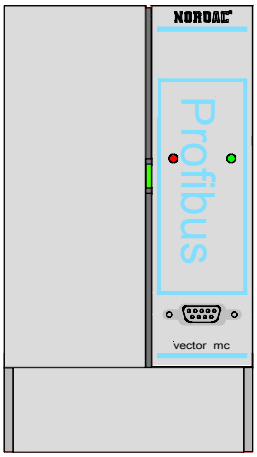
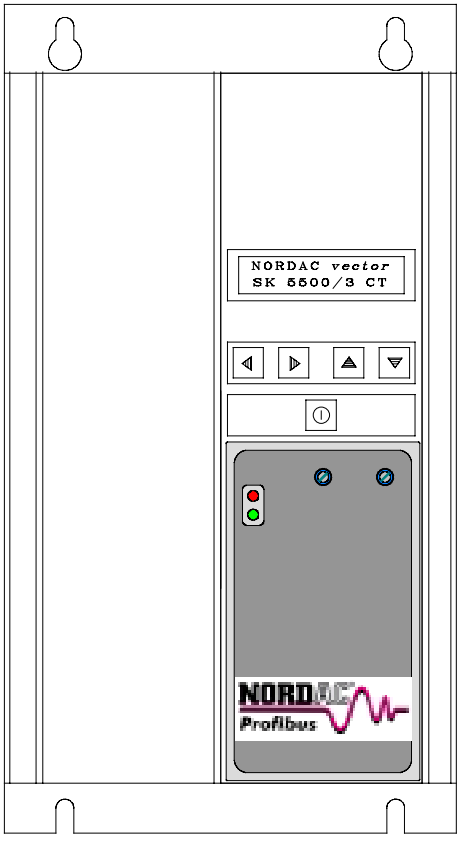
OPERATING INSTRUCTIONS

Profibus

For The Inverter Type Series

NORDAC *vector mc*
NORDAC *vector*





PROFI® PROCESS FIELD BUS

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NORDAC *vector* Frequency Inverters

Safety and operating instructions for converters feeding drives

(as per: Low Voltage Directive 73/23/EWG)

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 required covers, of improper use, installation errors 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 system start-up 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, the term "skilled 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. 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. 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. Any touching of electronic components and contacts shall be avoided.

Drive converters contain components sensitive to electrostatical processes 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.

Electrical installation shall be carried out in accordance with relevant rules and regulations (e.g. concerning cross-sectional areas of conductors, fusing, PE connection). For further information see documentation.

Instructions for installation in accordance with EMC requirements, like screening, earthing, provision of filters and routing of lines, 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 safety requirements imposed e.g. by the law on technical tools and equipment, accident prevention rules etc. Changes to the drive convertersby 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 shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

Do keep these Safety Instructions for future reference !

1. General

1.1. About these Instructions

The present PROFIBUS documentation is equally applicable to the NORDAC *vector* and the NORDAC *mc* type series. As the telegram format is virtually the same in either case, any information provided on this subject will relate to both the NORDAC *vector* and the NORDAC *mc*. The two types may even be connected into the same network together.
That is why each time we refer to "the inverter" or "the device" below, we shall be describing general properties which are characteristic of both type series. On the other hand whenever a function or feature is explained which is specific to only one of the type series, we shall expressly point this out.

1.2. The bus system

With the PROFIBUS system, data exchange among automation devices can be ensured even if these are very different in terms of purpose and design. PLC's, PC's, parameterisation and monitoring devices will be able to communicate in serial bit mode over a single bus to which each of them is connected. For any special requirements compatible versions are available.

PROFIBUS FMS: This is the universal approach to meeting communication requirements on field level. With the Profibus FMS (Field Message Specification), cyclical or non-cyclical data traffic can be handled at a medium rate.

PROFIBUS DP: This variety is used primarily wherever sensor and actuator communication is involved with instant system response being an indispensable requirement. PROFIBUS DP is a perfect alternative to expensive parallel signal transmission at 24 V and is very well suited to transmit measurement values. Allowing for especially high transmission speeds, this PROFIBUS version is used e.g. to operate frequency inverters which are connected to automation devices.

Generally the same transmission medium may be used for both the PROFIBUS FMS and the PROFIBUS DP systems. It is imperative however that all of the devices which are intended to communicate directly with one another should understand the protocol version used.
DIN 19245 Part 1 and 2 as well as the Part 3 supplements to this standard covering aspects specific to certain applications, provide directives as to the way data communication is to proceed. In accordance with European field bus standardisation the PROFIBUS is integrated into the European field bus standard pr EN 50170.

1.3. PROFIBUS DP used on NORDAC frequency inverters

Features:

- Electrically isolated bus interface
- Transmission rate up to 1.5 megabits
- Convenient connection to the inverter with a 9-pin Sub-D connector
- 2 LED´s for status display
- Convenient programming of all inverter parameters
- Output frequency is controlled via the PROFIBUS link
- Transmission of setpoint positions when the NORDAC *vector* with *posicon* option is used
- In-process polling of the respective inverter status
- Up to 126 inverters can be networked to a single bus

2. Assembly and installation

2.1. Delivery

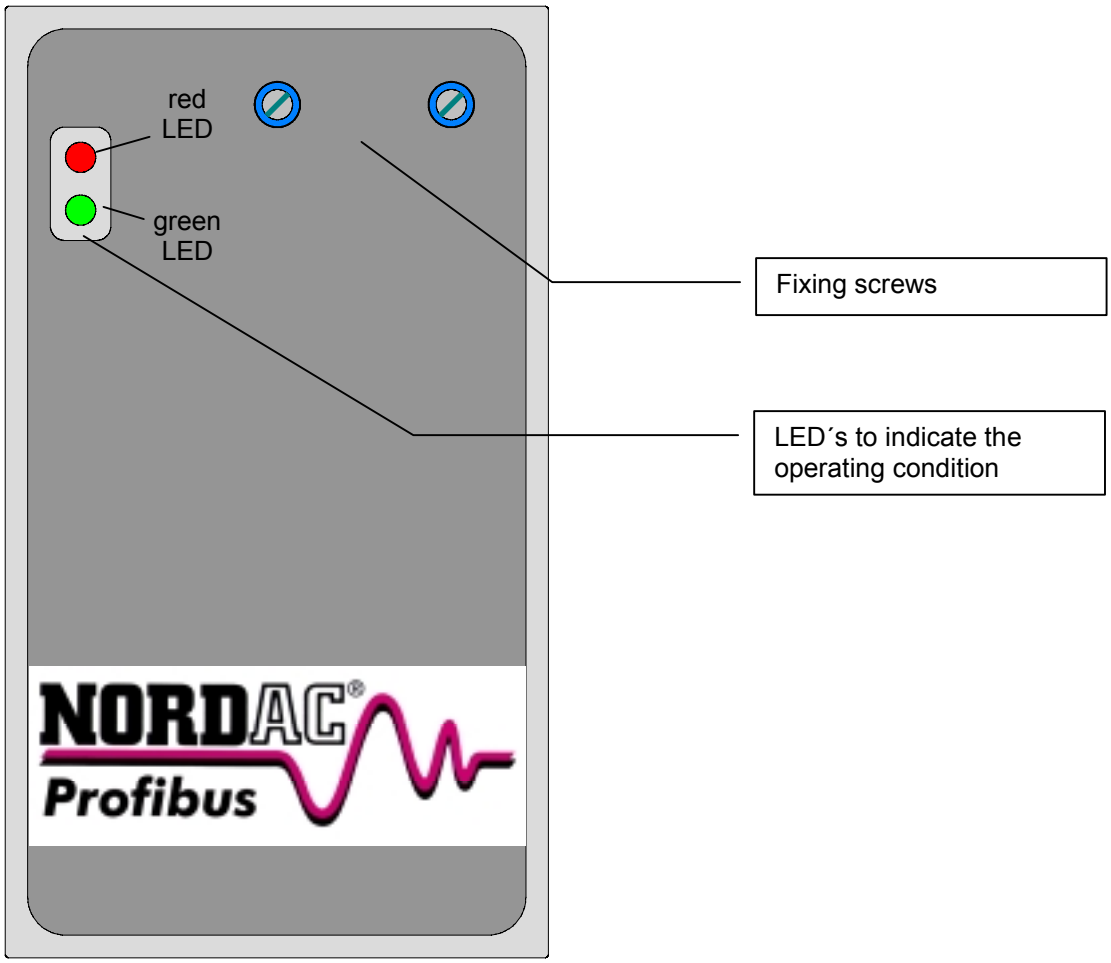
When the device is delivered, check **immediately** whether any damage such as deformation or loose parts has occurred during transport.
If it has, contact the carrier company without delay requesting careful assessment of the damage.

Important! Proceed in the same way even if the packaging has remained intact.

2.2. Scope of delivery and assembly

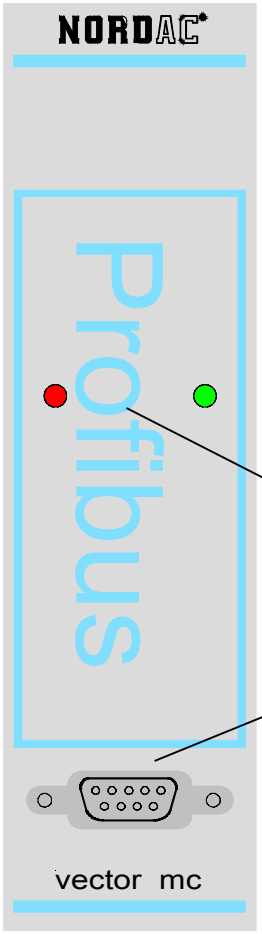
2.2.1. NORDAC vector

The PROFIBUS module for the NORDAC *vector* is contained in a plastic housing (72x126x28.5 mm) to be pushed on below the inverter keyboard. For electrical connection of the NORDAC *vector* frequency inverter the PROFIBUS module must be detached. This is easily done by loosening the two fixing screws of the module. Afterwards the front panel of the inverter can be removed. To put the optional module into operation it can be plugged into the control board without the front cover having to be attached. As the PROFIBUS module is fed directly via the inverter, no extra power supply from an external source will be required.



