FNC
SK 250/2 NC	...	SK 22000/2 NC
SK 1500/3 NC	...	SK 37000/3 NC
SK 7500/4 NC	...	SK 37000/4 NC



BU 3300/96 GB
October 1996





NORDAC compact frequency inverter



Safety and operating instructions for drive converters

in conformity with the low-voltage directive 73/23/EEC

1. General

In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioning as well as maintenance are to be carried out by skilled technical personnel (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

Drive converters are components designed for inclusion in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal operation) is admissible only where conformity with the EMC directive (89/336/EEC) has been established.

The drive converters meet the requirements of the low-voltage directive 73/23/EEC. They are subject to the harmonized standards of the series prEN 50178/DIN VDE 0160 in conjunction with EN 60439-1/ VDE 0660, part 500, and EN 60146/ VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converters shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converters, the applicable national accident prevention rules (e.g. VBG 4) must be complied with. The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converters bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converters shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. Act respecting technical equipment, accident prevention rules etc. Changes to the drive converters by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be respected.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

KEEP SAFETY INSTRUCTIONS IN A SAFE PLACE!

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1 General

The NORDAC *compact* is an inverter with a constant voltage DC link circuit for variable-speed three-phase AC motors which is capable of controlling motors with a rating between 250 watt and 37 kilowatt.

Control is handled by an internal microprocessor. Owing to a special method of pulse width modulation with selectable pulse frequency the motor is exceedingly quiet in operation. Effective and comprehensive protection of both the inverter and the motor is accomplished by various protective functions.

The mode of operation of the NORDAC *compact* unit can be adjusted to virtually any operating conditions by entering special parameter values using the keys provided for the purpose. Sophisticated speed adjustments, special ramp times, precise stopping and many other operational features can be achieved since special microcomputer technology has been developed for power electronics applications.

Load compensation is effected automatically by the current control system which permits automatic adaptation to the system requirement by Flux Current Control (FCC). A programmable ramp generator enables precisely defined acceleration and deceleration of the motor with adjustable jerk control. (Smoothing)

The programmable or optionally automatic boost feature ensures reliable starting of the motor. High-resolution speed adjustment is possible.

A programmable DC injection braking permits rapid and defined stopping. An integral brake-chopper (devices up to 5,5 kW only) together with the optional braking resistor facilitates driving and braking in both directions of rotation (4-quadrant operation) and can also be used to produce a high braking torque.

Five programmable binary inputs allow versatile control. A serial interface with bus capability (RS 485) permits easy connection to data networks as well as the interconnection of up to 31 NORDAC *compact* units. The inverter is provided with two relay outputs for fault signals and system messages.

1.1 Delivery

Examine the device **immediately** after delivery for transport damage such as distortions or loose parts. If damage has occurred contact the transport company without delay, make a careful note of the damage.

Important! This applies even if the packaging is undamaged.

1.2 Scope of delivery

Standard version:	IP 21 panel mounting unit Operating instructions Integrated display and keyboard, from 7,5 kW with clear text display (parameter setting-box) Integrated brake-chopper up to 5,5 kW Serial interface RS 485
Accessories available:	Braking resistor IP 20 Braking unit from 7,5 kW Mains filter for interference suppression Output choke, for use with long motor cables Interface converter RS 232 → RS 485 Parameter-software NORDCON Parameter setting-box

1.3 Installation and operation

Installation:	Installation by qualified personnel only! Observe local regulations applicable to installation of electrical systems! Adhere to accident prevention regulations!
Fault current:	Conventional earth-leakage circuit breakers are not suitable as sole protection when the local regulations do not allow a possible direct current component in the fault current (see DIN VDE 0160 section 6.5)
Leakage current :	It is not permitted to operate the frequency inverter without effective earthing continuity according to the local regulations for high leakage current (>3,5mA)!
Before switching on:	Re-attach all covers and guards!

CAUTION! DANGER!

The power section can still be live up to 5 minutes after being disconnected from the mains. Inverter terminals, motor supply cables and motor terminals can still be live!

Touching exposed or unconnected terminals, cables or parts of the device can lead to serious injuries or even death!

Important note! Caution! A motor stop can be caused by electronic disable, terminal short-circuit or blocked drive.

- Inverter terminals, motor cables and motor terminals are still live.
- A motor stop is not synonymous with an electrical isolation from the mains.
- Automatic run-up of the motor is possible if the inverter is not disconnected from the mains!

The electronic disable facility is not a device as defined by German Accident Prevention Regulations (UVV)!

The terminals of the control board are not at mains potential.

1.4 Wiring guidelines to minimise the effects of EMI

The inverters are designed to operate in an industrial environment where a high level of Electro-Magnetic Interference (EMI) can be expected. Usually, good installation practices will ensure safe and trouble-free operation. However, if problems are encountered, the following guidelines may prove useful. In particular, grounding of the system (0V) at the inverter, as described below, may prove effective.

- (1) Ensure that all equipment in the cubicle is well earthed using short, thick earthing cable connected to a common star point or busbar. It is particularly important that any control equipment that is connected to the inverter (such as PLC) is connected to the same earth or star point as the inverter via a short, thick link. Flat conductors (e.g. metal brackets) are preferred as they have lower impedance at high frequencies.

The return earth from motors controlled by the inverters should be connected directly to the earth connection (PE) on the associated inverter.

- (2) Use saw-tooth washers when mounting the inverter and ensure that a good electrical connection is made between the heatsink and the panel, removing paint if necessary.
- (3) Wherever possible, use screened leads for connections to the control circuitry. Terminate the ends of the cable neatly, ensuring that long strands of unscreened wire are not left visible.
- (4) Separate the control cables from the power connections as much as possible, using separate trunking, etc. If control and power cables cross, arrange the cables so that they cross at 90° if possible.
- (5) Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors, **fitted to the coils**. Varistor suppressors are also effective. This is particularly important if the contactors are controlled from the relays on the inverter.
- (6) Use screened or armoured cables for the power connections and ground the screen at both ends. If possible directly at the frequency inverter-PE.
- (7) If the drive is to be operated in a noise-sensitive environment, the RFI filter kit should be used to reduce the conducted and radiated interference from the inverter. In this case, the filter should be mounted as close to the inverter as possible and well grounded (see (2) above).
- (8) Select the lowest switching frequency possible. This will reduce the amount of EMI generated by the inverter.

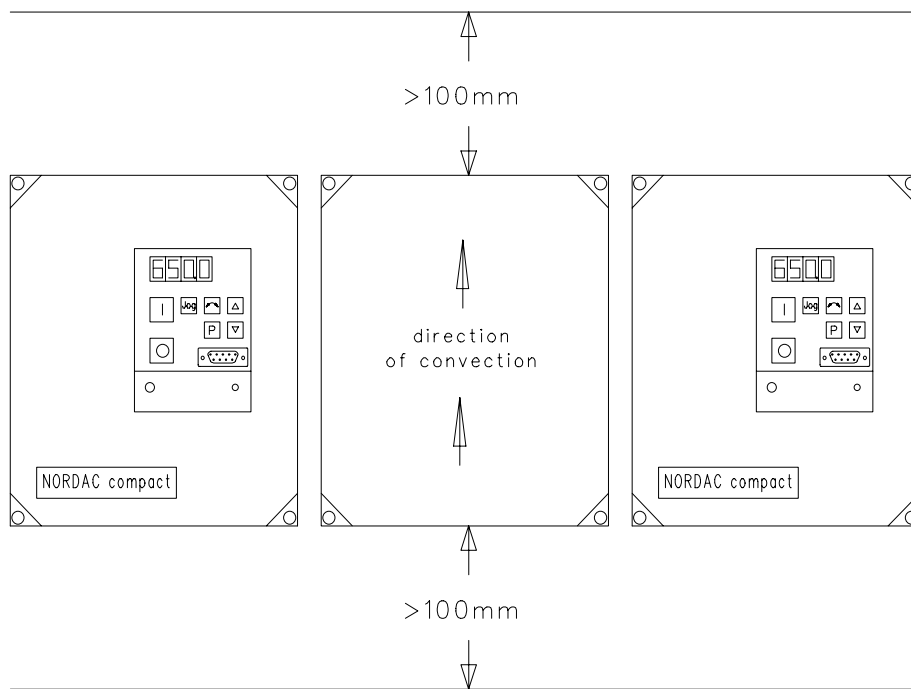
On no account must safety regulations be compromised when installing inverters !

2 Installation

The equipment requires adequate ventilation. For this purpose a minimum distance of 100 mm between top- and lower edge of the devices to the above or below assembly groups must be observed.

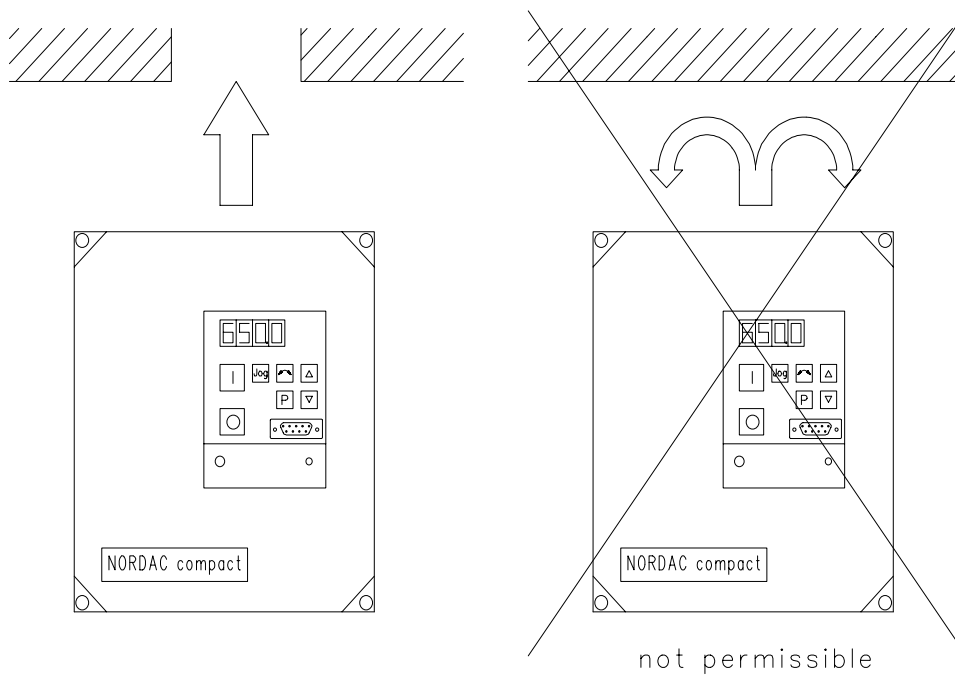
No additional distances towards the sides are required. The mounting can be done directly side by side.

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



If several inverters are installed one above the other, ensure that the temperature of the air drawn in remains within the allowable limits $\rightarrow 0 \dots 40^\circ\text{C}$.

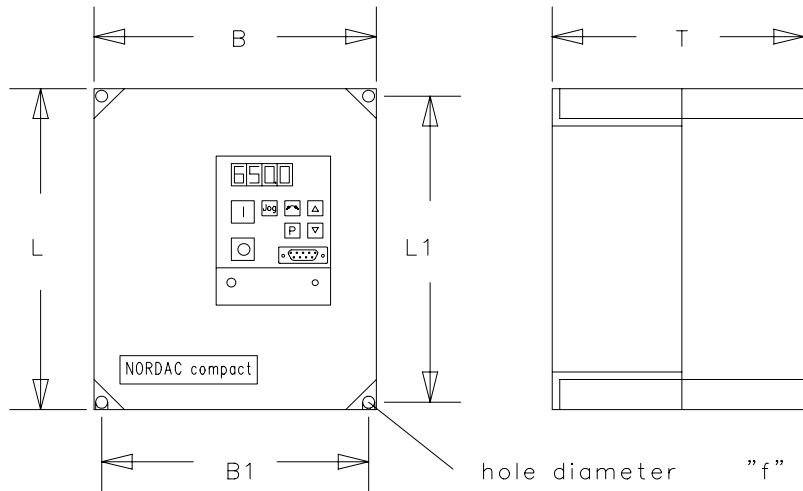
Without housing cover temperatures up to 50°C are possible, local regulations have to be observed.



3 Dimensions

3.1 Frequency inverter dimensions

Version shown IP 21



Type	B	L	T	B1	L1	f
SK 250/1 FNC to SK 750/1 FNC SK 250/2 NC to SK 750/2 NC	112	182	113	103	173	4,5
SK 1100/1 FNC to SK 1500/1 FNC SK 1100/2 NC to SK 1500/2 NC	149	184	157	138	174	4,8
SK 2200/1 FNC SK 2200/2 NC to SK 3000/2 NC	185	215	162	174	204	5,6
SK 1500/3 NC to SK 5500/3 NC	185	215	162	174	204	5,6
SK 5500/2 NC SK 7500/3 NC and SK 11000/3 NC SK 7500/4 NC and SK 11000/4 NC	275	450	200	235	430	8,5
SK 7500/2 NC and SK 11000/2 NC SK 15000/3 NC and SK 18500/3 NC SK 15000/4 NC and SK 18500/4 NC	275	550	202	235	530	8,5
SK 15000/2 NC to SK 22000/2 NC SK 22000/3 NC to SK 37000/3 NC SK 22000/4 NC to SK 37000/4 NC	275	650	278	235	630	8,5

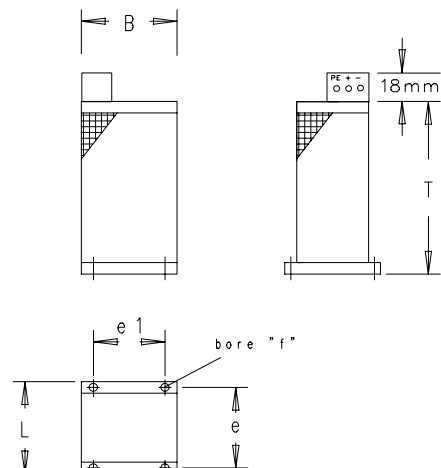
All dimensions in mm

3.2 Dimensions/data of braking resistor (optional)

Version shown IP 20

Baking resistor	B	L	T	e	e1	f
200 Ω / 44 W	65	100	123	90	45	4,5
82 Ω / 100 W	65	100	220	90	45	4,5
120 Ω / 180 W	65	100	220	90	45	4,5
60 Ω / 360 W	170	100	220	90	appr.150	4,5
40 Ω / 540 W	170	100	220	90	appr.150	4,5
Other resistors on request!						