Important: The optional PROFIBUS module can be fitted only to inverters which have been prepared for the purpose. Spot-conversion of the inverter is not possible though. If you wish to make use of the PROFIBUS optional feature, please contact your local NORD representative.

2.2.2. PROFIBUS activation module for NORDAC *vector mc*



To **install** the PROFIBUS activation module proceed as follows:

1. Disconnect the inverter from mains voltage, wait a few minutes as specified.
2. Remove the blind cover by just pulling it off over the top edge.
3. First hook in the PROFIBUS activation module at the lower end and then lock it into place at the upper end by pushing the module slightly upwards and towards the inverter surface until you hear a click .

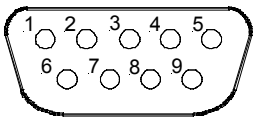
Operating status display

Sub-D female connector for bus connection

Power is supplied to the PROFIBUS module straight from the inverter so that no additional external power supply is necessary.

2.3. Pin assignment

The frequency inverters are linked up to the PROFIBUS DP network via a 9-pin SUB-D female connector as directed in the DIN E 19245 T3 standard. As the bus topology provides for the stations to be interconnected chain-like, there must be two cables into the D-type female connector (except for the stations at either end of the bus) – one input cable from the previous station and one output cable to the next station. The bus terminating plugs (resistance network) must be installed at the first and the last bus station.



PIN	Signal	Description
1	not assigned	-
2	not assigned	-
3	**B**	**Data line B**
4	RTS	Repeater driving signal
5	DGND	Data reference potential (GND)
6	VP	Supply voltage (+5V; 50mA max.)
7	not assigned	-
8	**A**	**Data line A**
9	not assigned	-
Shell	GND	Screen

Important: Never connect the supply voltage (PIN6) with the supply voltage of another PROFIBUS station.

Connection of the Sub-D female connector shell to protective earth is ensured via the inverter.

2.4. Laying the bus cables

Installation of the bus system in industrial environments should be carried out with special care to minimize the influence of parasitic signals. Please find some useful information below on how you can avoid interference and communication problems right from the start. The present routing instructions do not cover every detail however, and following them will not release you from adhering to applicable safety and accident prevention rules.

2.4.1. Conductive material

Frequency inverters are normally coupled to the PROFIBUS system with a twisted, shielded, two-wire line. This bus line is referred to as cable type A in the EN 50 170 standard. For the guaranteed transmission rates and transmission distances to be actually available, and for interference to be reliably suppressed it is imperative that every aspect and instruction regarding cable routing and properties is strictly observed.

2.4.2. Cable routing and shielding (EMI protection)

Without EMI precautions, high-frequency interference which is mainly caused by switching operations or by strokes of lightning, is likely to affect the electronic components in the bus stations so that reliable working of the system is no longer guaranteed.
Workmanlike shielding of the bus cable will dampen the magnetic leakage from other electrical sources in the vicinity, a factor that must unvariably be taken into account in industrial areas. The measures listed below will help you to obtain optimal shielding effects:

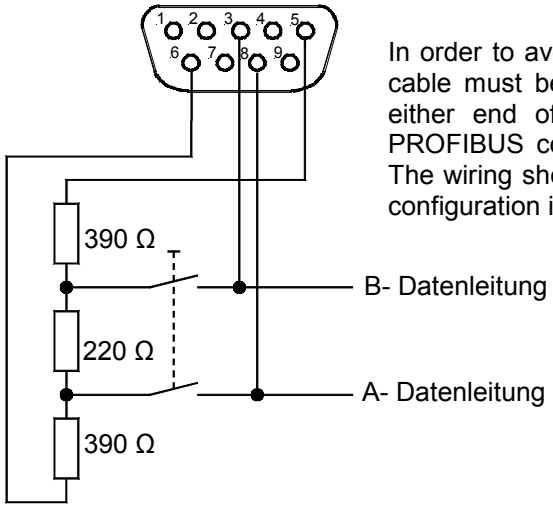
- Connect the devices involved in the bus system across the shortest possible path.
- The shield of the bus cable should be connected at both ends using a large contact surface.
- Use only connectors with metal or metallised housings.
- Do not connect field devices to the bus with stub lines if you can help it.
- Better not extend bus cables via plug-and-socket connectors either.

A clearance of 20 cm minimum should remain between bus cables and other lines if the voltage on these lines is greater than 60V. This applies to wiring arrangements in general both inside and outside of switching cabinets. If the bus cable is introduced into a switching cabinet, the shield should be connected to the shield bar with cable clamps as closely to the feed-through hole as possible. From there the shield should be extended up to the station and plugged into the connector.

Pl. note: With the shield being connected at both ends, a compensating current liable to endanger electronic components may flow if earth potentials are different. Potential differences must be reduced by ensuring sufficient potential equalization.

2.4.3. Bus connection

The two-wire line is connected to the PROFIBUS connector at PIN 8 (data line A) and at PIN 3 (data line B). Communication over the bus absolutely presupposes that the data lines A and B be connected to identical pins on all PROFIBUS stations. A generous portion of the cable shield should be connected to the shield collar, and there must be a conductive connection between the shield and the connector shell.



In order to avoid disturbance brought about by internal reflection, the bus cable must be terminated with a terminating network at the inverters at either end of the bus cable. The most simple method is to use a PROFIBUS connector with an integrated terminating resistance network. The wiring should be as shown in the opposite diagram even if a different configuration is used.

2.5. Setting the bus parameters

For the inverter to be operated on the PROFIBUS, apart from connecting the bus to the PROFIBUS master it will be necessary to configure a number of relevant parameters in the parameter set.

2.5.1. NORDAC *vector* parameters relating to the bus

For all of the devices of the NORDAC *vector* inverter series equipped with a PROFIBUS module, the **Extra Functions** menu group has been extended to comprise special PROFIBUS parameters.
For safety reasons, the factory setting of the inverter provides for control to proceed via the control terminals. Under these conditions the PROFIBUS is for monitoring only. For the PROFIBUS to take over control, the parameters **PPO type**, **BUS address** and inverter **interface** require setting. There is no need however to set the baud rate of the PROFIBUS as it is recognised automatically by the PROFIBUS module on the inverter. The message downtime can be selected in the **Bus timeout** parameter in accordance with PROFIBUS system requirements.

All parameters which are relevant for inverter operation by PROFIBUS control are found in the **Extra Functions** menu subsequent to the "mains voltage" parameter. A description of the parameters in question is provided below.
To view the parameters contained in the boxes with the grey shading, the optional PROFIBUS module must have been activated.

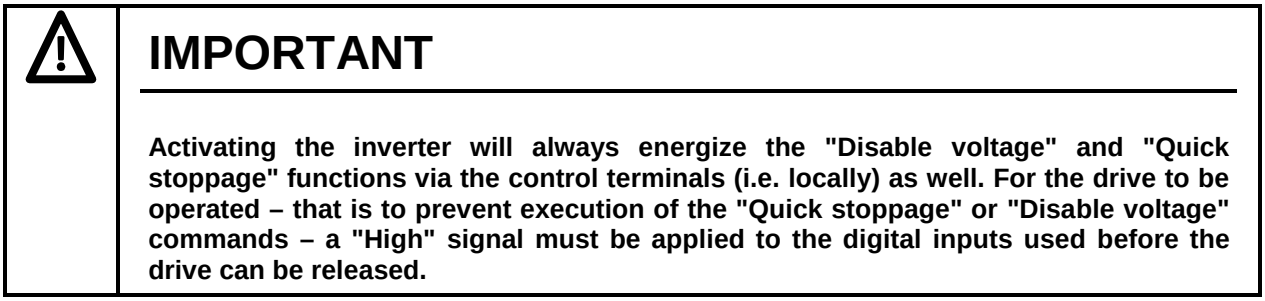
Extra functions parameter section (BU 4000, Item 7.15)

Type	Function “Message displayed” Comment	Range of values Resolution	Default setting
	BUS mode **“BUS mode”** Changeover between USS mode and PROFIBUS	External bus OFF USS	External bus
	Interface **“Interface”**	Local control Setpoint 1 BUS BUS BUS + setpoint 2 BUS limited Setpoint 1 limited BUS limited + setpoint 2	Local
	Local: The inverter is controlled via the control terminal strip **Setpoint 1 BUS:** A single setpoint is transmitted via the BUS. Evaluation as with the analogue setpoint input 1. The digital inputs of the control terminals continue to be active in the "local" mode. **BUS:** The inverter is controlled via the BUS (control word and setpoint 1). The analogue setpoint input 2 continues to be active in the "local" mode. **BUS + Setpoint 2:** As in "BUS", with however a second setpoint being awaited via the BUS. The function for the 2nd setpoint is programmed in the **"Mode an. inp. 2"** parameter. **Setpoint 1 limited:** As in setpoint 1 BUS, however with setpoint 1 being limited to a 0 ... 100% range. (Negative setpoints are not allowed.) **BUS limited:** As in BUS, however with setpoint 1 being limited to a 0 ... 100% range. (Negative setpoints are not allowed.) **BUS limited + setpoint 2:** As in BUS + setpoint 2, however with setpoint 1 being limited to a 0 ... 100% range (negative setpoints are not allowed).		
	PPO type **“PPO type”** The inverter supports protocols of different lengths as defined in the PROFIBUS directive, cf. Item 3 , Parameter Process Data Objects (PPO). Save here the PPO type which is to be used in control.	1 2 3 4	1

Type	Function “Message displayed” Comment	Range of values Resolution	Default setting
	BUS address **“BUS address”** The address of the PROFIBUS station can be set anywhere between 2 and 126.	1 ... 126	126
	Message downtime **“BUS timeout”** The maximum permissible time interval between two incoming data telegrams. The purpose of this function is to ensure that the inverter is switched off in the event of a communication breakdown. If after a valid data telegram has been received the next one does not arrive within the time interval set in this parameter, the inverter disconnects the output side, and a “**Timeout**“ error message is put out. 0 = no monitoring	0 ... 100s 0.1s	0

In order to ensure compatibility with the PROFIDRIVE profile, other parameters and functions are reprogrammed.