All dimensions in mm



4 Electrical installation

To connect the electrical leads it is necessary to open the unit. The housing cover is attached to the housing by one, four or six screws.

CAUTION!

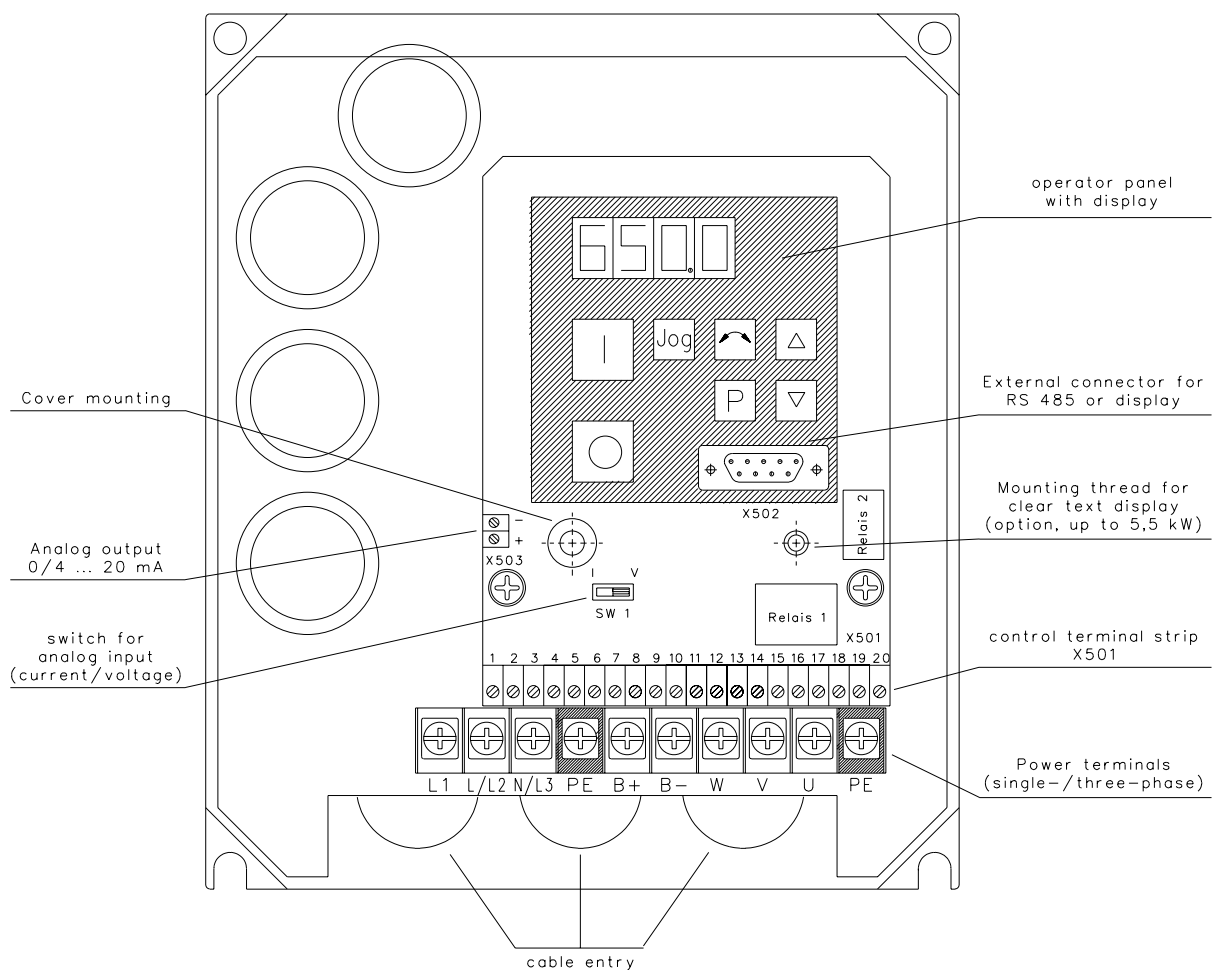
On the exposed printed circuit boards there are areas and components which carry extremely high direct voltages. It is not permissible to switch on the mains voltage while the device cover is removed!

The printed circuit boards which will be exposed upon removal of the cover carry highly sensitive CMOS-semiconductor components which are liable to be 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 only the screws of the terminal strips are allowed to be touched with insulated screwdrivers.

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

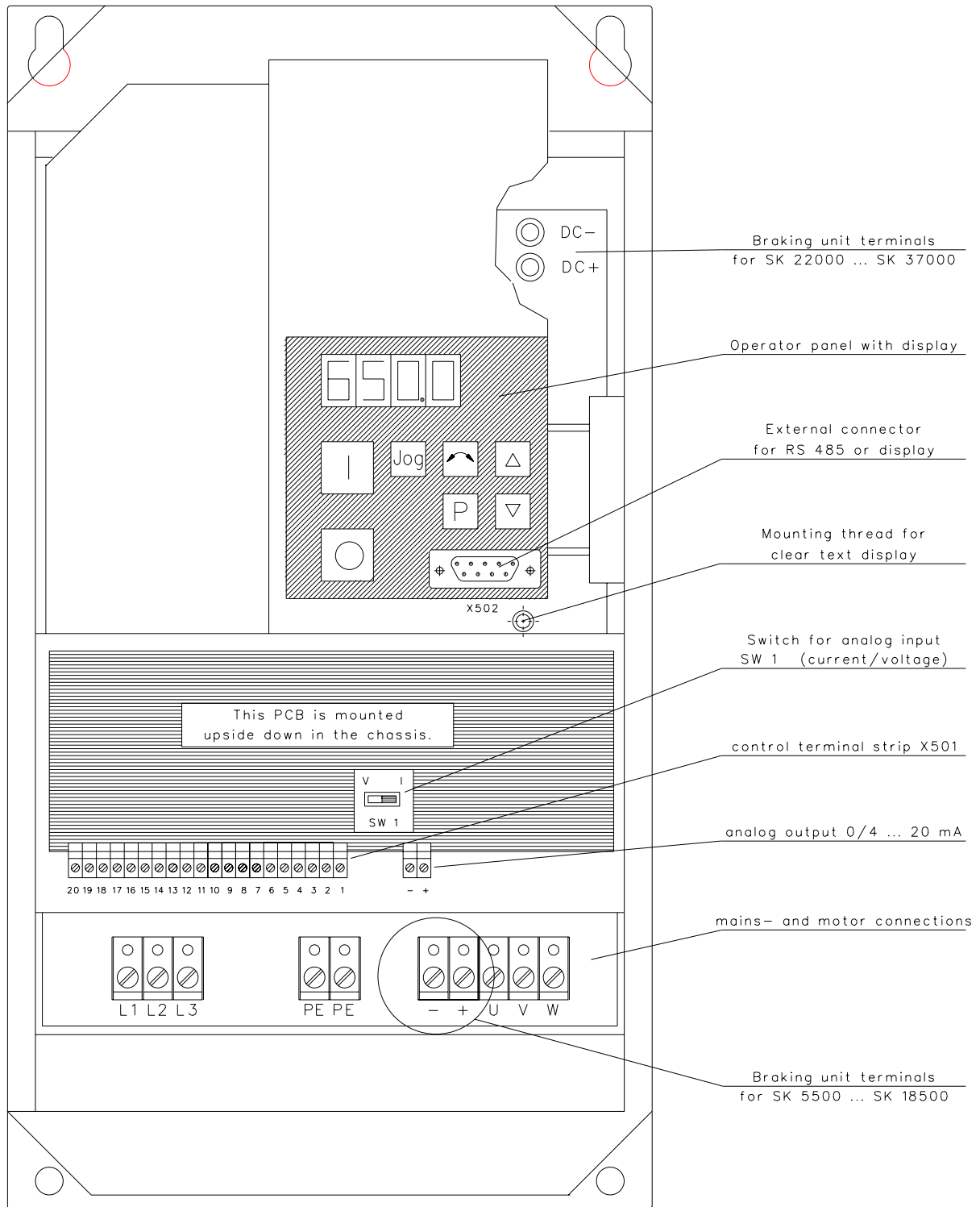
For observance of the current EC-guidelines to the EMC-law (from 01.01.1996) it is necessary to use a mains filter which is recommended by the manufacturer (this does not apply to devices with integrated mains filter) and to lay shielded cables. Make sure that the connection of the leads is perfect and that there is a good earth continuity on a centralized neutral point. (Comp. item 1.4)

4.1 View of SK 250/1 FNC to SK 5500/3 NC



Note: Depending on the type of device 3 connections (L/N/PE) or 4 connections (L₁/L₂/L₃/PE) are at the mains input. Connecting the motor the right motor voltage has to be cared of (star- resp. triangle-connection).

4.2 View of SK 5500/... NC to SK 37000/... NC



Note: There is a small deviation in the power terminal version of SK 22000/3 NC to SK 37000/3 NC !

4.3 Power section SK 250/1 (F)NC to SK 5500/3 NC

Connection for mains,

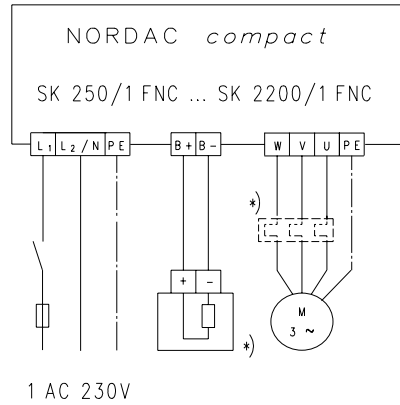
braking resistor and motor:

Maximum wire cross-sectional area:

Motor lead:

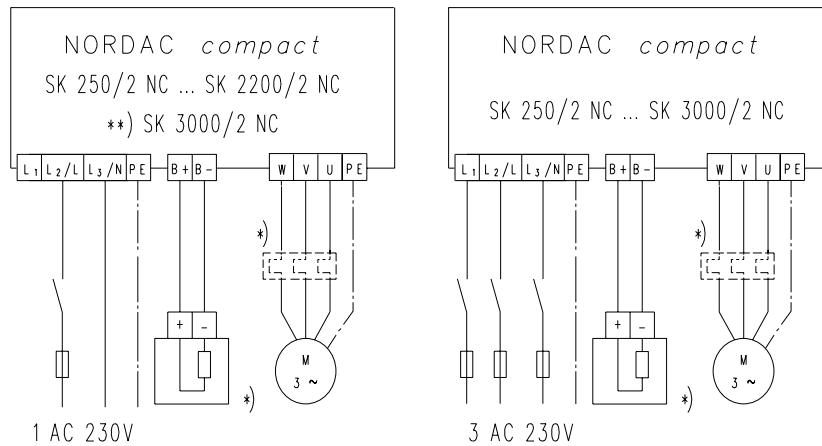
- via screw-type terminal strips on the lower output stage board
- 2,5 mm²
- max. 50 m using not shielded cable.
max. 25 m using shielded cable. The cable shield has to be laid both-sided, on the motor and directly on PE at the inverter.

4.3.1 SK 250/1 FNC to SK 2200/1 FNC, single phase, 230V



*) usage if required (option)!

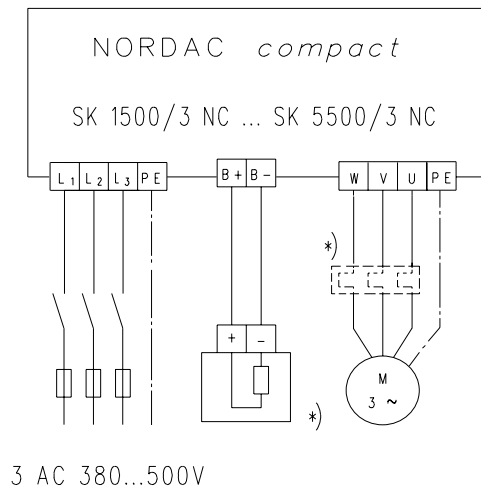
4.3.2 SK 250/2 NC to SK 3000/2 NC, single or three phase, 230V



*) usage if required (option)!

** CAUTION! The one-phase mains connection 230 V of SK 3000/2 NC is only permissible with a commutating reactor (4EM61) !

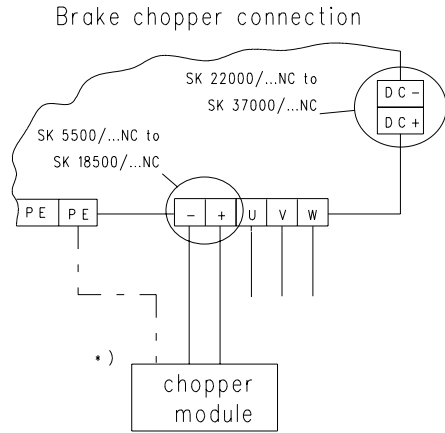
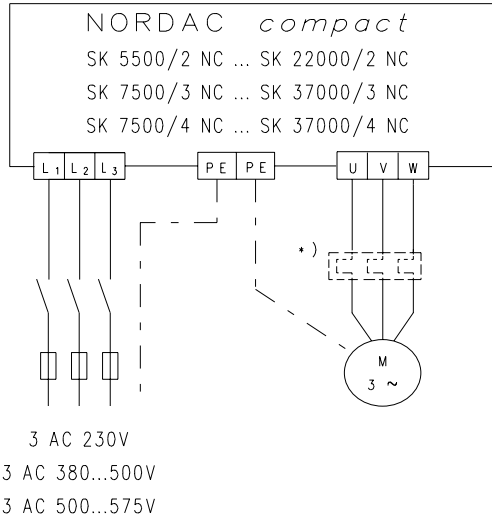
4.3.3 SK 1500/3 NC to SK 5500/3 NC, three phase, 380-500V



*) usage if required (option)!

4.4 Power section SK 5500/... NC to SK 37000/... NC

- Connection for mains and motor: - via screw-type terminal strips on the lower output stage board
 Maximum wire cross-sectional area: - 4 - 35 mm²
 Motor lead: - max. 50 m using not shielded cable.
 - max. 25 m using shielded cable. The cable shield has to be laid both-sided at the motor and directly on PE at the inverter.

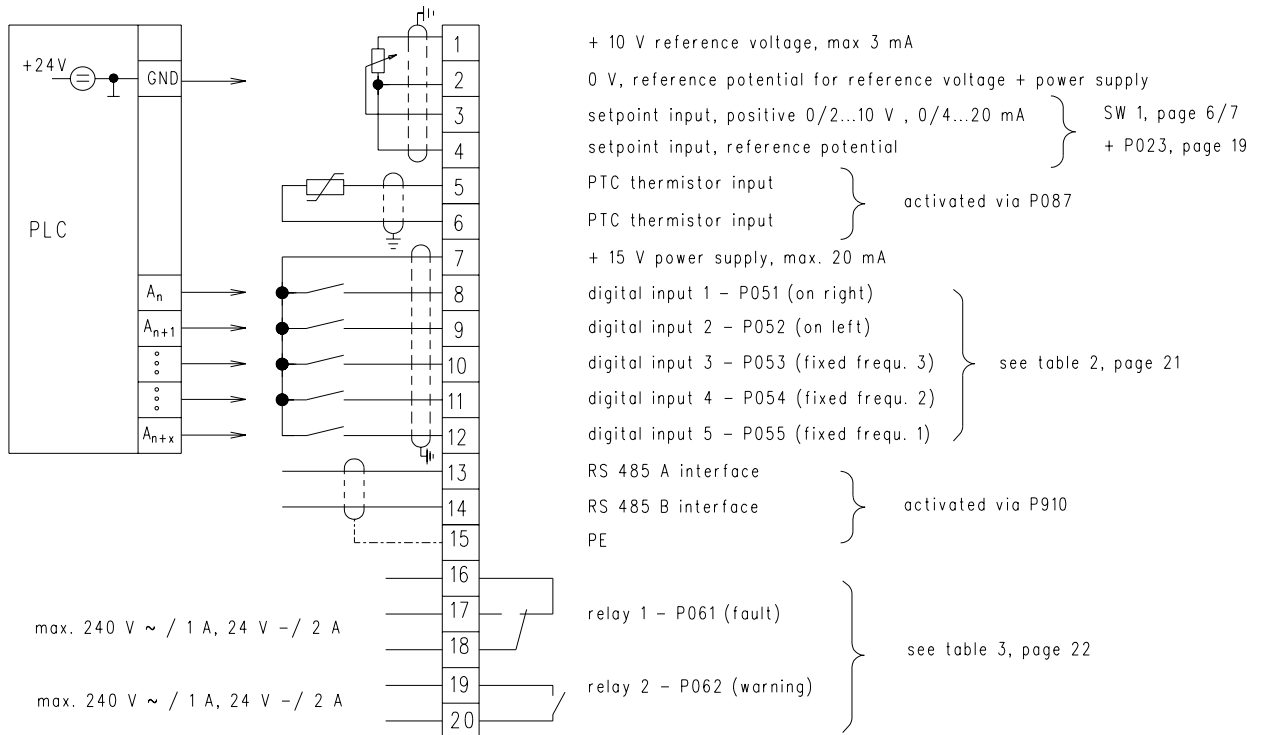


***) usage if required (option)!**

A safe motor protection against overtemperature at the frequency inverter is only guaranteed with a motor temperature detector (not with a motor protecting switch). Using a motor PTC-thermistor (P087 ⇒ 1) a separate installation from the motor cable has to be ensured. If necessary installation has to be done with a shielded cable.

4.5 Control section

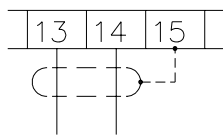
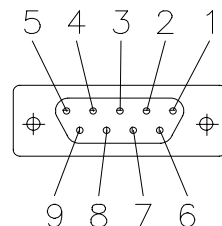
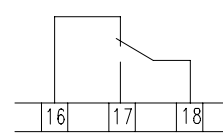
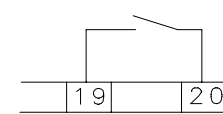
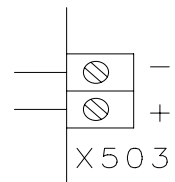
- Connection for the control wires: - 20-pole control terminal strip with screw terminals, max. 1,5 mm²
 Connection for the analog output: - 2-pole screw terminal, max. 0,75 mm²
 Changeover switch for the analog setpoint: - 1 pole switch on the control board, SW 1
 Cable: - install separately from mains-/motor leads and shield cable if necessary



The reset parameter adjustments for the relay functions and digital inputs are added in brackets.

4.5.1 Control inputs

Terminal X 501	Function / Notes	Data	Circuit / Circuit proposal
1 2	GND Reference voltage for analog setpoint input Loadability:	0 V 10V max. 3 mA terminals: 1,5mm ²	
3 4	Analog setpoint input positive negative Difference amplifier input Input resistance: Voltage Current	0 / 2 ... 10 V 0 / 4 ... 20 mA approx. 60 kΩ approx. 300 Ω R = 5 ... 10kΩ terminals: 1,5mm ²	<p>a) </p> <p>b) </p> <p>c) </p>
5 6	Motor- PTC input Response threshold:	1 ... 2 kΩ terminals: 1,5mm ²	
7 8 9 10 11 12	Power supply for the control inputs Loadability: Reference potential for the digital control inputs is terminal 2!! Control input 1 Control input 2 Control input 3 Control input 4 Control input 5 Input resistance:	+15V max. 20mA low level: 0...3V high level: 13...33V positive logic approx. 6,2 kΩ terminals: 1,5mm ²	<p></p> <p></p>

Terminal X 501	Function / Notes	Data	Circuit / Circuit proposal
13 14 15	Interface input <u>internal</u> RS 485 - B RS 485 - A PE - reference potential for RS 485-interface	terminals: 1,5mm ²	
or X502 D-plug	Interface input <u>external</u> Only usable if the internal connections (terminal 13/14) are not used.	3 → RS 485 - A 5 → 0 V, GND 6 → 5V-supply 8 → RS 485 - B	
16 17 18	Relay 1 (P061) , changeover contact <u>Warning</u> : an external inductive load must be suppressed in a suitably way (see chapter 1.4)	240 V ~ / 1,0 A 24 V = / 2,0 A terminals: 1,5mm ²	
19 20	Relay 2 (P062) , make contact <u>Warning</u> : an external inductive load must be suppressed in a suitably way (see chapter 1.4)	240 V ~ / 1,0 A 24 V = / 2,0 A terminals: 1,5mm ²	
X 503			
+ / -	Analog output (P025) Loadability: Output of an analog current corresponding to the output frequency, the frequency setpoint, the output current, the intermediate circuit voltage, the motor torque or the motor speed.	0 / 4 ... 20 mA 0 ... 500 Ω terminal: 0,75mm ²	

5 Operation and display

General:

- Display with a 4-digit LED 7-segment display
- Programming with 3 keys
- Control with 6 keys

5.1 Display and keyboard

After mains switch-on the operating value indication appears on the display, in the reset parameter the actual output frequency is adjusted.

The P-key must be operated for parameter setting in order to get from the parameter value to the display of the parameter numbers.

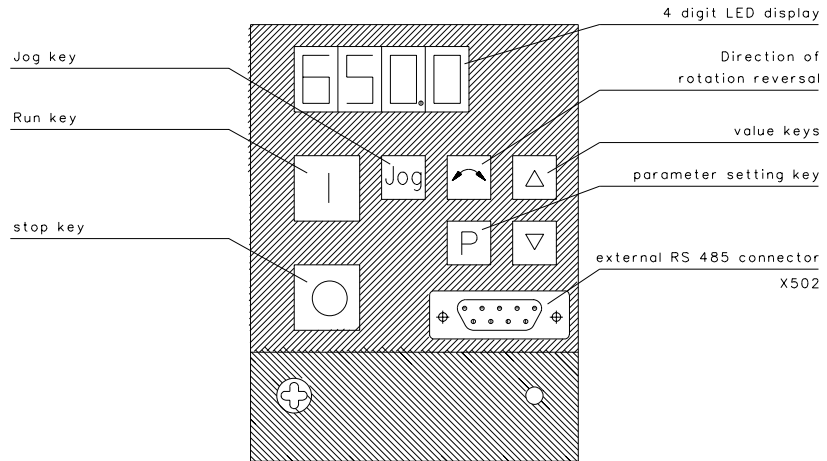
With the value keys it can now be changed between individual menu items.








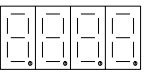
If the P-key is operated once more the content of the selected menu item appears.

E.g.: P002 → 10.0 s, acceleration time

With the value-keys the value of this menu item can now be changed.

In order to get to the operating value indication again the P-key has to be operated for reaching the menu line P000 with the value keys. After further operation of the P-key the selected operating value indication appears.



Key	Function	Description
	RUN key	To start the inverter while the key control is selected in P007 ⇒ 1 (reset parameter).
	STOP key	To stop the inverter while key control is selected in P007 ⇒ 1 (reset parameter). This key is also active if P007 ⇒ 0.
	P key	To change between parameter value (content) and parameter number (line). By operating this key twice, the key can also be used to delete the error memory if the error does not exist anymore. (1. indicate P000 , 2. delete error memory)
	Value keys (higher and lower)	To go through the menu lines (up and down). To change the values of the menu items (increase and reduce).
		To change the output frequency (positively and negatively) while keyboard control is selected. By setting the menu item P124 ⇒ 0 the value keys can be disabled.
	JOG key	Pressing this key while the inverter is stopped causes it to accelerate to the preset frequency. The inverter stops as soon as the key is released. (Data via P031 to P034 jog setpoints) This key is disabled during „normal operation“ or P123 ⇒ 0.
	Direction of rotation reversal	If this key is operated once while selected keyboard control the direction of rotation of the rotary field (output by the inverter) is changed . The display will indicate this by prefixing a minus sign „-“ to the output frequency indication. For values over 99,9 instead of the minus sign a flashing decimal point is indicated after the first digit .
	4 digit 7-segment display	Displays parameter numbers, parameter values and the error code. Within normal mode the frequency is indicated to one digit behind the comma. In order to set also the second digit after the comma after frequency value setting the P-key must be pressed until indication '---,n0' appears. Now the second digit after the comma can be set. A 'flashing display' indicates a warning. The kind of warning can be read in P931.

5.2 Keyboard control

In the delivery condition (P007 \Rightarrow 1) the inverter can be operated without any wiring of the control terminal strip. The control is done via keys on the inverter.

5.3 Control via control terminal strip

The existing digital control inputs (terminal 8 -12 if P007 \Rightarrow 0) can be programmed to various functions. For this purpose the menu items P051 to P056 and the corresponding table 2 are necessary.

- The control inputs can be controlled with potential-free contacts by means of the existing 15 V DC voltage supply (terminal 7).
- Alternatively it is also possible to use the 24 V-outputs of an PLC directly. The reference potential for the inputs is terminal 2 (GND).

5.4 Relay

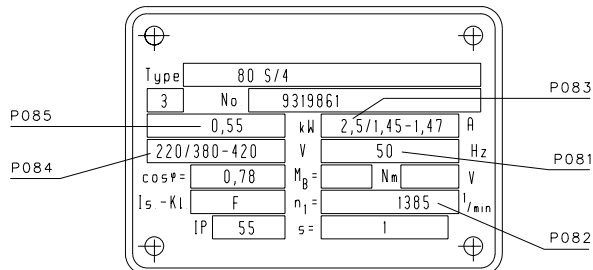
The pilot relays which are integrated in the frequency inverter can be programmed for various functions. Programming is done via the menu items P061 to P065 and table 3 in chapter 7.

6 Commissioning

6.1 Motor data

The inverter is programmed at the factory for standard applications on 4-pole standard motors. When using other motors or motors with a nominal power which does not correspond to the nominal power of the inverter, it is necessary to enter the specifications from the motor's rating plate into parameters P081 to P085. Please note that access to these parameters is not possible unless P009 has been set to 002 or 003.

Besides, it is necessary to switch off the current control if it concerns multi-motor operation or the usage of synchronous motors (P077 not 1).



Note: Ensure that the right motor inverter combination was selected, i.e. that voltages (star- or delta connection) correspond to each other and the maximum inverter currents are not exceeded.

6.2 Parameter setting at the first commissioning

The NORDAC compact frequency inverter is delivered with the adjustment that the related 4-pole standard motor can be driven with inverter nominal power without further pre-setting. Furthermore no control connections are required at all. The keys on the device serve to control the inverter.

After the mains voltage has been switched on following is necessary for operation :

- To operate the green **ON key**. The inverter now supplies 0 Hz at the output, the motor does not run.
- With the **value keys** (increase/reduce) the output frequency can be changed (→ digital setpoint).
- A direction of rotation reversal is caused with the **reversal key**.
- Stopping of the drive can be achieved with the **stop-key**. It can be started again with 0 Hz or the minimum motor frequency which is set in P012.
- If the last set frequency value should be stored, P011 ⇒ 1 is necessary. This is then always valid as initial value after switch off and switch on, also after mains-off.
- It is also possible to set an initial value (frequency setpoint digital) directly in P005. This one is changed during operation if P011 ⇒ 1 .
- If the output frequency is selected as display (P001 ⇒ 0) and the inverter is not released then the corresponding setpoint (P005 or in accordance with the selection in P006) appears or the adjusted minimum frequency (P012) appears in 1,5 sec intervals on the display.