- The **ramp-down** parameter is not visually accessible when the inverter is controlled via the bus, as in this case the relevant information will be supplied in the control word.
- When the setpoint is fed to the system via the PROFIBUS, the value set in the **minimum frequency** parameter is disregarded (a zero setting is assumed for this function). On the other hand the parameterized value is taken into account if the digital inputs are activated via the "remote control" function.



2.5.2. NORDAC *vector mc* parameters relating to the bus

The PROFIBUS module installed on the inverter is activated by setting the parameter **P509** to the value of 10, or to 8 or 9 respectively. After that PROFIBUS control will be able to communicate with the inverter as soon as the PPO type used has been set in **P508,** and the address of the inverter has been entered in **P507**. As the PROFIBUS baud rate is recognized by the PROFIBUS module of the inverter automatically, no transmission speed setting will be required.
The **P513** telegram timeout is set in accordance with the PROFIBUS system involved.

P507 PPO type Default [1]	Parameter Process data Objects (PPO) The inverter supports protocols of various lengths as defined in the PROFIBUS directive, cf. Item 3 . Use this parameter to save the PPO type which will be used in the control process. The inverter is capable of processing any of the PPO types 1, 2, 3 or 4.
P508 Profibus address Default [1]	Any PROFIBUS user address can be set within the range of 1 to 126.
P509 Interface Default [0]	Selection of the interface used to control the inverter **0 = Control terminals or keyboard control** with the Control Box mc (optional feature) **1 = Control terminals only ***, the only way to control the inverter is via the 4 digital inputs and the analogue input **2 = USS setpoint *,** the frequency setpoint is transmitted using the USS protocol. Still other control commands can be fed to the system via the digital inputs as well. **3 = USS control word ***, while the control signals (enable, sense of rotation,...) are transmitted via USS, the setpoint is applied to the analogue input, or fixed frequencies are used. **4 = USS ***, all of the control data is transmitted via the USS protocol. Neither the analogue input nor the digital ones are involved. **5 = CAN setpoint *** (optional feature) **6 = CAN control word *** (optional feature) **7 = CAN *** (optional feature) **8 = Profibus setpoint *** (optional feature) **9 = Profibus control word *** (optional feature) **10 = Profibus *** (optional feature) **11 = CAN Broadcasting *** (optional feature) ***** While keyboard control (Control Box *mc*) is disabled, you can still edit the parameters.
P513 Telegram timeout 0.1 ... 100.0 s Default [0.0]	Function monitoring the bus interface (USS, CAN or PROFIBUS) active at the time. After a valid telegram has been received, the next one should arrive within the time interval set in this parameter. If it doesn't, the inverter, sensing a failure, reads out the E010 error code and disconnects the output side. A 0.0 setting disables the monitoring function.

2.6. Fault monitoring

The PROFIBUS module monitors the following functions:

- State of connection with the master: fault e.g. due to the bus cable having been inadvertently pulled off
- Baud rate recognition
- Process data received from the PROFIBUS:
  After a valid telegram has been received, the next one is due within the time set in the "USS timeout" inverter parameter.
- Process data received from the inverter: when communication with the inverter is interrupted, an error message is entered in the PROFIBUS telegram within the comprehensive diagnosis function (2 bytes: 0x02 0x04).

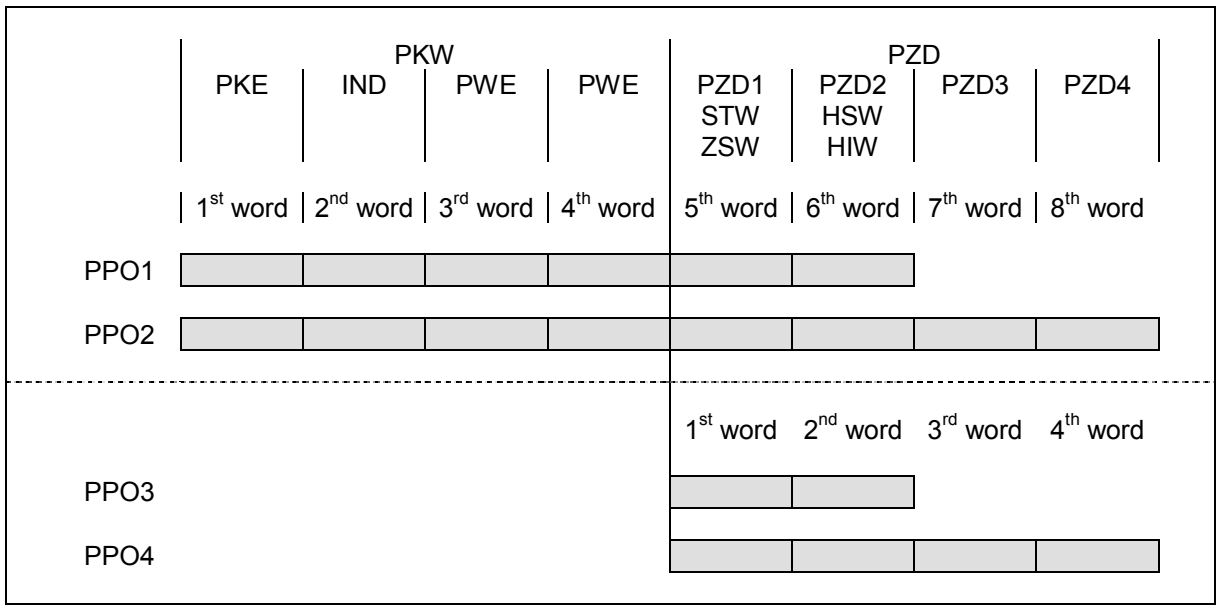
Each time communication with the inverter is temporarily interrupted, an error signal is put out. The inverter monitors communication with the PROFIBUS module. If there is a communication failure for more than approximately 100ms, the inverter will trigger the "USS timeout“ error signal.
Additionally the status of the PROFIBUS module is indicated by the two built-in LED’s:

Green LED	Red LED	Meaning
ON	OFF	Operation is normal; cyclical data transmission via the PROFIBUS is in progress
*	Lights up briefly at power-on or when a PROFIBUS para-meter is changed on the inverter	PROFIBUS module being initialized
Flashing slowly	OFF	No process data are received (300ms waiting time)
Flashing slowly	ON	Communication with the master is interrupted (e.g. as a result of a failure to recognize the baud rate).
Flashing slowly	Flashing slowly	Message downtime exceeded, the receipt of process data is suspended: the time set in the **BUS timeout** parameter on the *vector* inverter or in parameter **P513** in the *vector mc* has expired before new process data are received
*	Flashing quickly	The communication between inverter and the PROFIBUS module is interrupted.

3. Data transfer via the PROFIBUS

3.1. Format of effective data

In the present section we are going to describe the periodical data traffic between the PROFIBUS master and the inverter.
The medium used to transfer both process data (PZD) and parameters (P) from the master to the inverter in cyclic data traffic is defined as the Parameter/Process Data Object (PPO). The inverter is capable of processing PPO types 1, 2, 3 or 4. PPO 3 and PPO 4 are pure process data objects (PZDO) for applications in which cyclical parameter processing is not necessary. The contents is identical with the process data (PZD) part of the PPO 1or PPO 2 types respectively.
The diagram below shows an overview of the PPO's supported by the system.



Abbreviations used:

PPO	Parameter process data object	PWE	Parameter value
PKW	Parameter identifier value	STW	Control word 1
PZD	Process data	ZSW	Status word 1
PKE	Parameter identifier	HSW	Main setpoint
IND	Index	HIW	Main actual value

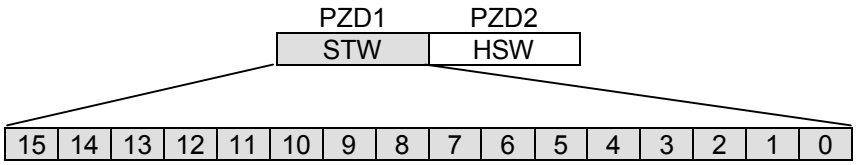
3.2. Process data (PZD)

Within the PZD process data area, control words and setpoints are transmitted from the master to the inverter, whereas status words and actual values are transmitted in the opposite direction from the inverter to the master. The elements (words) of the PZD area are always arranged in the same order, but are termed differently depending on which way the data is transmitted: Master Inverter / Inverter Master.

	PZD1 (16 bits)	PZD2 (16 bits)
Task telegram Master Inverter	Control word **STW**	Main setpoint **HSW**
Reply telegram Inverter Master	Status word **ZSW**	Main actual value **HIW**

3.2.1. The control word (STW) in the task telegram

In the task telegram the control word (STW) is the first word of the process data section to be transmitted to the inverter.