6.3 Parameter setting of the control terminal strip

If the control terminal strip is wired as shown in the connection diagram under chapter 4.5 it is possible to control the inverter completely from outside. Following parameter items have to be changed to reach a function :

- For disconnection of the keyboard control set P007 ⇒ 0 .
- On the control terminal strip enable-right (on right) is on control terminal 8 now and enable-left (on left) is on terminal 9. One of these both inputs must be controlled with a high signal (>13 V) . The digital control inputs are defined via P051 to P055.
- Via menu item P006 the frequency setpoint selection is made.

6.3.1 Digital setpoint

- After a release signal has been applied it is possible to increase and reduce the output frequency with the value keys directly on the frequency inverter. P006 ⇒ 0, digital setpoint
P005 is the initial value after a release
- By P024 ⇒ 1 an analog setpoint can be added to the digital adjustment.

6.3.2 Analog setpoint

- a) P006 ⇒ 1 stands for the control with an analog setpoint, e. g. a 10 kΩ potentiometer on the terminals 1 - 2 - 3. As the setpoint input is about a differential input a **wire jumper** from terminal 4 to 2 is necessary, terminal 4 should not remain open.
SW 1 must be set to V (see chapter 4).
- b) Alternatively it is also possible to control with an analog current setpoint (0/4 ... 20 mA). For definition of this function the switch on the control board has to be operated SW 1 ⇒ I. The menu item P023 defines whether it is run from 0 / 4 mA ... 20 mA.

6.3.3 Fixed frequencies or motorpotential functions

- a) P006 ⇒ 2. Now it is possible to retrieve four adjustable frequency values via the control terminal strip. These values are added if controlled simultaneously.
- b) The set value for the digital inputs will be 6 then (P052 to P055).
- c) Output frequencies can also been changed steplessly (through the control inputs) via the set values 11 and 12.

6.4 If the motor does not start up

If the motor does not start up when the ON command has been given check if a frequency setpoint is entered if the motor specifications have been entered correctly under the parameters P081 to P085. Beforehand the access to these parameters must be enabled by a corresponding adjustment of P009. Check the setting of the frequency setpoint under the parameter number P005 and P006 .

Meaning of the parameter settings:

P081	
P082	The data of the motor rating plate
P083	must be entered in these parameters
P084	
P085	
P086	Motor current limiting
P089	Stator resistor of the motor is measured and stored automatically via P088
P005 = 0	Means that the digital setpoint is on 0 Increase of the setpoint value by changing P005 or setting the value keys in the value mode of P000.
P006 = 0	Means that the digital setpoint value is used as setpoint (frequency setting via the value keys)

If the motor does not run after parameters have been changed accidentally, reset the NORDAC compact to the factory default parameter values by setting P944 ⇒ 1 and then pressing the P key. Afterwards you should check the motor data of P081 - P085 (possibly also P089) and re-enter them if necessary.

If there is a high starting torque please set P088 ⇒ 1 before ON-command. At the next switch on the stator resistance of the motor will be measured and stored. This value is significant for the motor current at low frequencies.

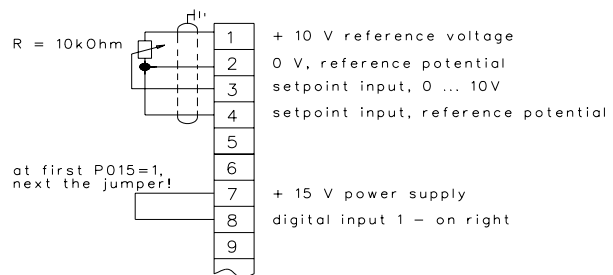
Using a wire jumper for the "ON-command" P015 must be programmed to 1 → automatic restart!

6.5 Minimum assignment / configuration of the control terminal strip

For the easiest control via control terminal strip the items :

- P006 = 1
- P007 = 0
- P009 = 3
- P015 = 1 have to be programmed.

The control has to be carried out as shown on the drawing.



Caution ! Mains voltage connection might lead to an immediate re-start of the motor !

P015=1 is the automatic re-start.

7 Tables of the menu items

Menu item	Function	Setting range	Default setting	Select. setting
P000	Operating display	---		
P001 •	Display selection	0 - 6	0	
P002 •	Ramp up time, related to P013 to 0 Hz	0 - 650,0 sec.	10,0 sec.	
P003 •	Ramp down time related to 0 Hz to P013	0 - 650,0 sec.	10,0 sec.	
P004 •	Smoothing	0 - 40,0 sec.	0	
P005 •	Frequency setpoint (digital)	0 - 650,0 Hz	0	
P006	Frequency setpoint type selection	0 - 2	0	
P007 •	Keyboard operation	0 - 1	1	
P009 •	Key parameters	0 - 3	0	
P011 •	Frequency setpoint memory	0 - 1	0	
P012 •	Minimum motor frequency	0 - 650,00 Hz	0	
P013 •	Maximum motor frequency	0 - 650,00 Hz	50,00 Hz	
P014 •	Skip frequency	0 - 650,00 Hz	0	
P015 •	Automatic restart	0 - 1	0	
P016 •	Flying restart circuit	0 - 4	0	
P017	Smoothing mode (P004 > 0 sec.)	1 - 2	1	
P018	Automatic restart after fault	0 - 1	0	
P021 •	Minimum output frequency, analog ⇒ 0V or 0/4mA	0 - 650,00 Hz	0	
P022 •	Maximum output frequency, analog ⇒ 10V or 20mA	0 - 650,00 Hz	50,00 Hz	
P023 •	Analog setpoint selection	0 - 3	0	
P024 •	Analog setpoint addition (P006 ⇒ 0 or 2)	0 - 1	0	
P025 •	Analog output definition	0 - 105	0	
P031 •	Jog setpoint right	0 - 650,00 Hz	5,00 Hz	
P032 •	Jog setpoint left	0 - 650,00 Hz	5,00 Hz	
P033 •	Acceleration time for jog setpoints, related to P013	0 - 650,0 sec.	10,0 sec.	
P034 •	Deceleration time for jog setpoints, related to P013	0 - 650,0 sec.	10,0 sec.	
P041 •	1. Fixed frequency (DIN 5, terminal 12)	0 - 650,00 Hz	5,00 Hz	
P042 •	2. Fixed frequency (DIN 4, terminal 11)	0 - 650,00 Hz	10,00 Hz	
P043 •	3. Fixed frequency (DIN 3, terminal 10)	0 - 650,00 Hz	20,00 Hz	
P044 •	4. Fixed frequency (DIN 2, terminal 9)	0 - 650,00 Hz	40,00 Hz	
P045	Inversion of fixed frequencies 1. - 4.	0 - 7	0	
P046 •	5. Fixed frequency	BCD coding see page 20	0 - 650,00 Hz	0
P047 •	6. Fixed frequency		0 - 650,00 Hz	0
P048 •	7. Fixed frequency		0 - 650,00 Hz	0
P049 •	8. Fixed frequency		0 - 650,00 Hz	0
P050	Inversion of fixed frequencies 5. - 8.	0 - 7	0	
P051	Selection control function, DIN 1 ⇒ control terminal 8	0 - 17	1 (ON right)	
P052	Selection control function, DIN 2 ⇒ control terminal 9	0 - 17	2 (ON left)	
P053	Selection control function, DIN 3 ⇒ control terminal 10	0 - 17	6 (3. Fixed frequency)	
P054	Selection control function, DIN 4 ⇒ control terminal 11	0 - 17	6 (2. Fixed frequency)	
P055	Selection control function, DIN 5 ⇒ control terminal 12	0 - 17	6 (1. Fixed frequency)	
P056	Digital input debounce time	0 - 2	0	
P061	Selection relay function RL1	0 - 11	6 (Fault message)	
P062	Selection relay function RL2	0 - 11	8 (Warning)	
P063	External brake release delay (function 4)	0 - 20,0 sec.	1,0 sec.	
P064	External brake stopping time (function 4)	0 - 20,0 sec.	1,0 sec.	

The parameters which are marked with • can also be changed during operation.
The factory default settings which are marked with °°° depend on the power of the inverter.

P065	Current threshold for relay function 9	0 - 99,0 A	1,0 A	
P070	Pulse duty factor for braking resistor (brake-chopper)	0 - 4	0	
P071	• Slip compensation 0 ⇒ OFF	0 - 200 %	0	
P072	• Slip limit	0 - 500 %	250 %	
P073	• DC injection braking 0 ⇒ OFF	0 - 250 %	0	
P074	• Motor derating curves as temperature protection	0 - 3	0	
P075	• Braking resistance, activates the internal brake-chopper	0/50/85 - 250 Ω	0	
P076	• Pulse frequency	0 - 10	0 / 4	
P077	Control mode, linear - FCC - quadratic	0 - 2	1 = FCC	
P078	• Static boost (start-up current is changed)	0 - 250 %	100 %	
P079	• Dynamic boost, initial starting torque	0 - 250 %	0	
P081	Nominal frequency for motor	0 - 650 00 Hz	50 Hz	
P082	Nominal speed for motor	0 - 9999 1/min	∞∞	
P083	Nominal current for motor	0,1 - 99,9 A	∞∞	
P084	Nominal voltage for motor	0 - 1000 V	∞∞	
P085	Nominal power for motor	0 - 50,0 kW/hp	∞∞	
P086	• Motor current limit	0 - 250 %	150 %	
P087	• Motor PTC - input enable	0 - 1	0	
P088	Auto calibration, automatic stator resistance measurement	0 - 1	0	
P089	• Stator resistance of the motor	0,01 - 100,0 Ω	∞∞	
P091	• Slave address	0 - 30	0	
P092	• Baud rate	3 - 7	6	
P093	• Telegram down-time control	0 - 240 sec.	0	
P094	• 100 % setpoint when operation via RS 485	0 - 650,00 Hz	50,00 Hz	
P095	• USS compatibility	0 - 2	0	
P101	• Operation for Europe or USA	0 - 1	0	
P111	Inverter power rating	0 - 50,0 kW/hp	Read-only parameter	
P121	Enable/disable ON key	0 - 1	0	
P122	Enable/disable forward/reverse key	0 - 1	1	
P123	Enable/disable JOG key	0 - 1	1	
P124	Enable/disable ↑↓ keys	0 - 1	1	
P131	Frequency setpoint	0 - 650 00 Hz	Read-only parameter	
P132	Motor current	0 - 99,9 A	Read-only parameter	
P133	Motor torque	0 - 250 %	Read-only parameter	
P134	DC link voltage	0 - 1000 V	Read-only parameter	
P135	Motor speed	0 - 9999 1/min	Read-only parameter	
P720	• Special input-/ output control functions	0 - 7	0	
P721	Analog setpoint voltage	0.00 - 10.00 V	Read-only parameter	
P722	• Analog output current control	0.0 - 20.0 mA	--	
P723	Status of the digital control inputs	0 - 31	Read-only parameter	
P724	• Relay control	0 - 3	0	
P910	Local (terminal strip)/remote (RS485) mode	0 - 4	0	
P922	Software version	0 - 9999	Read-only parameter	
P923	• Equipment system number	0 - 255	0	
P930	Most recent fault code	0 - 9999	Read-only parameter	
P931	Most recent warning	0 - 9999	Read-only parameter	
P944	Reset to factory default settings	0 - 1	0	
P971	• EEPROM memory control	0 - 1	1	

The parameters which are marked with • can also be changed during operation.
The factory default settings which are marked with ∞∞ depend on the power of the inverter.

7.1 Explanation of the menu-items and adjustments

Parameter no.	Adjustments and notes
P000	In the operating display the output selected in P001 is shown. In the event of a failure the error message is displayed according to table >>warnings and faults<<. In the event of a warning the display flashes. If the output frequency has been selected in P001 the corresponding setpoint flashes about every 1,5 seconds when the inverter is stopped.
P001	<ul style="list-style-type: none"> • Display selection: <ul style="list-style-type: none"> 0 = Output frequency (Hz) 4 = Motor torque (% of Nm) 1 = Frequency setpoint (Hz) Display works from approx. 10 Hz 2 = Motor current (A) 5 = Motor speed (1/min) 3 = DC link voltage (V DC) 6 = USS status
P002	<ul style="list-style-type: none"> • Ramp up time adjustable from 0 to 650 seconds, related to 0 Hz to f_{max} (P013).
P003	<ul style="list-style-type: none"> • Ramp down time adjustable from 0 to 650 seconds, related to f_{max} (P013) to 0 Hz.
P004	<ul style="list-style-type: none"> • Time from 0 to 40 seconds until the complete acceleration is activated respectively deactivated by edge smoothing \Rightarrow S-form acceleration ramp (P002 or P003 \geq P004) <p>e.g.: P002 \Rightarrow 10 sec. P004 \Rightarrow 5 sec.</p> <p>\Rightarrow total ramp up time = 15 sec.</p>
P005	<ul style="list-style-type: none"> • Initial frequency setpoint (digital) adjustable between 0 and 650 Hz.. Only with P006 \Rightarrow 0!
P006	<p>setpoint selection</p> <ul style="list-style-type: none"> 0 = digital, using "up-down"-keys (value keys) 1 = analog, internal 10 V voltage with potentiometer, external analog setpoint 0 ... 10 V or 0/4 ... 20 mA 2 = Fixed frequency or motor potentiometer, depending on the value of the binary inputs(P051-P055)
P007	<ul style="list-style-type: none"> • Enable or disable of the keyboard operation via front panel. <ul style="list-style-type: none"> 0 = Front panel keyboard is disabled. Control must be done via the digital control inputs. 1 = Keyboard on the front panel is active. Additionally it depends on the parameters P121 to P124.
P009	<ul style="list-style-type: none"> • Determines which parameters can be adjusted. Key parameters are the following: <ul style="list-style-type: none"> 0 = Only parameters from P001 to P009 can be read/set. 1 = Only parameters from P001 to P009 can be set and parameters from P011 to P944 can only be read. 2 = All parameters can be set but P009 automatically resets to 0 when power is removed . 3 = All parameters can be set, also if power had been removed in the meantime.
P011	<p>Non-volatile setpoint memory:</p> <ul style="list-style-type: none"> 0 = Disabled 1 = (Enabled after switch-off i.e. the setpoint alterations made with the up/down-keys or motorpoti are stored even if power has been removed from the inverter).
P012	<ul style="list-style-type: none"> • Minimum motor frequency adjustable from 0.00 Hz to 650.00 Hz but not higher than the adjusted maximum motor frequency.
P013	<ul style="list-style-type: none"> • Maximum motor frequency adjustable from 0.00 Hz to 650.00 Hz but not lower than the adjusted minimum motor frequency.
P014	<ul style="list-style-type: none"> • A skip frequency can be set with this parameter to avoid the effects of resonance of the inverter. Frequencies within ± 2 Hz of this setting are suppressed. Stationary operation is not possible within the suppressed frequency range. The range is just passed through.
P015	<ul style="list-style-type: none"> • With this parameter the function of enabling (on-right/on-left) is influenced. The inverter can restart automatically after a mains break without signal change at the control inputs. <ul style="list-style-type: none"> 0 = Disabled 1 = Automatic restart, effective after mains break

The parameters which are marked with • can also be changed during operation.
The factory default settings which are marked with ∞ depend on the power of the inverter.