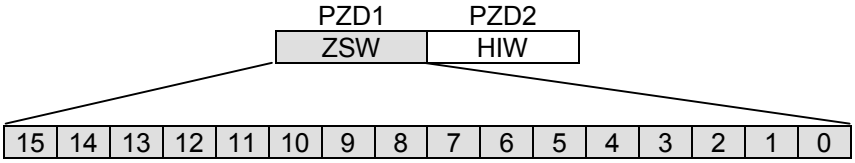


Meaning of the various bits

Bit	Value	Meaning	Comment
0	0	OFF 1	Deceleration in accordance with predefined ramp At f=0Hz: Voltage = disconnection from supply
	1	ON	**Ready for operation**
1	0	OFF 2	Disable the voltage; the voltage at the inverter output is switched off; the FI condition changes to **start-disable**
	1	Operating condition	OFF 2 ineffective
2	0	OFF 3	Quick stoppage within the parameterized quick stop period; at f=0Hz disconnection from supply; the FI condition changes to **start-disable**
	1	Operating condition	OFF 3 ineffective
3	0	Disable operation	Voltage is disabled; the FI changes into condition **Ready to start**
	1	Enable operation	Output voltage is enabled; acceleration ramp up to the applied setpoint
4	0	Disable ramp generator	Ramp generator is reset to zero; no disconnection from supply at f=0Hz; FI remains in the **operation enabled** condition
	1	Operating condition	Ramp generator is enabled
5	0	Stop ramp generator	The setpoint currently transmitted by the ramp generator is freezed (frequency is maintained at a constant level)
	1	Enable ramp generator	Setpoint on the ramp generator is enabled
6	0	Disable setpoint	Selected setpoint is set to zero on the ramp generator
	1	Enable setpoint	Selected setpoint is activated on the ramp genrator
7	0		
	1	Acknowledge	Faults which control has ceased to report are acknowledged with a change from 0 to 1. Important: When the "Ack.Fault" function has been assigned to a digital input, this bit must not be permanently set to 1 via the bus (if it were, edge evaluation would be prevented).
8	0/1		Not assigned (Inching function is not supported)
9	0/1		Not assigned (Inching function is not supported)
10	0	PZD invalid	The process data transmitted are invalid.
	1	PZD valid	The process data transmitted from the master are valid. Important: If only setpoints are transmitted via the bus (setting: interface), this bit must have been set for the transmitted setpoint to be validated.
11	0		
	1	Rotation clockwise	Clockwise rotation ON
12	0		
	1	Rotation anticlockwise	Anticlockwise rotation ON
13	0/1		Not assigned
14	0/1	Parameter set switching bit 0	00 Parameter set 1 01 Parameter set 2 10 Parameter set 3 11 Parameter set 4 Important: In the NORDAC *vector mc* series only two parameter sets are available. Bit 15 in the STW control word is irrelevant there.
15	0/1	Parameter set switching bit 1	

3.2.2. The status word (ZSW) in the reply telegram

In the reply telegram sent by the inverter, the status word (ZSW) will be the first word of the process data to be transmitted.

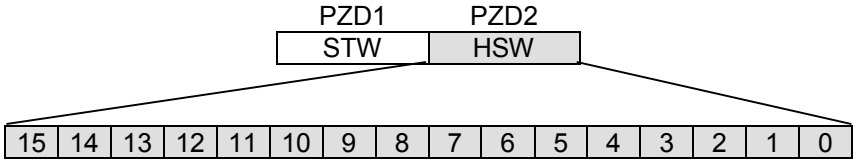


Meaning of the various bits

Bit	Value	Meaning	Comment
0	0	Not ready to start	
	1	Ready to start	Initialization completed, loading relay ON, output voltage disabled
1	0	Not ready for operation	Causes: ON command not activated, fault signal applied, OFF 2 or OFF 3 is active, **start-disable** status is active
	1	Ready for operation	ON command is active, no fault. The inverter may start up with the **ENABLE OPERATION** command.
2	0	Operation disabled	
	1	Operation enabled	Output voltage is enabled; acceleration up to the setpoint applied
3	0	No fault	
	1	Fault	Drive inoperative due to malfunction; after successful fault acknowledgement the inverter switches into the **start-disable** condition.
4	0	OFF2	OFF 2 command is energized
	1	OFF2 de-energized	
5	0	OFF3	OFF3 command is energized
	1	OFF3 de-energized	
6	0	No start-disable	
	1	Start-disable	Changes to **ready-to-start** condition via OFF1
7	0	No warning	
	1	Warning	Drive is still running, no acknowledgement required
8	0	Actual value not o.k.	Actual value does not match the setpoint
	1	Actual value o.k.	Actual value coincides with desired setpoint (level with setpoint)
9	0	Local master control	Master control active locally right on the device
	1	Master control requested	The automation device is requested to assume master control
10	0	Actual value below reference value	Programmed function of MFR is negative, or in other words actual value < programmed reference value Please note: In the NORDAC *vector mc*, this condition is indicated by the MFR1, while with the NORDAC *vector* it is indicated by the MFR2.
	1	Reference value has been equalled	Programmed function of the MFR is positive, in other words actual value > programmed reference input Please note: The status is indicated by the MFR1 of the NORDAC *vector mc* or by the MFR2 of the NORDAC *vector*.
11	0		
	1	Rotation clockwise	Inverter output voltage has got a positive phase sequence
12	0		
	1	Rotation anticlockwise	Inverter output voltage has got a negative phase sequence
13	0/1		
14	0/1	Currently active parameter set 0	00 Parameter set 1 01 Parameter set 2 10 Parameter set 3 12 Parameter set 4 Please note: In the NORDAC *vector mc* type series only two parameter sets are available, so bit 15 in the ZSW status word is without relevance there.
15	0/1	Currently active parameter set 1	

3.2.3. The main setpoint (HSW) in the task telegram

In the task telegram the main setpoint (HSW) is transmitted to the inverter as the second word of the process data.



Generally the main setpoint (i.e. the desired frequency value) is encoded in a 16-bit word to be transmitted to the inverter. The setpoint is transmitted as an integral number in the range (-32768 to 32767), with the value of 16384 (4000 HEX) being equal to 100%. The value C000 HEX is equivalent to –100%. Thus setpoints can be transmitted in the range –200% to +200%.
The main setpoint is scaled to 100% in the **Maximum frequency** parameter or in **P105** respectively.

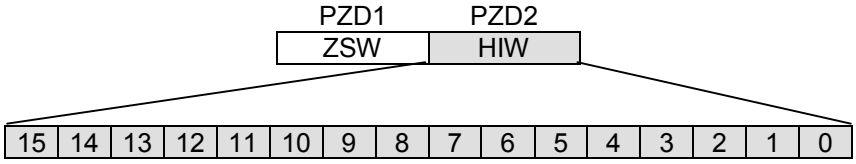
If the optional *posicon* board is used as an add-on component to the NORDAC *vector* inverter, the setpoint position can be fed to the system via the bus with PPO type 2 and 4 in absolute terms, either as a percentage value (16-bit bus mode, digital bus mode 1, digital bus mode 2), or as an absolute resolutions value (32-bit bus mode). In the 16-bit mode and in the digital bus modes 1 and 2, the position information is transmitted in the 16-bit main control word (HSW). In the 32-bit bus mode, the PZD3 word is used in addition to the HSW (main setpoint) word, so that an overall 32-bit value is transmitted.

3.2.4. Second setpoint (only with NORDAC *vector*)

If PPO type 2 or 4 are used, another setpoint can be transmitted in the word PZD4 in addition to the main setpoint. The function of the second setpoint is selected in the **Funct. an. input2** inverter parameter. The value is scaled in the **Frequency 100 %** parameter while the functions >Addition<, >Subtraction<, >Actual frequency value<, >PID controller< and >Maximum frequency during positioning< are configured, or in the **Torque 100%** parameter after the >Torque limit< function has been selected.
The setpoint is transmitted as an integral number in the range (-32768 to 32767). The value 16384 (4000 HEX) corresponds to 100%. With the value C000 HEX corresponding to –100%, an overall setpoint transmission range from –200% to +200% will be available.

3.2.5. The main actual value (HIW) in the reply telegram

In the inverter reply telegram the second word to be transmitted to the master in terms of process data is the main actual value (HIW).



The main actual value is a 16-bit word which will transmit the real frequency output of the inverter. The main actual value is scaled in the same way as the setpoint.
A transmitted actual value of +100% (4000HEX) will correspond to the value set in the **Maximum frequency** parameter or **P105** respectively. For the transmission of actual values a range between –200% to +200% is available.

3.2.6. Actual value 2 (only with NORDAC *vector*)

If PPO types 3 or 4 are used in transmission via the PROFIBUS , a second actual value can be fed to the control system in PZD4. The quantity to be transmitted can be selected in the analogue output parameter and will be transmitted as an absolute value without decimals. Check the PNU list for the resolution of the output values.

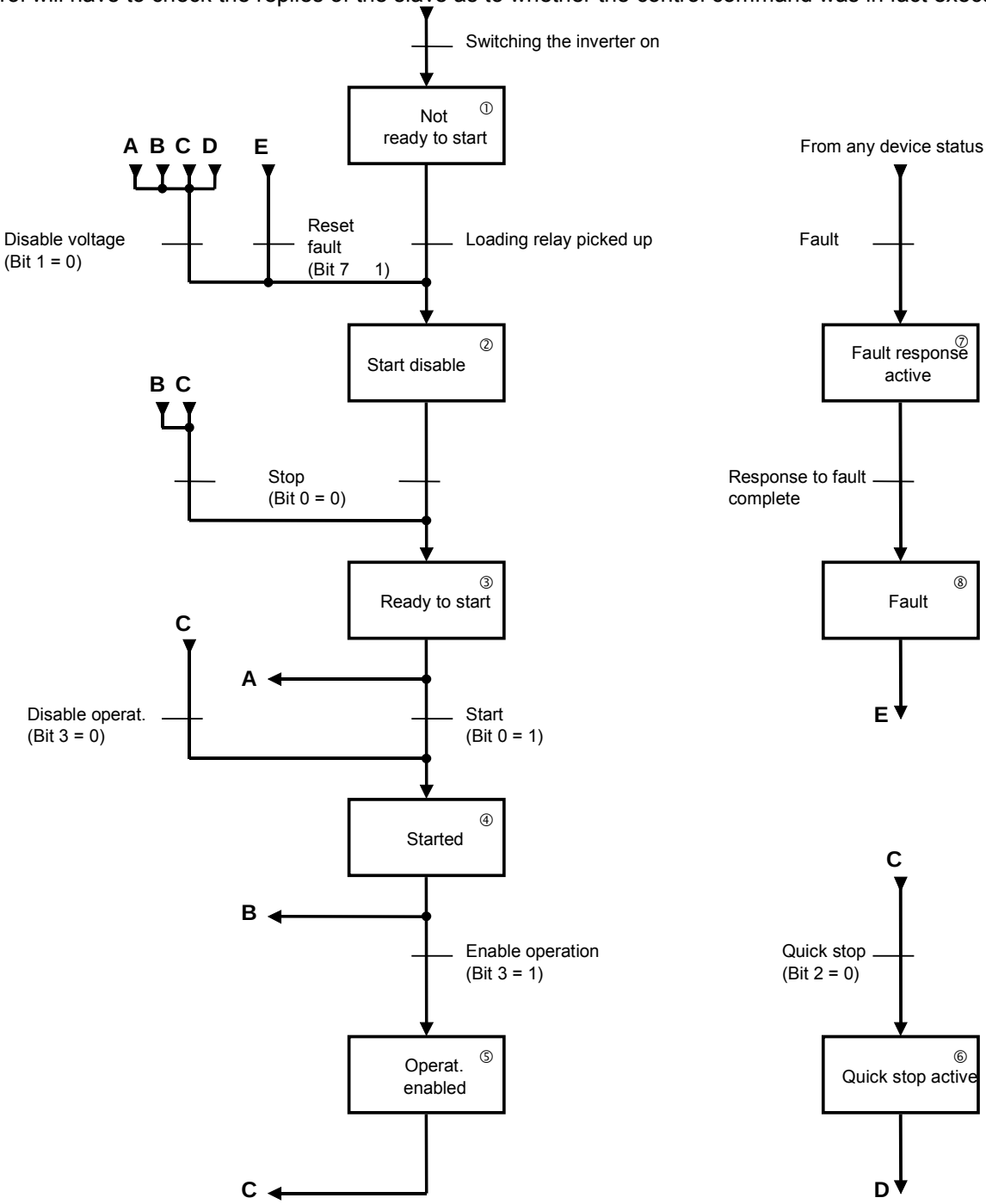
Example:

Selected quantity	Value	Value transmitted	HEX value in PZD4
Output current	12.55A	1255	4E7
Output frequency	67.5	675	2A3
Torque*	89%	89	59

The torque is always transmitted as a percentage value related to the nominal torque of the motor.

3.3. State machine

The states the frequency inverter will pass through are prearranged in a definite order (a sequence which is called a "state machine"). Transition from one state to another is triggered by appropriate control commands in the control word of the process data. The current status is fed back in the status word of the process data.
When the inverter is switched on, it will enter a **start-disable** state and remain there until the "Stop (OFF1)" command is transmitted.
Normally the reply to a master telegram does not contain the reaction to the issued control instruction yet. Control will have to check the replies of the slave as to whether the control command was in fact executed.



Priority of control commands:
1. Disable voltage
2. Quick stop
3. Stop oper.
4. Enable operation
5. Start
6. Disable operat.
7. Fault reset

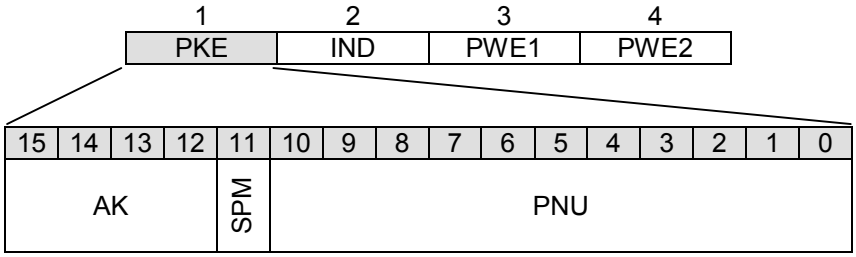
Status identification:
① Bit 0 = 0
② Bit 6 = 1
③ Bit 0 = 1
④ Bit 1 = 1
⑤ Bit 2 = 1
⑥ Bit 5 = 0
⑦ Bit 2 & Bit 3 = 1
⑧ Bit 3 = 1

3.4. Parameter area (PKW)

The PKW (parameter identifier value) procedure can be used to configure parameters for cyclical data traffic. The procedure runs as follows: the master formulates a task and the inverter formulates the appropriate reply. The parameter area is only used for transmissions involving PPO type 1 and PPO type 2.

3.4.1. Parameter identifier (PKE)

The parameter in question and the task/the reply are encoded in the parameter identifier (**PKE**).



The parameter identifier (**PKE**) is always a 16-bit value.

PNU: Bits 0 to 10 comprise the number of the desired parameter (**PNU**), or in the reply telegram of the inverter, the number of the parameter currently activated.

> **Please note:** The parameter numbers (**PNU**) for the inverters of the NORDAC *vector mc* type series are determined by adding the amount of 1,000 to the parameter numbers in the BU 4100 Operating Instructions enclosed with the inverter.
> Example: **Minimum frequency**, **P104** changes to **PNU=1104** in the PROFIBUS. All of the other parameters are treated in the same way.
>
> For the parameter numbers of the NORDAC *vector* type series see Item 6 of the present Operating Instructions.
>
> A list of the PROFIDRIVE standard parameters used is provided in the Additional Information section of the present Operating Instructions.

SPM: Bit 11 is the toggle bit for spontaneous message processing. This function is **not** supported by the PROFIBUS module though!

AK: Bits 12 to 15 contain the task or reply identifier, as the case may be.

The table below contains a complete list of the tasks which can be transmitted from the master to the inverter. In the right column you will find the reply that will be sent if operating conditions are normal (reply identifier positive). Depending on the task identifier involved, the range of possible reply identifiers is limited to very definite ones. If there is an error (reply identifier negative), the inverter always supplies the value 7 to the master in the reply identifier (AK).

AK	Function of task identifier	Positive reply identifier
0	No task	0
1	Request parameter value	1 / 2
2	Change parameter value (word)	1
3	Change parameter value (double word)[1]	2
4	Request description element	-
5	Change description element	-
6	Request parameter value (array)	4 / 5
7	Change parameter value (array word)	4
8	Change parameter value (array double word)[1]	5
9	Request number of array elements	6

Please note: The task identifiers (AK) 4 and 5 are not executable and will always return a negative reply (value 7).

Meaning of the values transmitted in the reply identifier:

AK	Function
0	No reply
1	Transmit parameter value (word)
2	Transmit parameter value (double word)*
4	Transmit parameter value (array word)
5	Transmit parameter value (array double word)*
7	Task not executable (with fault number in par. value PWE2)

* Only with PPO type 2 and PPO type 4

Until a task has been executed the inverter will supply the reply to the previous task. The master must therefore always verify whether the reply received matches the task that has been transmitted. The plausibility check can be based on the value given in the reply identifier (AK), the parameter number received (PNU) with the corresponding index (IND), and on the current parameter value (PWE) when a parameter description is involved.

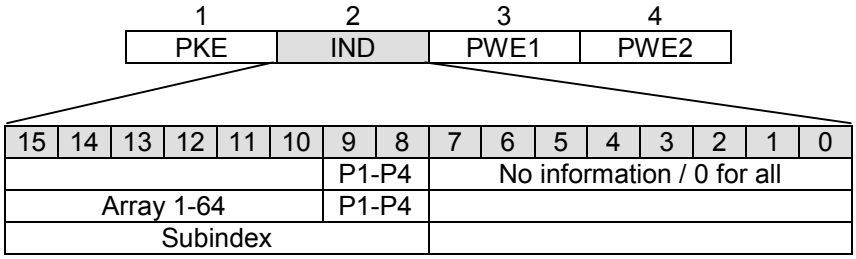
Error messages relating to inexecutable tasks

If the reply identifier carries a "task not executable" (AK = 7) statement, an encoded error message is additionally attached in the parameter value (**PWE2**) of the inverter's reply. In the table below the meaning of the transmitted values is explained:

No.	Message
0	illegal parameter number
1	parameter value cannot be changed
2	lower or upper value limit was exceeded
3	incorrect sub-index
4	no array
7	description element cannot be changed
9	no description data available
201	invalid task element in the task that was received last
202	internal reply identifier cannot be visualized

Please note: For more information see Item 4.1.1 Communication in the present instructions.

3.4.2. Subindex (IND)



The structure and function of the parameter index (IND) varies with the type of the parameter to be transmitted.
For values which can be defined in one parameter set while in another they can't, bits 8 and 9 of the index (IND) are used to select the parameter set in which a setting can be made (0 = parameter set 1, 1 = parameter set 2,...).
If the parameter to be configured is an array-type parameter as well (e.g. a position array with the *posicon* option), the subindex of the desired parameter is accessible too via bits 10 to 15 (0 = array element 1, 1 = array element 2, ...):

Array element	Parameter set	Index
5 (000101_{BIN})	2 (01_{BIN})	15_{HEX} = 0001 0101 $_{BIN}$
21 (010101_{BIN})	4 (11_{BIN})	57_{HEX} = 0101 0111 $_{BIN}$

If a parameter is not pertinent to a particular parameter set, bits 7 to 15 are used to address the subindex. If we look for instance at parameter 1801, Previous Error 1, the subindex allows for reading out not only the cause of the failure, but various operating parameters as well which were active at the moment the incident occurred.

- Subindex 1 — Time Previous Error 1
- Subindex 2 — Frequ. Previous Error 1
- Subindex 3 — Voltage Previous Error 1
- Subindex 4 — Current Previous Error 1
- Subindex 5 — Temp. Previous Error 1
- Subindex 6 — P-set Previous Error 1

The list of parameter numbers (Item 6) will inform you on the structure of the various parameters and of the type of operating values that can be polled via the subindices.