Parameter no.	Adjustments and notes																					
P016 •	<p>This parameter allows the inverter to start onto a spinning motor. If this function is activated when the motor is at rest and unloaded a slow rotation occurs.</p> <p>0 = Disabled</p> <p>1 = Flying restart possible after power-up (P015 = 1), fault (P018 = 1) or OFF2-function.</p> <p>2 = Flying restart is always effective, as well after on right/ on left or OFF3-function. Useful for applications, where the motor can be driven by the load.</p> <p>3 = Flying restart possible after power-up (P015 = 1), fault (P018 = 1) or OFF2-function. It is only searched within the selected direction of rotation.</p> <p>4 = Flying restart is always effective, as well after on right / on left or OFF3-function. Useful for applications, where the motor can be driven by the load. It is only searched within the selected direction of rotation.</p>																					
P017	<p>Changes the type of smoothing (P004 > 0 sec).</p> <p>1= Continuous smoothing, as defined by P004.</p> <p>2 = Discontinuous smoothing. The smoothing is interrupted when a reduction in the frequency setting is detected. (For a faster reaction to a setpoint change.)</p>																					
P018	<p>If this function is set to '1', an occurred fault is reset automatically, if possible. If not, the inverter will attempt to restart up to 5 times maximum while the intervals are increasing. After the last unsuccessful attempt the inverter will be finally disconnected.</p> <p>0 = Disabled</p> <p>1 = Automatic restart after fault is active</p>																					
P021 •	<p>Frequency adjustable at applied analog setpoint of 0V/0mA resp. 2V/4mA (determined by P023). This frequency is adjustable from 0.00 to 650.00 Hz and can also be set to a higher value than P022.</p> <p>⇒ Inverting setpoint is possible!</p>																					
P022 •	<p>Frequency at applied analog setpoint of 10V/20mA. This frequency is adjustable from 0.00 to 650.00 Hz and can also be set to a lower value than P021.</p> <p>⇒ Inverting setpoint is possible!</p>																					
P023 •	<p>Select analog setpoint, depending also on the switch SW1 (on the control card).</p> <p>0 = 0 ... 10 V or 0 ... 20 mA</p> <p>1 = 2 ... 10 V or 4 ... 20 mA (the inverter supplies the frequency which is set in P012, resp. P021 if U<2 V or I < 4 mA, possibly 0 Hz ⇒ the controller is not disabled)</p> <p>2 = 2 ... 10 V or 4 ... 20 mA (the inverter will come to a controlled stop if U < 1 V or I < 2 mA ⇒ the controller is disabled, no output signal is supplied)</p>																					
P024 •	<p>The analog setpoint value will be added to the digital setpoint value, a fixed frequency or the motor potentiometer-setting (only if P006 ⇒ 0 or 2).</p> <p>0 = No addition</p> <p>1 = Addition of the analog setpoint to the digital setpoint, to the fixed frequency and/or to the motor potentiometer frequency.</p>																					
P025 •	<p>Analog output, display selection in accordance with the setting value or the nominal value.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">0 ... 20 mA</th> <th style="width: 33%;">4 ... 20 mA</th> <th style="width: 33%;">⇒ Selection via P025</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">100</td> <td>Output frequency, related to P013</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">101</td> <td>Frequency setpoint (i.e. adjusted setpoint at the inverter input), related to P013</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">102</td> <td>Motor(overload)current, related to P083 x P086 / 100%</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">103</td> <td>Inverter dc-link voltage, 20 mA = 1023 V DC</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">104</td> <td>Motor torque, 0% ⇒ 10/12 mA (± display) 0/4 mA = -250%, 20 mA = +250%, $M_{100\%} = \left(\frac{P_{085}}{P_{082}} \right) \times 9,55 \text{ Nm}$</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">105</td> <td>Motor torque, related to P082</td> </tr> </tbody> </table>	0 ... 20 mA	4 ... 20 mA	⇒ Selection via P025	0	100	Output frequency, related to P013	1	101	Frequency setpoint (i.e. adjusted setpoint at the inverter input), related to P013	2	102	Motor(overload)current, related to P083 x P086 / 100%	3	103	Inverter dc-link voltage, 20 mA = 1023 V DC	4	104	Motor torque, 0% ⇒ 10/12 mA (± display) 0/4 mA = -250%, 20 mA = +250%, $M_{100\%} = \left(\frac{P_{085}}{P_{082}} \right) \times 9,55 \text{ Nm}$	5	105	Motor torque, related to P082
0 ... 20 mA	4 ... 20 mA	⇒ Selection via P025																				
0	100	Output frequency, related to P013																				
1	101	Frequency setpoint (i.e. adjusted setpoint at the inverter input), related to P013																				
2	102	Motor(overload)current, related to P083 x P086 / 100%																				
3	103	Inverter dc-link voltage, 20 mA = 1023 V DC																				
4	104	Motor torque, 0% ⇒ 10/12 mA (± display) 0/4 mA = -250%, 20 mA = +250%, $M_{100\%} = \left(\frac{P_{085}}{P_{082}} \right) \times 9,55 \text{ Nm}$																				
5	105	Motor torque, related to P082																				
P031 •	<p>The jog setpoint right fixes the frequency from 0.0 to 650.0 Hz which is supplied by the inverter when the input jogging right is activated. This value can be lower than the minimum frequency (P012).</p> <p>The control function „reversal of direction" (see page 20/21, table 2) is possible.</p>																					

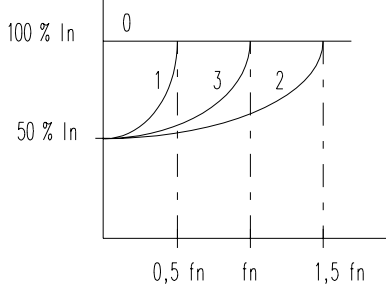
Parameter no.	Adjustments and notes			
P032 •	The jog setpoint left fixes the frequency from 0.0 to 650.0 Hz, which is supplied by the inverter when the input jogging left is activated. This value can be lower than the minimum frequency. The control function „reversal of direction" (see page 20/21, table 2) is possible.			
P033 •	Ramp up time from 0 ... maximum frequency (P013) for the jog function. The ramp up time can be set from 0 ... 650.0 seconds. This time can also be used for other functions or setpoints (control function 16).			
P034 •	Ramp down time from maximum frequency (P013) ... 0 for the jog function. The ramp down time can be set from 0... 650.0 seconds. This time can also be used for other functions or setpoints (control function 16).			
P041 •	1. Fixed frequency	DIN 5 (terminal 12)	The fixed frequency values are added if they are controlled simultaneously.	
P042 •	2. Fixed frequency	DIN 4 (terminal 11)		
P043 •	3. Fixed frequency	DIN 3 (terminal 10)		
P044 •	4. Fixed frequency	DIN 2 (terminal 9)		
P045	With this parameter the direction of rotation can be defined for each individual fixed frequency (see table 1), there will be a correctly signed addition of the fixed frequencies.			
Table 1 Inversion of the fixed setpoints (P045 or P050)				
Setting value	1./5. Fixed frequency	2./6. Fixed frequency	3./7. Fixed frequency	4./8. Fixed frequency
0	⇒	⇒	⇒	⇒
1	⇐	⇒	⇒	⇒
2	⇒	⇐	⇒	⇒
3	⇒	⇒	⇐	⇒
4	⇒	⇒	⇒	⇐
5	⇐	⇐	⇒	⇒
6	⇐	⇐	⇐	⇒
7	⇐	⇐	⇐	⇐
⇒ Fixed setpoint not inverted		⇐ Fixed setpoint inverted		
P046	5. fixed frequency	Fixed frequency 1. to 8. can be read corresponding to table : "binary coded fixed frequency mapping (BCD)" In order to activate this function the digital inputs 3,4 and 5 have to be set to the adjusted value 17 corresponding to table 2.		
P047	6. fixed frequency			
P048	7. fixed frequency			
P049	8. fixed frequency			
P050	With this parameter the direction of rotation for fixed frequencies 5 to 8 can be defined (see also table 1)			
Binary Coded Fixed Frequency Mapping (BCD)				
	DIN 3 (P053)	DIN 4 (P045)	DIN 5 (P055)	
Fixed freq. 5 (P046)	0	0	0	
Fixed freq. 6 (P047)	0	0	1	
Fixed freq. 7 (P048)	0	1	0	
Fixed freq. 8 (P049)	0	1	1	
Fixed freq. 1 (P041)	1	0	0	
Fixed freq. 2 (P042)	1	0	1	
Fixed freq. 3 (P043)	1	1	0	
Fixed freq. 4 (P044)	1	1	1	
Note : If P051 or P052 => 6 while P053 or P054 or P055 => 17, then the setpoints are added.				
P051	DIN 1 (terminal 8)			
P052	DIN 2 (terminal 9)			

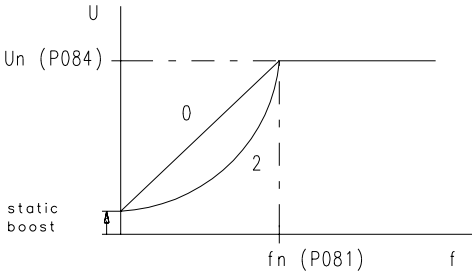
The parameters which are marked with • can also be changed during operation.
The factory default settings which are marked with ∞ depend on the power of the inverter.

Parameter no.	Adjustments and notes						
P053	DIN 3 (terminal 10)	Selection of the control function of the digital inputs, see table 2					
P054	DIN 4 (terminal 11)						
P055	DIN 5 (terminal 12)						
Table 2 Functional selection of the binary inputs							
		P 051	P 052	P 053	P 054	P 055	
Setting-value	Function	DIN 1 terminal 8	DIN 2 terminal 9	DIN 3 terminal 10	DIN 4 terminal 11	DIN 5 terminal 12	active
0	no function	×	×	×	×	×	---
1	on right controller-enabling	×	×	×	×	×	high
2	on left controller-enabling	×	×	×	×	×	high
3	direction reversal of the elect. rotary field after a controller-enabling	×	×	×	×	×	high
4	OFF 2, free slowing down without deceleration ramp	×	×	×	×	×	low
5	OFF 3, quick braking at the maximum dc-link voltage	×	×	×	×	×	low
6	1. - 4. Fixed frequency	×	× (4.)	× (3.)	× (2.)	× (1.)	high
7	Jog right (P031), only without enabling	×	×	×	×	×	high
8	Jog left (P032), only without enabling	×	×	×	×	×	high
9	Automation external operation, only if P910 ⇒ 1 Change between control via the control terminal strip and the interface RS 485.	×	×	×	×	×	high
10	Fault code reset	×	×	×	×	×	flank
11	Increase frequency	×	×	×	×	×	high
12	Decrease frequency	×	×	×	×	×	high
13	Disable analog setpoint	×	×	×	×	×	high
14	Disable P-key	×	×	×	×	×	high
15	Enable dc brake	×	×	×	×	×	high
16	Activate ramp-up generator of the jog setpoints (P033 and P034)	×	×	×	×	×	high
17	Binary fixed freq. control (fixed frequencies 1 - 8) see BCD table			×	×	×	high
× ⇒ possible/permissible settings of the digital inputs							
P056	Digital input response time: 0 = 12,5 ms 1 = 7,5 ms 2 = 2,5 ms This parameter defines the time for which a signal must be applied at the digital inputs in order to trigger off a reaction in the frequency inverter. For applications a total response time of 7,5 ms + one of above mentioned time result from this.						
P061	The configuration of relay RL1 (terminal 16/17/18) is defined with this adjustment. (see table 3)						

The parameters which are marked with • can also be changed during operation.
The factory default settings which are marked with °°° depend on the power of the inverter.