3.4.3. Parameter value (PWE)

The parameter value (PWE) is always transmitted as a (32-bit) double word. Only one parameter value can be transmitted in a telegram at a time.
PWE1 (the word with the higher value) and PWE2 (the word with the lower value, 4th word) carry the 32-bit parameter value together.
A 16-bit parameter value is transmitted in PWE2. In this case the word intended to transmit the PWE1 information should be set to the value 0 on the PROFIBUS-DP master, in order to exclude any misinterpretation.

Important: 32-bit parameter values are used with the optional Posicon feature only. All relevant parameters are described in the "Posicon with PROFIBUS" Additional Operating Instructions.

4. Additional information

4.1.1. Communication

The master will repeat a task to the inverter several times if necessary until the device has transmitted a reply. In this way it is ensured that the task has in fact been transmitted. The inverter will in turn submit the reply periodically until a new task is transmitted by the master. When a reply consists of a parameter value, the inverter will adjust it according to the most recent measurement each time it tries again. The inverter will transmit a reply telegram after two cycles at the earliest.

4.1.2. PROFIBUS master file

The complete performance characteristics of the NORDAC *vector* PROFIBUS module are included in a master file. Organisation, information content, and coding of the master file data (GSD) are standardized. With this data set, NORDAC *vector* inverters can be conveniently adjusted to specific process requirements, and so can parameterisation devices of other manufacturers.This master file can be obtained from NORD if required.
The registered PROFIBUS User Organization has filed this information irrespective of the product source and is providing it in the Internet; to be downloaded via **(http:// www.profibus.com).**

4.1.3. PROFIDRIVE standard parameters

The following parameters defined in the PROFIDRIVE profile have been adopted for the NORDAC *vector* PROFIBUS module.

PNU	Comment
918	User address
927	PKW operating priority (always 1, i.e. PROFIBUS interface)
947	Error number: The number of the current fault is stored in this parameter. The Nordac *vector* inverter allows for reading out information from an array with 4 error numbers max. If indices are accessed to which no error has been assigned, the error number of the last fault is read out.
965	Profile number (3.0)
967	Control word
968	Status word
970	Load data set If this parameter is set to the value 1, the factory settings are loaded and all of the modifier bits are reset to 0. In the NORDAC *vector* inverter series, this function is enabled with a 0 setting of this parameter however.
971	Transfer to the non-volatile memory (is always performed automatically)

4.1.4. Repair

Should the device be in need of repair, kindly send it to the address below:

Enercon NORD Electronic GmbH
Finkenburgweg 11
26603 Aurich

Any questions in connection with repair should be addressed to:

Getriebebau NORD GmbH & Co.
Telefon: 04532 / 401-514 oder -518
Telefax: 04532 / 401-555

Please understand that when a frequency inverter is sent to us for repair, we cannot guarantee any parts which might still be attached to it, such as line cables, potentiometers, external displays etc.!
Better remove from the inverter all parts which are not genuine.

Unit master file (GSD)

```
;===========================================================================
; GSD file for       "NORDAC vector" frequency inverter
;                    with "NORDAC profibus"
;                    GETRIEBEBAU NORD GmbH & Co
; Last update: 1.2 of 09.09.98
; In charge of the GSD master file:
;                    Mr. Volmer (04532 401-513)
;===========================================================================
;
;---------General information-------------------------------------------------
;
#Profibus_DP;
Vendor_Name           = "GETRIEBEBAU NORD" ;name of manufacturer
Model_Name            = "NORDAC profibus"  ;product designation
Revision              = "1.1"              ;last modified
Ident_Number          = 0x7531             ;identification number
Protocol_Ident        = 0                  ;protocol type (DP)
Station_Type          = 0                  ;station type (slave)
FMS_supp              = 0                  ;no FMS
Hardware_Release      = "1.1"              ;hardware release
Software_Release      = "6020 0005"        ;software release
;
9.6_supp              = 1                  ;supported baud rates
19.2_supp             = 1
93.75_supp            = 1
187.5_supp            = 1
500_supp              = 1
1.5M_supp             = 1
;
MaxTsdr_9.6           = 60                 ;max. reply times
MaxTsdr_19.2          = 60
MaxTsdr_93.75         = 60
MaxTsdr_187.5         = 60
MaxTsdr_500           = 100
MaxTsdr_1.5M          = 150
;
Redundancy            = 0                  ;no redundant transmission
Repeater_Ctrl_Sig     = 2                  ;RTS signal with TTL level
24V_Pins              = 0                  ;no 24V pins
Implementation_Type   = "SPC4"                          ;ASIC type

;
;---------DP-Slave Specific Values--------------------------------------
;
Freeze_Mode_supp      = 1                  ;freeze mode is supported
Sync_Mode_supp        = 1                  ;sync mode is supported
Auto_Baud_supp        = 1                  ;autom. baud rate recognition
Set_Slave_Add_supp    = 0                  ;no slave address setting
User_Prm_Data_Len     = 0                  ;no extended parameterisation values
Min_Slave_Intervall   = 40                 ;min. slave interval 4ms
;
Modular_Station       = 1                  ;modular device
Max_Module            = 4                  ;2 modules max.
Max_Input_Len         = 20                 ;maximum input data length
Max_Output_Len        = 20                 ;maximum output data length
Max_Data_Len          = 40                 ;maximum sum total of data
Max_User_Prm_Data_Len = 0                  ;maximum user_prm_data length
;
Unit_Diag_Bit(1)      = "SPM-FIFO overflow"
Unit_Diag_Bit(2)      = "Actual value is not updated"
;
Modul_Offset          = 0                  ;first slot number
Slave_Family          = 1                  ;main family: drives
;
;---------Module description--------------------------------------------
;
Module = "PPO 1:   4 PKW | 2 PZD        " 0xF3, 0xF1
EndModule
Module = "PPO 2:   4 PKW | 4 + 2 PZD    " 0xF3, 0xF5
EndModule
Module = "PPO 3:   0 PKW | 2 PZD        " 0xF1
EndModule
Module = "PPO 4:   0 PKW | 4 + 2 PZD    " 0xF5
EndModule
```

5. Parameter numbers (PNU) of the Nordac *vector* series

This part of the Operating Instructions comprises a list of all parameters of the NORDAC *vector* inverter series accessible with the PROFIBUS along with the parameter number (**PNU**) to be used. To facilitate programming the **HEX** value is provided as well. In the Flags column you will find additional information for parameter configuration. The abbreviations used are explained below.

Abbreviations used:

PNU Parameter number
HEX Hexadecimal value
IND Subindex
***** Value varying with FI type

Flags
P Parameter pertinent to a specific parameter set
O Parameter variable on-line
L Long-value (32-bit) parameter
A Array parameter
R Read-only parameter

5.1. Basic parameters

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1202	4B2	0	Accel. time	0.05 seconds	0.05..1600s	*	P O - - -
1203	4B3	0	Decel. time	0.05 Sekunden	0.05..1600s	*	P O - - -
1204	4B4	0	Minimum frequ.	0.1 Hz	0..max.frequ.	0 Hz	P O - - -
1205	4B5	0	Maximum frequ.	0.1 Hz	Min.fr...999Hz	70 Hz	P O - - -
1206	4B6	0	Control mode	0 = linear characteristic 1 = square characteristic 2 = automatic characteristic 3 = ISD control	0..3	3	P - - - -
1207	4B7	0	Operating mode	0 = analogue 1 = motor potentiometer	0..1	0	- - - - -

5.2. Motor data

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1300	514	0	Standard motor	-1 : no motor 0 = 0.37 kW / 24 =0.5 PS 1 = 0.55 kW / 25 =0.75 PS 2 = 0.75 kW / 26 = 1.0 PS 3 = 1.1 kW / 27 = 1.5 PS 4 = 1.5 kW / 28 = 2.0 PS 5 = 2.2 kW / 29 = 3.0 PS 6 = 3.0 kW / 30 = 5.0 PS 7 = 4.0 kW / 31 = 7.5 PS 8 = 5.5 kW / 32 = 10.0 PS 9 = 7.5 kW / 33 = 15.0 PS 10 = 11.0 kW / 34 = 20.0 PS 11 = 15.0 kW / 35 = 25.0 PS 12 = 18.5 kW / 36 = 30.0 PS 13 = 22.0 kW / 37 = 40.0 PS 14 = 30.0 kW / 38 = 50.0 PS 15 = 37.0 kW / 39 = 60.0 PS 16 = 45.0 kW / 40 = 75.0 PS 17 = 55.0 kW / 41 =100.0 PS 18 = 75.0 kW / 42 =120.0 PS 19 = 90.0 kW / 43 =150.0 PS 20 = 110.0 kW /44=180.0 PS 21 = 132.0 kW /45=220.0 PS 22 = 160.0 kW /46=270.0 PS 23 = 200.0 kW	-1..46	*	P - - - -
1301	515	0	Nomin. frequency	0.1 Hz	0..999Hz	50Hz	P - - - -
1302	516	0	Nominal speed	1 min-1	0..30.000min-1	*	P - - - -
1303	517	0	Nominal current	0.01A	0..1.5*I_{NFU}	*	P - - - -
1304	518	0	Nominal voltage	1V	0..460V	400V	P - - - -
1305	519	0	Nominal power	0.01kW	0..1.5*P_{NFU}	*	P - - - -
1306	51A	0	Nomin. Cos(PHI)	0.01	0.5..1.0	*	P - - - -
1307	51B	0	Motor connection	0 = star 1 = delta	0..1	*	P - - - -
1308	51C	0	Stator resistance	0.01Ohm	0..40Ohm	*	P - - - -
1309	51D	0	No-load current	0.01A	0..1.5*I_{NMOT}	*	P - - - -