Parameter no.	Adjustments and notes																																										
P062	The configuration of relay RL2 (terminal 19/20) is defined with this adjustment. (see table 3)																																										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">Table 3 Configuration of relay 1 and 2 (P061 and P062)</th> </tr> <tr> <th style="width: 15%;">Setting value</th> <th style="width: 65%;">output-function</th> <th style="width: 20%;">active</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>no output-function</td> <td>low</td> </tr> <tr> <td>1</td> <td>inverter supplies output signal</td> <td>high</td> </tr> <tr> <td>2</td> <td>inverter frequency is 0.0 Hz</td> <td>low</td> </tr> <tr> <td>3</td> <td>motor running direction right</td> <td>high</td> </tr> <tr> <td>4</td> <td>external brake on (see parameter P063 and P064)</td> <td>low</td> </tr> <tr> <td>5</td> <td>inverter output frequency \leq minimum frequency (P012)</td> <td>low</td> </tr> <tr> <td>6</td> <td>total error \rightarrowP930</td> <td>low</td> </tr> <tr> <td>7</td> <td>inverter output frequency \geq setpoint</td> <td>high</td> </tr> <tr> <td>8</td> <td>total warning \rightarrowP931</td> <td>low</td> </tr> <tr> <td>9</td> <td>inverter output current \geq P065</td> <td>high</td> </tr> <tr> <td>10</td> <td>warning : motor current limit (P086)</td> <td>low</td> </tr> <tr> <td>11</td> <td>warning : motor over temperature (I^2t-control)</td> <td>low</td> </tr> </tbody> </table> <p style="margin-left: 40px;">low active: in the indicating status the relay is in its release condition</p> <p style="margin-left: 40px;">high aktiv: in the indicating status the relay is controlled (picked up)</p>	Table 3 Configuration of relay 1 and 2 (P061 and P062)			Setting value	output-function	active	0	no output-function	low	1	inverter supplies output signal	high	2	inverter frequency is 0.0 Hz	low	3	motor running direction right	high	4	external brake on (see parameter P063 and P064)	low	5	inverter output frequency \leq minimum frequency (P012)	low	6	total error \rightarrow P930	low	7	inverter output frequency \geq setpoint	high	8	total warning \rightarrow P931	low	9	inverter output current \geq P065	high	10	warning : motor current limit (P086)	low	11	warning : motor over temperature (I^2t -control)	low
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P063	Only effective if the relay is set to control an external brake (P061 \Rightarrow 4). In this case when the inverter is switched on, it will run at the minimum frequency for the time set by this parameter (P012) before releasing the brake control relay and ramping up.																																										
P064	As P063, only effective if the relay is set to control an external brake. This parameter defines the period for which the inverter continues to run at the minimum frequency (P012) after ramping down and while the external brake is applied.																																										
	<p>Notes: Settings for P063 and P064 should be slightly longer than the actual time taken for the external brake to apply and release respectively.</p> <p>Setting P063 or P064 to too high a value, especially with P012 set to a high value, can cause an overcurrent warning or trip as the inverter attempts to move a locked motor shaft.</p> <div style="text-align: right;"> </div>																																										
P065	Current threshold for current indication. This parameter indicates at which current the pilot relay (RL1 or RL2) switches with the set value 9. The contact opens when it falls below 90 % of the current value (hysteresis).																																										
P070 (only valid if devices have an integr. chopper)	<table style="width: 100%;"> <tr> <td>Pulse duty factor of braking resistor (brake-chopper)</td> <td>0 = Duty factor 5 %</td> </tr> <tr> <td>1 = Duty factor 10 %</td> <td>2 = Duty factor 20 %</td> </tr> <tr> <td>3 = Duty factor 50 %</td> <td>4 = Duty factor 100 %</td> </tr> </table> <p>Note: The „normal“ resistors are designed for duty factor 5 %. Higher duty factors are only allowed to be selected if corresponding resistors are used.</p>	Pulse duty factor of braking resistor (brake-chopper)	0 = Duty factor 5 %	1 = Duty factor 10 %	2 = Duty factor 20 %	3 = Duty factor 50 %	4 = Duty factor 100 %																																				
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P071 •	<p>With this parameter the slip speed of an asynchronous machine which occurs at load can be compensated in an operation of 0% to 200% of the nominal slip. The motor speed approximately correspond to the synchronous speed.</p> <p>WARNING!! When using synchronous motors or motors that are connected in parallel the compensation must be deactivated by setting to zero.</p>																																										
P072 •	<p>With this parameter the slip of the motor can be limited within 0% to 500% of the nominal slip to prevent “pull-out” (stalling). When the slip limit is reached, the inverter reduces the frequency until it is falling below the limiting value.</p>																																										

Parameter no.	Adjustments and notes																																																																																																																								
P073 •	<p>Here the braking current from 0% to 250% of the motor nominal current (P083), inserted for the dc injection braking, is entered. Entering 0 switches off the dc injection braking. DC injection braking is effective for the period of time set by parameter P003 related to the maximum frequency in P013. While the dc braking injection is active, "dc" is indicated on the display.</p> <p>If a relay function is programmed to set value 4 (brake on), then the dc injection braking is ineffective.</p> <p>WARNING: Frequent use of long periods of dc injection braking can cause the motor to overheat !</p>																																																																																																																								
P074 •	<p>Self-cooling fan ventilated motors tend to overheat at low speeds. This is because the current (and therefore the heat) generated in the motor is the same but the rate if heat dissipation from the motor is only about 25 % of normal when the fan is not running. It may be necessary, therefore, to derate a self-cooled motor at low speeds using this parameter. For this function following 3 derating curves are available.</p>  <p>0 = no derating</p> <p>1 = Normally suitable for 2-pole motors which generally have better cooling due to their higher speeds. The inverter assumes that the motor can dissipate full power at $\geq 50\%$ nominal frequency.</p> <p>2 = Try this setting if the motor still runs too hot with P074 set to '3'.</p> <p>3 = Suits most motors, full nominal power delivered at $\geq 100\%$ nominal frequency.</p>																																																																																																																								
P075 • (only valid if devices have an integr. chopper)	<p>Using a braking resistor the inserted resistance value within range $50\ \Omega$ to $250\ \Omega$ must be entered here. 0 switches off the brake-chopper.</p> <p>Lower resistance values can lead to damages of the inverter.</p>																																																																																																																								
P076 •	<table border="0"> <tr> <td>Sets the pulse frequency from 2,44 to 16 kHz and the PWM-mode. 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.</td> <td>0/1 = 16 kHz</td> <td></td> </tr> <tr> <td>Previously used modulation modes 1 and 2 are now combined and selected automatically by the inverter.</td> <td>2/3 = 8 kHz</td> <td></td> </tr> <tr> <td>Mode 3 randomises the pulse frequency to avoid resonance and can be used to reduce noise in the motor.</td> <td>4/5 = 4 kHz</td> <td></td> </tr> <tr> <td></td> <td>6/7 = 2,44 kHz</td> <td></td> </tr> <tr> <td></td> <td>8 = 8 - 16 kHz</td> <td>modulation mode 3</td> </tr> <tr> <td></td> <td>9 = 4 - 8 kHz</td> <td>modulation mode 3</td> </tr> <tr> <td></td> <td>10 = 2,44 - 4 kHz</td> <td>modulation mode 3</td> </tr> </table> <p>NOTE! Operating with 16 kHz the display of the current at frequencies below 10 Hz is less accurate. Reaching the inverter's temperature limit the clock-rate frequency is automatically reduced.</p>	Sets the pulse frequency from 2,44 to 16 kHz and the PWM-mode. 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.	0/1 = 16 kHz		Previously used modulation modes 1 and 2 are now combined and selected automatically by the inverter.	2/3 = 8 kHz		Mode 3 randomises the pulse frequency to avoid resonance and can be used to reduce noise in the motor.	4/5 = 4 kHz			6/7 = 2,44 kHz			8 = 8 - 16 kHz	modulation mode 3		9 = 4 - 8 kHz	modulation mode 3		10 = 2,44 - 4 kHz	modulation mode 3																																																																																																			
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Parameter no.	Adjustments and notes
P077	<p>NORDAC compact can be operated either with current control (FCC) or with U/f-curve.</p> <p>NOTE! When using synchronous motors and motors that are connected in parallel an U/f-characteristic curve has to be adjusted.</p> <p>0 = linear U/f-curve, for constant load torque 1 = FCC-Flux Current Control 2 = quadratic U/f-curve (fan characteristic curve), for squared rising load torque</p> 
P078	<ul style="list-style-type: none"> The start-up current can be set in the range of 0 to 250% of the motor current rating (static boost) in order to adjust the torque at start-up and low frequencies to the load machine. <p>WARNING! If P078 is set too high overheating of the motor can result.</p>
P079	<ul style="list-style-type: none"> For drives which require a high initial starting torque it is possible to set an extra voltage increase by boosting the starting current by 0 to 250% of the nominal motor current. This increase is only effective during initial start up and until the frequency setpoint is reached (dynamic boost) <p>NOTE! This increase is in addition to P078.</p>
P081	Nominal frequency for motor (Hz)
P082	Nominal speed for motor (1/min)
P083	Nominal current for motor (A)
P084	Nominal voltage for motor (V)
P085	Nominal power for motor (kW/hp)
<p>These values must be set for the motor used. Read the specifications on the motor's rating plate. Note : The inverter's default settings vary according to the power rating.</p>	
P086	<ul style="list-style-type: none"> With these parameters the motor nominal current can be limited and overheating of the motor prevented. If the set value is exceeded the output frequency is reduced until the current falls below this limit. During this process the display flashes as a warning indication. <p>At SK 7500/3 NC to SK 37000/3 NC and selection of the quadratic U/f-characteristic curve (P077 ⇒ 2) this value will be permanently set to 100% . No higher values can be adjusted.</p>
P087	<p>PTC enable (control terminals 5/6) 0 = disabled 1 = external PTC enabled</p>
P088	<p>By setting this parameter to 1 an automatic measurement of the stator resistance of the motor is done the next time the inverter is set to run. The measured value is stored in P089 and then reset to 0. If no correct measurement is possible the inverter indicates F188.</p> <p>CAUTION: If one of the signal relays (P061/P062) is programmed to braking control (setting value 4) the automatic stator resistance measurement leads to relay signal (→ brake ventilation)!</p>
P089	<ul style="list-style-type: none"> Values between 0,01 Ω to 100 Ω can be entered or measured by P088 automatically. This value is very important for the motor current at low frequencies ⇒ starting torque! The value entered should be the resistance between any two motor phases.
P091	<ul style="list-style-type: none"> If the NORDAC compact should be operated by a data remote control via serial interface RS 485 it is possible to enter the bus address via this parameter. Range 0 to 30.
P092	<p>The baud rate of the received data telegrams is entered here.</p> <p>3 = 1.200 baud 6 = 9.600 baud 4 = not usable 7 = 19.200 baud 5 = 4.800 baud</p>
P093	<ul style="list-style-type: none"> This is the maximum permissible period between two incoming data telegrams. In applications where the inverter is usually controlled or monitored constantly via the serial link, this feature is used to turn off the inverter in the event of a communications failure. Timing starts after a valid data telegram has been received and if a further telegram is not received within the specified time period, the inverter will trip and display fault code F008. <p>Value 0 switches off the control.</p>
P094	<ul style="list-style-type: none"> In the data telegram setpoints are transmitted in 0% to 100% values. Therefore in this parameter it is necessary to adjust the frequency corresponding 100 % to the setpoint.
P095	<p>USS compatibility 0 = Compatible with 0,1 Hz resolution 1= Enable 0,01 Hz resolution</p> <p>2 = PZD is not scaled but represents the actual frequency value to a resolution of 0,01 Hz.</p>
P101	<ul style="list-style-type: none"> This sets the inverter for European or USA supply and motor values. Also the motor data are set to the corresponding standard (kW/hp). After changing this parameter an initial program loading with P944 is necessary ! <p>0 = Europe, 50 Hz 1 = USA, 60 Hz</p>
P111	Read-only parameter that indicates the power rating. Depending on P101 in kW or hp.

The parameters which are marked with • can also be changed during operation.
 The factory default settings which are marked with ∞∞∞ depend on the power of the inverter.

Parameter no.	Adjustments and notes	
P121	Enable/disable ON key Note: Effective if P007 is set to '1'.	0 = ON key disabled 1 = ON key enabled
P122	Enable/disable forward/reverse key	0 = forward/reverse key disabled 1 = forward/reverse key enabled
P123	Enable/disable JOG key	0 = JOG key disabled 1 = JOG key enabled
P124	Enable/disable value keys	0 = value keys disabled 1 = Value keys enabled
P131	Frequency setpoint (Hz)	Read-only parameter. It is about copies of the values stored in P001; direct access via the serial interface.
P132	Motor current (A)	
P133	Motor torque (%)	
P134	DC link voltage (V)	
P135	Motor RPM (1/min)	
P720	<ul style="list-style-type: none"> Enables a direct access to the control of the output relays and the analog output via the serial interface (RS 485 / USS or the operator box). 	0 = Normal operation 1 = Direct control of relay 1 2 = Direct control of relay 2 3 = Direct control of 1 and 2 4 = Direct control of the analog output 5 = Direct control of the analog output and relay 1 6 = Direct control of the analog output and relay 2 7 = Direct control of the analog output, relay 1 and relay 2
P721	This menu item indicates the approximate setpoint voltage in Volt which applies at the setpoint input.	
P722	<ul style="list-style-type: none"> This menu item controls the current of the analog output, from 0 to 20 mA. Effective if P720 ⇒ 4, 5, 6 or 7. 	
P723	A decimal number (0 ... 31) is indicated which represents the status of the digital control inputs after conversion into a 5 figure binary number (00000 ... 11111). The least significant bit represents DIN1 and the most significant DIN5. E.g. if P723 ⇒ 11, the binary number is '0 1 0 1 1'. That means that the control inputs DIN1, DIN2 and DIN4 are high and the inputs DIN3 and DIN5 are low.	
P724	<ul style="list-style-type: none"> This menu item controls the output relays in connection with P720. 	0 = Both relays off 1 = Relay 1 on 2 = Relay 2 on 3 = both relays on
P910	Sets the inverter for internal control (local control) or remote control (automation) over the serial interface RS 485. Note: When setting value '1' or '3', the analog input remains active when P006 ⇒ 1.	0 = Local control, control terminal strip 1 = Remote control and setting of parameters via RS 485. 2 = Local control, but remote control of frequency setpoint. 3 = Remote control, but local control of frequency setpoint. 4 = Local control of the motor, remote control of parameter setting and ault quit. Local quit. of an error is possible.
P922	This parameter contains the software version of the device and cannot be changed.	
P923	<ul style="list-style-type: none"> Equipment system number. You can use this parameter to allocate a unique reference number to the inverter. It has no operational effect for the inverter function. 	
P930	Last recorded fault code which led to device disconnection. The table in chapter "warnings and faults" is valid for this. This error memory is also preserved after mains switch off.	
P931	The last recorded warning is stored under this parameter until the next voltage disconnection. 002 = Current limit active (P086) 004 = Slip limit exceeded (P072) 003 = Voltage limit active 005 = Motor overtemperature (I ² t, P074)	
P944	With this adjustment it can be reset to the factory default settings. All parameters are reset to the factory default settings, except P101! 0 = no change 1 = resets all parameters to the factory default settings	
P971	<ul style="list-style-type: none"> Specially for control via a bus. 	0 = Parameter changes are not stored in the EEPROM after mains disconnection. The rate of occurrence of write/read cycles is reduced and the lifetime of the EEPROM is extended. 1 = The parameter settings are also preserved after mains disconnection.