5.3. Control parameters

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1400	578	0	Ramp response	0 = Off 1 = On	0..1	1	P O - - -
1401	579	0	Current limit 1	0.1A	0..curr.lim.2	1.4*I_{NFI}	P O - - -
1402	57A	0	Current limit 2	0.1A	c.li.1..1,5*I_{NFU}	1.5*INFI	P O - - -
1403	57B	0	Braking delay	0 = Off 1 = On	0..1	0	P O - - -
1404	57C	0	Ramp down	0 = Off 1 = On	0..1	1	P O - - -
1405	57D	0	Corner frequency	0.1Hz	20..999Hz	50Hz	P O - - -
1406	57E	0	Static boost	0.1V	OFF..100V	*	P O - - -
1407	57F	0	Dynam. Boost	0,1V	OFF..120V	0	P O - - -
1408	580	0	Duration dyn. boost	0.1s	0.1..20s	0.1s	P O - - -
1409	581	0	DC brake	0 = Off 1 = On 2 = instantly	0..2	0	P O - - -
1410	582	0	DC brake time	0.1s	0.1..60s	1s	P O - - -
1411	583	0	DC brake voltage	0.1V	0..120V	*	P O - - -
1412	584	0	Setpoint delay	0.01s	OFF..10s	0	P O - - -
1413	585	0	Ramp smoothing	1%	OFF..100%	0	P O - - -
1414	586	0	Flying start feature	0 = Off 1 = On (R + L) 2 = On (R / L) 3 = after disconn. (R + L) 4 = after disconn. (R / L)		0	P - - - -
1415	587	0	Flying start offset	0.1 Hz	-10..+10Hz	0Hz	P - - - -
1416	588	0	Flying start resol.	0.05Hz	0.05..5Hz	1Hz	P - - - -
1417	589	0	Slip compensation	0 = Off 1 = On	0..1	1	P O - - -
1418	58A	0	Aut. frequ. increase	0 = Off 1 = On	0..1	0	P O - - -
1419	58B	0	P-factor frequ. incr.	1	0..32000	1000	P O - - -
1420	58C	0	Torque limit	1%	24(Off)...400%	24	P O - - -

5.4. Control terminals

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1500	5DC	0	Mode an. input 1	0 = 0...10V limited 1 = 0...10V 2 = -10V..+10V 3 = 0...20mA 4 = 4...20mA 5 = Off	0..5	0	P O - - -
1501	5DD	0	Alignment1: 0%>	0.02V	-	0V	- - - - -
1502	5DE	0	Alignment1: 100%>	0.02V	-	10V	- - - - -
1503	5DF	0	Filter an. inp. 1	0 = Off 1 = On	0..1	OFF	- O - - -
1504	5E0	0	Funct. an. inp. 2	0 = None 1 = Add value to input 1 2 = Subtract value from inp.1 3 = Actual frequency value 4 = Current limit 5 = Torque limit 6 = Max.frequ. – positioning 7 = PID controller	0..7	0	P - - - -
1505	5E1	0	Mode an. inp. 2	0 = 0...10V limited 1 = 0...10V 2 = -10V..+10V 3 = 0...20mA 4 = 4...20mA 5 = Off	0..5	0	- - - - -
1506	5E2	0	Alignment2: 0%>	0.02V	-	0V	- - - - -
1507	5E3	0	Alignment2: 100%>	0.02V	-	10V	- - - - -
1508	5E4	0	Filter an. inp. 2	0 = Off 1 = On	0..1	OFF	- O - - -
1509	5E5	0	Frequency 100%	1 Hz	0..999Hz	50Hz	P O - - -
1510	5E6	0	PI controller P	0.10%	0..800%	100%	P O - - -
1511	5E7	0	PI controller I	0.01%/ms	0..100%/ms	10%/ms	P O - - -
1512	5E8	0	PI controller D	0.1%ms	0..400%/ms	0%/ms	P O - - -
1513	5E9	0	PI controller T	1ms	2..32000ms	2ms	P O - - -
1514	5EA	0	Limit PI controller	0.1Hz	2..999Hz	10Hz	P O - - -
1515	5EB	0	Current limit 100%	0.1A	0..2*I_{NFU}	1.5*I_{NFU}	P O - - -
1516	5EC	0	Torque 100%	1%	25..400%	100%	P O - - -
1517	5ED	0	Analogue output	0 = Off 1 = Output frequency 2 = Output frequ., signed 3 = Output current 4 = Output voltage 5 = Active power 6 = Cos phi 7 = Torque 8 = Torque, signed 9 = Speed 10 = Speed, signed	0..10	0	- O - - -

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1518	5EE	0	Norm. An. output	1%	10..500%	100%	- O - - -
1520	5F0	0	Digital input 2	0 = No function 1 = Enable right 2 = Enable left 3 = Sense of rotation 4 = Fault acknowledgement 5 = Param. set input 1 6 = Param. set input 2 7 = Disable the voltage 8 = Quick stop 9 - 11= Fixed frequ. 1-3 10 = Fixed frequency 2	0..13	2	- - - - -
				11 = Fixed frequency 3 12 = Frequency + 13 = Remote control			
1521	5F1	0	Digital input 3	as parameter 520	0..13	9	- - - - -
1522	5F2	0	Digital input 4	as parameter 520	0..14	5	- - - - -
1523	5F3	0	Digital input 5	as parameter 520	0..15	6	- - - - -
1524	5F4	0	Digital input 6	as parameter 520	0..16	4	- - - - -
1525	5F5	0	Enable active	0 = Edge 1 = Level	0..1	0	- - - - -
1526	5F6	0	Mot. temp. protect.	0 = Off 1 = On	0..1	0	- O - - -
1527	5F7	0	Relay 1 fct. (binary)	Bit 1 = Current limit Bit 2 = Frequency limit Bit 3 = Brake control Bit 4 = Temperature warning Bit 5 = Overcurrent tripping Bit 6 = Ramp resp. active Bit 7 = Contouring error Bit 8 = Slip limit Bit 9 = Torque limit Bit 10 = Generative torque Bit 11 = Setp. = actual frequ. Bit 12 = Inactive fault	0..4095	Fault	P O - - -
1528	5F8	0	Relay 1 logic	0 = OR 1 = AND	0..1	0	P O - - -
1529	5F9	0	Relay 1 current	0.1 A	0..2*I_{NFU}	I_{NFU}	P O - - -
1530	5FA	0	Relay 1 I-hyst.	1%	0..20%	10%	P O - - -
1531	5FB	0	Relay 1 frequ.	0.1 Hz	0..max.Freq.	50.5Hz	P O - - -
1532	5FC	0	Relay 1 contour.	1 min-1	0..500min-1	100min-1	P O - - -
1533	5FD	0	Relay 1 slip	1%	0..400%	300%	P O - - -
1534	5FE	0	Relay 1 torque	1%	0..400%	300%	P O - - -
1535	5FF	0	Relay 2 fct.	as parameter 527	0..4095	brake	P O - - -
1536	600	0	Relay 2 logic	as parameter 528	0..1	0	P O - - -
1537	601	0	Relay 2 current	0.1 A	0..2*I_{NFI}	I_{NFI}	P O - - -
1538	602	0	Relay 2 I-hyst.	1%	0..20%	10%	P O - - -
1539	603	0	Relay 2 frequ.	0.1 Hz	0..max.frequ.	50.5Hz	P O - - -
1540	604	0	Relay 2 contour.	1 min-1	0..500min-1	100min-1	P O - - -
1541	605	0	Relay 2 slip	1%	0..400%	300%	P O - - -
1542	606	0	Relay 2 torque	1%	0..400%	300%	P O - - -

5.5. Additional functions

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1600	640	0	Language	0 = German 1 = English 2 = French 3 = Spanish 4 = Swedish 5 = Dutch	0..5	0	- O - - -
1601	641	0	Keyboard control	0 = Off 1 = On	0..1	0	- O - - -
1602	642	0	Factory setting	0 = Off 1 = On	0..1	0	- - - - -
1603	643	0	Password	1	0..9999	0	- - - - -
1604	644	0	Change password	1	0..9999	0	- - - - -
1605	645	0	Fixed frequency 1	0.1 Hz	+/-max.frequ.	10Hz	P O - - -
1606	646	0	Fixed frequency 2	0.1 hz	+/-max.frequ.	20Hz	P O - - -
1607	647	0	Fixed frequency 3	0.1 Hz	+/-max.frequ.	40Hz	P O - - -
1608	648	0	Loss reduction	0 = Off 1 = On	0..1	0	P O - - -
1609	649	0	Switching frequ.	0 = 2kHz 1 = 4kHz 2 = 8kHz 3 = 16kHz	0..3	2	P O - - -
1610	64A	0	Skip frequ. 1 high	0.1 Hz	0..max.frequ.	0	P O - - -
1611	64B	0	Skip frequ. 1 low	0.1 Hz	0..max.frequ.	1	P O - - -
1612	64C	0	Skip frequ. 2 high	0.1 Hz	0..max.frequ.	2	P O - - -
1613	64D	0	Skip frequ. 2 low	0.1 Hz	0..max.frequ.	3	P O - - -
1614	64E	0	Quick stop at fault	0 = Off 1 = On	0..1	0	P - - - -
1615	64F	0	Quick stop time	0.05s	0.05..10s	0.1s	P - - - -
1616	650	0	Autom. acknowl.	0=Off,1-9=1-9 times,10=always	1..10	0	- - - - -
1617	651	0	Abs. min. frequency	0.1 Hz	0.1..10Hz	1Hz	- O - - -
1618	652	0	Mains voltage	1 V	303(auto)..506V	303	- - - - -
1619	653	0	Bus mode	0 = Off 1 = USS 2 = External bus	0..2	1	- - - - -
1620	654	0	USS-Modus	0 = Slave 1 = Master 1 2 = Master 2 3 = Master 3	0..3	0	- - - - -
1621	655	0	Interface	0 = Local control 1 = Setpoint 1 bus 2 = Bus 3 = Bus + setpoint 2 4 = Setpoint 1 limited 5 = Bus limited 6 = Bus + Setpoint 2 lim.	0..6	0	- - - - -

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1622	656	0	PPO type	0 = PPO1 1 = PPO2 2 = PPO3 3 = PPO4	0..3	0	- - - - -
1623	657	0	Baud rate	0 = 4800 baud 1 = 9600 baud 2 = 19200 baud 3 = 38400 baud	0..3	1	- - - - -
1624	658	0	Bus address	1	0..31	0	- - - - -
1625	659	0	Bus timeout	0.1s	0..100s	0s	- - - - -
1626	65A	0	Rstat adaption	0 = Off 1 = On	0..1	0	P O - - -
1627	65B	0	Servo mode	0 = Off 1 = On	0..1	0	P - - - -
1628	65C	0	Shaft encoder resol.	0 = 500 1 = 512 2 = 1000 3 = 1012 4 = 2000 5 = 2048 6 = 4096 7 = 5000	0..7	6	- - - - -
1629	65D	0	Speed controller P	1%	0..800%	100%	P O - - -
1630	65E	0	Speed controller I	1%/s	0..800%/s	10%/s	P O - - -
1631	65F	0	Current controller P	1%	0..800%	100%	P O - - -
1632	660	0	Current controller I	0.1%/ms	0..1000%/ms	300%/ms	P O - - -
1633	661	0	Limit current contr.	1V	0..400V	100V	P O - - -
1634	662	0	Field weaken. contr. P	1%	0..400%	50%	P O - - -
1635	663	0	Field weaken. contr. I	0,1%/ms	0..100%/ms	10%/ms	P O - - -
1636	664	0	Field weakening limit	1%	0..100%	100%	P O - - -
1641	669	0	ISD control gain	1%	25..400%	100%	P O - - -

5.6. Positioning (only with *PosiCon* extension)

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags				
1700	6A4	0	Current position	0.001rev			-	-	L	A	R
1701	6A5	0	Position control	0 = Off 1 = On	0..1	0	P	-	-	-	-
1702	6A6	0	SSC mode	0 = Off 1 = SSI – Master 2 = SSI – Slave 3 = SCI – Master 4 = SCI - Slave	0..4	0	-	-	-	-	-
1703	6A7	0	SCI mode	0 = 32-bit [cascade] 1 = 32-bit [pos ref] 2 = 32-bit [pos]	0..2	0	-	-	-	-	-
1704	6A8	0	Setpoint mode	0 = Digital mode 1 1 = Digital mode 2 2 = Bus mode 16 bits 3 = Bus mode 32 bits 4 = Dig. bus mode 1 5 = Dig. bus mode 2 6 = SSI mode 7 = SCI mode 8 = Cascade	0..8	0	-	-	-	-	-
1705	6A9	0	Bus 100% Pos.	2rev	0..50000rev	2rev	P	-	-	-	-
1706	6AA	0	Pos. recognition	0 = Incremental 1 = Absolute mode 1 2 = Absolute mode 2	0..2	0	-	-	-	-	-
1707	6AB	0	SSI resolution/rev	0 = 64 1 = 128 2 = 256 3 = 512 4 = 1024 5 = 2048 6 = 4096	0..6	6	-	-	-	-	-
1708	6AC	0	SSI max. revolu.	0 = 1 1 = 16 2 = 256 3 = 4096	0..3	3	-	-	-	-	-
1709	6AD	0	Offset abs. pos.	0.001rev	-50000..50000	0	-	O	L	-	-
1710	6AE	0	Curr. pos. check	0 = Off 1 = On	0..1	0	-	-	-	-	-
1711	6AF	0	SSC check	0 = Off 1 = On	0..1	0	-	-	-	-	-
1712	6B0	0	Reduction	1	-10000..10000	1	-	O	-	-	-
1713	6B1	0	Multiplication	1	-10000..10000	1	-	O	-	-	-
1714	6B2	0	Ref. pt. mode	0 = Off 1 = On 2 = Save pos. On 3 = Reset position	0..3	0	-	-	-	-	-

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1715	6B3	0	Frequ. ref. point	0.1Hz	0..999Hz	5Hz	P O - - -
1716	6B4	*	Position *Index=pos–1*4+P.set	0.001rev	-50000..50000	0	P O L A -
1717	6B5	*	Pos. increm. *Index=Pos–1*4+P.set	0.001rev	-50000..50000	0	P O L A -
1718	6B6	0	Pos. controller P	0.10%	1..100%	50%	P O - - -
1719	6B7	0	Displacement calcul.	0 = Off 1 = On	0..1	1	P O - - -
1720	6B8	0	Large destin. window	0.01rev	0..50	0	P O - - -
1721	6B9	0	Relay 3 functions	1 = Final pos. 2 = Position 4 = Abs. pos. 8 = Reference	1..8	8	P - - - -
1722	6BA	0	Relay 3 pos.	0.001rev	-50000..50000	0	P - L - -
1723	6BB	0	Rel. 3 abs. pos.	0.001rev	0..50000	0	P - L - -
1724	6BC	0	Relay 3 hyst.	0.01rev	0..50	1	P - - - -
1725	6BD	0	Relais 4 fct.s	1 = Final position 2 = Position 4 = Abs. position 16 = Pos. array	1..16	1	P - - - -
1726	6BE	0	Relay 4 pos.	0.001rev	-50000..50000	0	P - L - -
1727	6BF	0	Rel. 4 abs. pos.	0.001rev	0..50000	0	P - L - -
1728	6C0	0	Relay 4 hyst.	0.01rev	0..50	1	P - - - -
1731	6C3	0	Pos.softw. vers.	1	0..32000	0	- - - - -
1731	6C3	1	Pos.softw. vers.D	1	0..32000	0	- - - - -
1732	6C4	0	Minimum pos.	0.001rev	-50000..50000		- - L - -
1733	6C5	0	Maximum pos.	0.001rev	-50000..50000		- - L - -
1734	6C6	0	Current setp. pos.	0.001rev	-50000..50000		- - L - R

5.7. Information

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1800	708	0	New error	0 = No fault 1 = FI overtemperature 2 = Motor overtemperature 3 = Overcurrent 4 = Module overcurrent 5 = Overvoltage 6 = Undervoltage 7 = Phase failure 8 = Parameter lost 9 = Flying start error 10 = USS timeout 11-23 = System failure 1-13 24 = Reference point error 25 = Shaft encoder error	0..25	0	- - - - R
1801	709	0	Past fault 1	see above	0..25	0	- - - - R
1801	709	1	Time past fault 1	1h	0..10000h	0h	- - - - R
1801	709	2	Frequ. past fault 1	0.1Hz	0..999Hz	0Hz	- - - - R
1801	709	3	Volt. past fault 1	1V	0..1000V	0V	- - - - R

PNU	HEX	IND	Parameter	Resolution / Settings	Range of values	Default	Flags
1801	709	4	Current past fault 1	0.1A	0..300A	0A	- - - - R
1801	709	5	Temp. past fault 1	0.1C	0..10000C	0C	- - - - R
1801	709	6	Par. set past fault 1	1	0..3	0	- - - - R
1802	70A	0-6	Past fault 2	see above	s.o.	s.o.	- - - - R
1803	70B	0-6	Past fault 3	see above	s.o.	s.o.	- - - - R
1804	70C	0-6	Past fault 4	see above	s.o.	s.o.	- - - - R
1805	70D	0-6	Past fault 5	see above	s.o.	s.o.	- - - - R
1806	70E	0	FI overtemperature	1	0..1000	0	- - - - R
1806	70E	1	Motor overtemp.	1	0..1000	0	- - - - R
1806	70E	2	Overcurrent	1	0..1000	0	- - - - R
1806	70E	3	Module overcurrent	1	0..1000	0	- - - - R
1806	70E	4	Overvoltage	1	0..1000	0	- - - - R
1806	70E	5	Undervoltage	1	0..1000	0	- - - - R
1806	70E	6	Phase failure	1	0..1000	0	- - - - R
1806	70E	7	Parameter lost	1	0..1000	0	- - - - R
1806	70E	8	Flying start error	1	0..1000	0	- - - - R
1806	70E	9	Time-out	1	0..1000	0	- - - - R
1806	70E	10-22	System faults 1-13	1	0..1000	0	- - - - R
1806	70E	23	Reference point	1	0..1000	0	- - - - R
1806	70E	24	Shaft encod. error	1	0..1000	0	- - - - R
1807	70F	0	FI overtemp. warn.	1	0..1000	0	- - - - R
1807	70F	1	Mot. overtemp. warn.	1	0..1000	0	- - - - R
1807	70F	2	Overcurrent warning	1	0..1000	0	- - - - R
1807	70F	3	C552 < > C166	1	0..1000	0	- - - - R
1807	70F	4	Fault at dig. inp.	1	0..1000	0	- - - - R
1808	710	0	Operating period	1	0..65000	0	- - - - R
1810	712	0	Event MFR1	1	0..1	0	- - - - R
1811	713	0	Event MFR2	1	0..1	0	- - - - R
1812	714	0	Software vers.	1	0..65000	0	- - - - R
1812	714	1	Software vers.D	1	0..65000	0	- - - - R
1813	715	0	Frequency	0.1 Hz	0..999Hz	0Hz	- - - - R
1813	715	1	Reactive current	0.1 A	0..300A	0A	- - - - R
1813	715	2	Active current	0.1 A	0..300A	0A	- - - - R
1825	721	0	Temp. heat sink	1°C	0..10000C	0C	- - - - R
1825	721	1	Pulse frequ. act. val.	1	0..3	0	- - - - R
1825	721	2	D.c. link volt. meas. val.	1	0..999V	0V	- - - - R

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