The parameters which are marked with • can also be changed during operation.
 The factory default settings which are marked with ∞∞∞ depend on the power of the inverter.

8 Warnings and faults

A large part of the frequency inverter functions and operating data is constantly controlled and compared with the limiting values. If a deviation is realised, the inverter reacts with a warning or fault signal.

- Warnings** → Information but no stopping of the motor. It is worked on a limiting value which is not leading to a stopping at the moment, but might lead to it later.
In the event of a warning the current indication on the display **flashes** and the kind of warning can be read in the menu item **P931**. The last warning is stored until the first mains disconnection.
- faults** → The inverter switches off, error code appears on the display. As long as a fault exist it is not possible to carry on operating the inverter.
When the fault has been corrected, the error memory can be reset with the P-key by mains-off/on or control input (function 10).
The last fault is stored, also after mains disconnection.

8.1 List of possible faults

In the following table all faults which can be registered are represented. These are immediately indicated on the display of the inverter.

Fault code	Fault	Cause	Corrective action
F001	Overvoltage	<ul style="list-style-type: none"> Supply voltage too high. Motor energy recovery too high. Braking time (P003) is too short. No braking resistor or too high-resistance. P075 is on 0 despite braking resistor 	<ul style="list-style-type: none"> Check supply voltage and reduce it, if necessary. Check value of braking resistor Increase braking time. Check connection of braking resistor. Set P075 > 0 .
F002	Overcurrent	<ul style="list-style-type: none"> The internal overcurrent tripping has responded, The overcurrent must have been at a multiple inverter nominal current. Wrong motor-inverter assignment. Wrong motor data. Ramp-up time too short (P002). 	<ul style="list-style-type: none"> Reduce the boost set (P078 and P079). Check motor data (P081 to P089). Check dimensioning of the drive. Increase ramp-up and braking time.
F003	Overload	<ul style="list-style-type: none"> The motor is overloaded. The motor has a very high slip. 	<ul style="list-style-type: none"> Reduce the load of the drive. Increase the maximum frequency (P013) → slip compensation
F004	Overheating of motor (monitoring with PTC thermistor)	If P087 ⇒ 1: <ul style="list-style-type: none"> The connected PTC thermistor has tripped, the motor is overloaded. The control terminals 5 and 6 are open. 	<ul style="list-style-type: none"> Improve cooling of the motor. Check motor dimensioning. Connect PTC thermistor or link control terminals. P087 ⇒ 0
F005	Inverter overtemperature This error can only be reset by mains switch-off and on!	<ul style="list-style-type: none"> Ambient temperature too high. Ventilation not free No vertical installation. 	<ul style="list-style-type: none"> Check / improve switch gear cubicle ventilation. Check ambient temperature of the inverter, max. 40°C. Observe installation/mounting notes under item 2.
F006	Mains phase missing (3-phase units only)	<ul style="list-style-type: none"> Mains phase error 	<ul style="list-style-type: none"> All three mains phases must be checked.
F008	USS protocol timeout	<ul style="list-style-type: none"> Error at data transfer via RS485 P093 is set too small. 	<ul style="list-style-type: none"> Check the serial interface Extend P093 Check settings from P091 to P093.

Fault code	Fault	Cause	Corrective action
F009	Undervoltage	<ul style="list-style-type: none"> Supply voltage is too low. 	<ul style="list-style-type: none"> Please check the mains connection. All three phases and the level of the voltage !
F010	Initialisation fault	<ul style="list-style-type: none"> Error in the program flow. Loss of single set data 	<ul style="list-style-type: none"> Reduce errors on the mains- or control wires. Set P009 \Rightarrow 0000 before power down.
F011	Internal interface fault	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Switch off power and switch on again.
F013 or <u>any</u> digit on the display or <u>no</u> display despite mains voltage	Program fault	<ul style="list-style-type: none"> Program abort 	<ul style="list-style-type: none"> Switch off power and switch on again. Check mains voltage regarding peak strains. Please observe Wiring Guidelines under chapter 1.4!
F015	Flying restart fault	<ul style="list-style-type: none"> Failure 'catching' the motor 	<ul style="list-style-type: none"> Set P016 to another value
F106	Parameter fault in P006	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Parameterise fixed frequencies and / or Motor potentiometer at the binary inputs.
F112	Parameter fault in P012	<ul style="list-style-type: none"> P012 is larger than P013 	<ul style="list-style-type: none"> Set parameter P012 < P013.
F151-154	Digital input parameter fault	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Change settings from P051 to P053.
F188	Stator resistance fault	<ul style="list-style-type: none"> Motor is not connected The resistance is outside the range of value 	<ul style="list-style-type: none"> Measure stator resistance manually (between 2 phases) and then enter in P089. Set P088 \Rightarrow 0. Motor power is too small.

9 EMC-measures

9.1 Radio interference suppression level

The radio interference suppression in accordance with **EN 55011 limit curve B** is observed when using a mainsfilter recommended by us and shielded motor-, braking resistor- and mains cables between filter and inverter.

At one-phase devices with integrated mains filter (**SK 250/1 FNC to SK 2200/1 FNC**) it is possible to reach interference suppression level. An extra external mains filter is not suitable at these units.

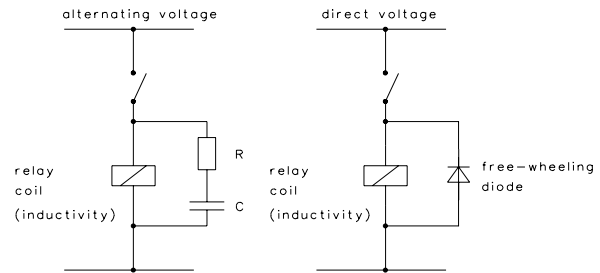
The shield has to be grounded on both sides. The shield on the inverter has to be laid on the metal-mask of the inverter by a corresponding brass PG-screwed joint. The cable shield should not be disconnected, but additionally be put directly on the corresponding PE terminal.

9.2 Noise immunity

NORDAC compact frequency inverters observe following limiting values respectively standards for noise immunity.

Basic specification EN50082-1 for public systems and EN50082-2 for industry which each contain other standards:

Standard	Level req'd	Level met	Notes
EN61002	8kV	15kV, 8kV	8kV contact, 15kV air discharge, metal surfaces
EN61003	3V/m	3V/m	
EN61004	2/4kV	2/4kV	4kV Supply, 2kV Control (cap. coupling)
EN61005 VDE0160	provisional	2kV, 4kV	Line/ Line, Line/ Earth Generally Comply; emerging standard is unclear at present



Inductivities (contactors, braking coils and so on) are to be connected or mains filter are to be inserted if necessary.

9.3 CE-marking

NORDAC compact frequency inverters are electric devices for application in industrial plants. They are destined for application in machines for three phase motor speed control. Notes and recommendations for installation are contained in the operating instruction.

Frequency inverters are not liable for CE-marking. They are not devices in the sense of the EMC-guidelines, as they are exclusively produced as supply-parts for processing by industry and craft and are not used independently.

With the measures recommended under 1.4 and 9.1 the pre-conditions for observance of the EMC-guidelines are fulfilled.

European Low Voltage Directive

The NORDAC compact product ranges comply with the requirements of the Low Voltage Directive 73/23/EEC. The units are certified for compliance with the following standards :

EN 60204-1
EN 60146-1-1

European Machinery Directive

The NORDAC compact inverter series do not fall under the scope of the Machine Directive 89/392/EEC. However, the devices have been fully evaluated for compliance with the Essential Health & Safety requirements of the directive when used in typical machine application.

10 Additional features (OPTIONS)

10.1 Mains filter

Mainsfilter for observance of the radio interference suppression levels are at various nominal current ratings. These are, however, not suitable for SK 250/1 FNC to SK 2200/1 FNC. For all other devices radio interference suppression level B in accordance with EN 55011 is reached.

recommended mains filter, one-phase			
Filter type	Mains voltage	Nominal current	Overload capability
6SE3090-0BA07-0FB0	1 x 250V, 50/60Hz	6,5 A	1,5 · I _N for 3 min / hour
6SE3090-0BC07-0FB1		20 A	
...		25 A	

recommended mains filter, three-phase			
Filter type	Mains voltage	Nominal current	Overload capability
B84143-B8-R	3 x 440V/250V, 50/60Hz	8 A	1,5 · I _N for 3 min / hour
B84143-B12-R		12 A	
B84143-B16-R		16 A	
B84143-B25-R		25 A	
B84143-B36-R		36 A	
B84143-B50-R		50 A	
B84143-B80-R		80 A	

10.2 Output choke

In cases with very long motor cable lengths an output choke has to be installed if necessary. This choke compensates the cable capacity which occurs due to the cable length.

If the output cable capacity is too high this can lead to an overcurrent signal.

10.3 Parameter setting-box (operator panel)

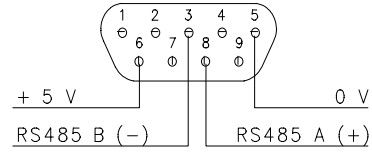
Important ! Before using the parameter setting-box, the parameter P092 (baud rate) must be set to the default adjustment '006'. No further master at the USS bus (e.g. SPS etc.) are possible via serial interface as long as the parameter box is connected with the inverter.

This parameter setting-box is used as enhanced operator panel. Especially this box gives by far more information about the parameter setting and the operating data.

Connection must be done via the external RS 485 socket and a securing screw on the inverter. The inverter does not need to be de-energized for connection.

The operator box has following features:

- 64 character - 4 lines backlit LCD screen.
- Choice of five languages
- Can operate as a master device for controlling up to 31 inverters via RS 485
- Can read and write parameters
- Can store up to 31 parameter sets
- Menu-driven screen options
- Simple to install, also for panel mounting



The front panel keys operate in a similar manner to the original keys on the inverter, i.e. the value-keys change values or scroll within the menu-lines, the P-key changes between menu-line and contents of the menu-line. By the change of value to line with the P-key, the last adjustment is stored automatically (enter).

Immediately after the first commissioning of the parameter setting-box the menu "LANGUAGE" appears. The flashing dashed line (cursor) indicates the language which is selected by operating the P-key.

The display will change to show the main menu (see picture right), out of which various menu groups can be selected. By pressing the value (down)-key and the P-key it can be changed back to the main menu at any time.

```

OPERATE  UP READ
DIAG.    DOWN LOAD
PARA.    LANGUAGE
MODUS    INFO P↑
    
```

OPERATE (Operate)

Selecting OPERATE causes a screen similar to that shown right to appear. The top line indicates the current operational state of the inverter. The arrow indicates the direction of rotation of the motor.

- RPM = Speed of the motor
- F = Output frequency, can be changed with the value keys
- I = Output current
- M = Motor torque

```

P000  RUNNING →
RPM = 1400
F = 50.00 Hz
I = 2.6 A    M = 125 %
P↑
    
```

When the P-key is operated, the screen changes in the parameter selection. Press the value keys to view or change parameter settings. Press P to change between line and content.

```

P000
NORDAC COMPACT
↓ Access parameter
P Operate drive
    
```

DIAG (Diagnostic)

Selecting this option after a fault has occurred causes the diagnostics screen to be displayed. Pressing the value keys scrolls through the text that describes the possible causes of the fault. Press P to return to the main menu.

```

Overtemperature
# Check ambient
temp. not too high
F005 P↑
    
```

PARA (Parameter selection)

Selecting this menu group causes the parameter selection screen to be displayed (See OPERATE above).

MODE (Operating mode)

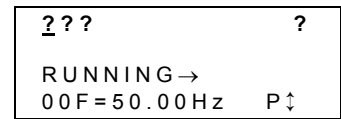
This option provides facilities for controlling other inverters connected via RS 485 and for editing the operator panel's operational parameters. The mode selected is retained during power interruptions.



The default mode is **LOCAL**. In this mode the parameter setting-box can only control a single inverter.

If several inverters are connected together then you must select **MASTER** mode. If you select OPERATE from the main menu after putting the operator panel into MASTER mode, a screen similar to that shown right will appear.

In this example the top line shows that 4 inverters are connected to the bus with addresses 00, 01, 02 and 15. the address of the selected inverter is shown alongside the operational state. Select the inverter to be controlled by pressing the value keys and entering P. This causes the local OPERATE screen to appear.



Note: This OPERATE screen also appears if DIAG is selected from the main menu while in MASTER mode. However pressing P causes the local diagnostics screen to be displayed.

Selecting **INTERNAL** enables you to access and edit stored parameter sets, even if the operator panel is not connected to an inverter. Access to these is via the parameter selection screen.

Selecting **CONTROL** lets you change the following operator panel parameters :

- **Backlighting** → on/off
 - **4-digit display** → on/off
- If a key is not pressed for 45 sec, the display changes to show the value determined by the setting of P001 in large (full-screen) characters.
- **Parameter box reset** → on/off
- This selection deletes all stored parameter sets from memory and resets the operator panel to the default language (English).

UPREAD

This option lets you copy parameter sets to the operator panel from any inverter connected via the RS 485. Upt to a maximum of 31 sets can be stored. They are retained in memory during power interruptions and even while the operator panel is disconnected from the inverter.

Note: The operator panel must be in MASTER mode before it can read parameter sets from other inverters on the interface. In LOCAL mode the operator panel can only read the parameter set from the inverter to which it is connected.

DOWNLOAD

This option lets you copy parameter sets previously stored in the operator panel to any inverter connected via the USS bus.

Note: As for UPREAD, the operator panel must be in MASTER mode before it can copy parameter sets to other inverters on the USS bus.

LANGUAGE

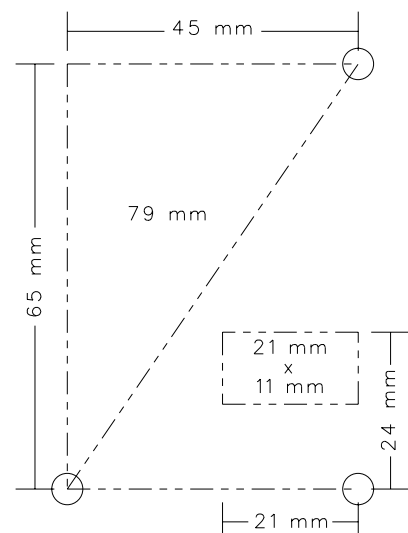
This option lets you change the language at any time.

INFO

Selecting this option causes the LCD screen to display a brief description of the operator panel. Press the value (down) key to scroll through the text one line at a time. Press P at any time to return to the main menu.

Fixing points and cutout for panel mounting

The front view is shown. The fixing should be done with M5 x 10 screws. The cutout 21mm x 11mm is necessary for the plug-in connection.



11 Technical data

11.1 Single-phase inverters, 230V, with integrated input filter

Type SK ...	250/1 FNC	370/1 FNC	550/1 FNC	750/1 FNC	1100/1 FNC	1500/1 FNC	2200/1 FNC	
Max. rated power, 4 pole motor	kW HP	0,25 0,33	0,37 0,50	0,55 0,75	0,75 1	1,1 1,5	1,5 2	2,2 3
Output power, with 230V	kVA	0,66	0,88	1,14	1,5	2,1	2,8	4,0
Max. current	A	1,6	2,3	2,9	3,7	5,2	7,0	10,0
Output voltage	3 x 230 V ± 15 %							
Brake-chopper	standard, integrated							
Recomm. braking resistor	200 Ω / 44W				82 Ω / 100W			
Min. braking resistor	Ω	65	65	65	65	65	65	65
Max. chopper current	A							
Mains voltage	1 x 230 V ± 15 %, 2 x 208 V ± 10 %, 47 - 63 Hz							
Max. input current	A	3,0	3,8	5,5	6,5	14,0	18,0	20,0
Recommended mains fusing (slow-blow)	A	10			16	20		25
Recommended wire cross-sectional area	mm²	1,0			1,5	2,5		
Weight approx.	kg	1,9				2,6		5,0
Cooling with integrated fan		no	no	no	no	yes	yes	yes

11.2 Single- and three-phase inverters, 230V

Type SK ...		250/2 NC	370/2 NC	550/2 NC	750/2 NC	1100/2 NC	1500/2 NC	2200/2 NC	3000/2 NC
Max. rated power, 4 pole motor	kW	0,25	0,37	0,55	0,75	1,1	1,5	2,2	3,0
	HP	0,33	0,50	0,75	1	1,5	2	3	4
Output power, with 230V	kVA	0,66	0,88	1,14	1,5	2,1	2,8	4,0	5,2
Max. current	A	1,6	2,3	2,9	3,7	5,2	7,0	10,0	12,7
Output voltage		3 x 230 V ± 15 %							
Brake-chopper		standard, integrated							
Recomm. braking resistor		200 Ω / 44W				82 Ω / 100W			
Min. braking resistor	Ω	65	65	65	65	65	65	65	65
Max. chopper current	A								
Mains voltage		1 / 3 x 230 V ± 15 %, 47 - 63 Hz							
Max. input current	A	2,1	3,0	4,2	5,0	7,0	9,5	12,0	14,5
	one-phase	3,0	3,8	5,5	6,5	14,0	18,0	20,0	** 25,0
Recommended mains fusing (slow-blow)	A	10				16/20		25/35	
Recommended wire cross-sectional area	mm²	1,0				1,5		2,5	
Weight approx.	kg	1,8				2,4		4,5	
Cooling with integrated fan		no	no	no	no	yes	yes	yes	yes

**** CAUTION! The one-phase mains connection 230V of SK 3000/2 NC is only permissible with a commutating reactor (4EM61) !**

11.3 Three-phase inverters, 230 V

Type SK ...		5500/2 NC		7500/2 NC		11000/2 NC		15000/2 NC		18500/2 NC		22000/2 NC	
Constant load torque	→ CT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	
	Variable load torque	→ VT											
Max. rated power, 4 pole motor	kW	5,5	7,5	7,5	11,0	11,0	15,0	15,0	18,5	18,5	22,0	22,0	
	HP	7,5	10	10	15	15	20	20	25	25	30	30	
Output power, with 230 V	kVA	9,1	10,9	12,7	15,4	17,6	20,7	21,4	25,5	25,9	29,7	30,7	
Max. current	A	22	28	28	42	42	54	54	68	68	80	80	
Output voltage		3 x 230 V ± 15 %											
OPTION	Brake-chopper	not integrated, only as an option											
	min. braking resistor	Ω											
	max. chopper current	A											
Mains voltage		3 x 230 V ± 15 %, 47 - 63 Hz											
Max. input current	A	32	45	61	75	87	90						
Recommended mains fusing (slow-blow)	A	32	50	63	80	100							
Recommended wire cross-sectional area	mm²	4	10	16	25	35							
Weight approx.	kg	20,5	24,0	25,0	28,0	30,0	32,0						
Cooling with integrated fan		yes											

11.4 Three-phase inverters, 380 - 500 V

Type SK ...		1500/3 NC	2200/3 NC	3000/3 NC	4000/3 NC	5500/3 NC
Max. rated power, 4 pole motor	kW HP	1,5 2	2,2 3	3,0 4	4,0 5	5,5 7,5
Output power, with 400V	kVA	2,8	4,0	5,2	7,0	9,0
max. current up to 440V from 441V (NEMA motor)	A	4,2 3,4	6,1 4,8	7,7 6,4	10,2 7,6	13,2 11,0
Output voltage		3 x 380 - 500 V ± 10 %				
Brake-chopper		standard, integrated				
Recomm. braking resistor		120Ω / 180W				
min. braking resistor	Ω	85	85	85	85	85
max. chopper current	A					
Mains voltage		3 x 380 - 500 V ± 10 %, 47 - 63 Hz				
Max. input current	A	5,5	7,5	10,0	12,5	16,0
Recommended mains fusing (slow-blow)	A	10	16		20	
Recommended wire cross- sectional area	mm²	1,0	1,5		2,5	
Weight approx.	kg	5,0				
Cooling with integrated fan		yes	yes	yes	yes	yes

11.5 Three-phase inverters, 380 - 500 V

Type SK ...		7500/3 NC		11000/3 NC		15000/3 NC		18500/3 NC		22000/3 NC		30000/3 NC		37000/3 NC	
Constant load torque → CT Variable load torque → VT		CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	
Max. rated power, 4 pole motor	kW HP	7,5 10	11,0 15	11,0 15	15,0 20	15,0 20	18,5 25	18,5 25	22,0 30	22,0 30	30,0 40	30,0 40	37,0 50	37,0 50	
Output power, with 400V	kVA	12,7	17,7	17,7	21,5	21,5	26,0	26,0	30,8	30,8	40,8	40,8	49,9	49,9	
Max. current up to 440V from 441V (NEMA motor)	A	19,0 14,0	23,5 21,0	26,0 21,0	30,0 27,0	32,0 27,0	37,0 34,0	38,0 34,0	43,5 40,0	45,0 40,0	58,0 52,0	58,0 52,0	70,5 65,0	72,0 65,0	
Output voltage		3 x 380 - 500 V ± 10 %													
OPTION	Brake-chopper	not integrated, only as an option													
	min. braking resistor	Ω													
	Max. chopper current	A													
Mains voltage		3 x 380 - 500 V ± 10 %, 47 - 63 Hz													
Max. input current	A	30		32		41		49		64		79		96	
Recommended mains fusing (slow-blow)	A	32			50			80			100				
Recommended wire cross- sectional area	mm²	4			10			25			35				
Weight approx.	kg	19,5		20,5		24,0		25,0		28,0		30,0		32,0	
Cooling with integrated fan		yes													

11.6 Three-phase inverters, 575 V

Type SK ...	7500/4 NC		11000/4 NC		15000/4 NC		18500/4 NC		22000/4 NC		30000/4 NC		37000/4 NC		
Constant load torque → CT Variables load torque → VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	
max. rated power, 4 pole motor kW HP	7,5 10	11,0 15	11,0 15	15,0 20	15,0 20	18,5 25	18,5 25	22,0 30	22,0 30	30,0 40	30,0 40	37,0 50	37,0 50	45,0 --	
Output power, with 400V kVA	12,0	14,6	16,8	19,7	20,3	24,4	24,6	28,3	29,3	37,8	38,8	46,7	47,4	55,2	
Max. current A	11,0	17,0	17,0	22,0	22,0	27,0	27,0	32,0	32,0	41,0	41,0	52,0	52,0	62,0	
Output voltage	3 x 575 V ± 10 %														
OPTION	Brake-chopper	not integrated, only as an option													
	min. braking resistor Ω														
	max. chopper current A														
Mains voltage	3 x 575 V ± 10 %, 47 - 63 Hz														
Max. input current A	18		24		29		34		45		55		65		
Recommended mains fusing (slow-blow) A	25				32		40		50		63		80		
Recommended wire cross-sectional area mm²	4						6		10		16		25		
Weight approx. kg	19,5		20,5		24,0		25,0		28,0		30,0		32,0		
Cooling with integrated fan	yes														

11.7 General technical data

Overload capability	150 % for 60 sec. depending on the max. current
Output frequency	0 Hz ... 650 Hz
Frequency resolution	0,01 Hz
Clock-rate frequency	2,44 kHz ... 16 kHz, z.T. 2,44 kHz to 4 kHz without loss of performance
Ambient temperature	0°C ... 40°C, no moisture or aggressive gases (without housing up to 50°C)
Storage temperature	-20°C ... 70°C, no moisture or aggressive gases
Relative humidity	90% rel., no condensation
Installation altitude	up to 1000 m above sea level, without loss of performance
Degree of protection	IP 21, NEMA 1
Electrical protection	earth-fault, short-circuit and no-load proof, supply monitoring
Approvals	for UL and CSA in preparation

Subject to technical modification

Part number.: 0606 3386

Manufacturer is:

GETRIEBEBAU NORD

Schlicht + Küchenmeister GmbH & Co.

Rudolf-Diesel-Str. 1

22941 Bargteheide

P.O. Box 12 62

22934 Bargteheide

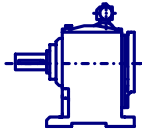
Germany

MODULAR SYSTEM

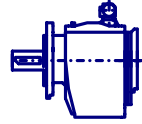
GEARBOX

MODULAR COMPONENTS

HELICAL GEARBOX
(FOOT MOUNTED)



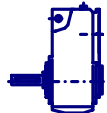
HELICAL GEARBOX
(FLANGE MOUNTED)



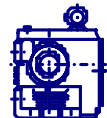
SHAFT MOUNT REDUCER
WITH HOLLOW SHAFT



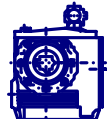
SHAFT MOUNT REDUCER
WITH SOLID SHAFT



WORM GEAR UNIT
(FOOT MOUNTED)



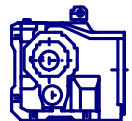
WORM GEAR UNIT
(SHAFT MOUNTED)



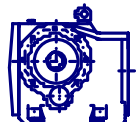
WORM GEAR UNIT
(FLANGE MOUNTED)



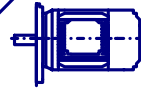
HELICAL-BEVEL GEAR UNIT
(FOOT MOUNTED)



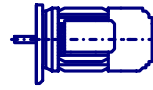
HELICAL-BEVEL GEAR UNIT
(SHAFT MOUNTED)



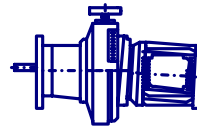
HELICAL-BEVEL GEAR UNIT
(FLANGE MOUNTED)



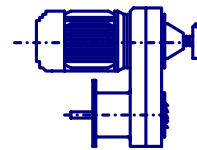
ELEKTRIC MOTOR



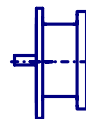
BRAKE MOTOR



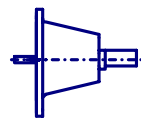
FRICTION-WHEEL
VARIABLE SPEED
GEARED MOTOR



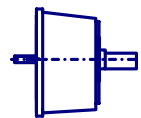
VARIABLE SPEED
GEARED MOTOR



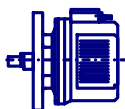
IEC ATTACHEMENT
CYLINDER



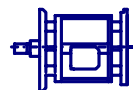
FREE INPUT SHAFT
HOUSING



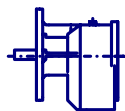
FLANGE AT INPUT
SIDE



HYDRAULIC
COUPLING WITH
OR WITHOUT BRAKE



COMBINED COUPLING
CLUTCH AND BRAKE



HELICAL SPEED
REDUCER FOR
EXTREMELY LOW
SPEEDS