Contents

04/98 AWB 823-1290-GB

About this manual

This manual contains the information you need to configure the parameters of the DE 4-NET-DP PROFIBUS-DP interface module.

It also contains a description of the function, installation and commissioning of the DE 4-NET-DP interface module.

The manual uses the following abbreviations and symbols:

PNU:
Parameter number

Host computer (PROFIBUS master):
Higher-level computer (PLC or PC) which centrally manages all subordinate stations (slaves) in the bus system.

This symbol refers to useful tips and additional information

▶ This symbol indicates steps of work that you need to carry out

03/98 AWB 823-1290-D

Attention!
This symbol warns you about instructions which should be observed to avoid possible damage to equipment, other items in the vicinity or data.

Warning!
This symbol warns you about instructions which should be observed to avoid possible severe damage to or destruction of equipment, other items in the vicinity or data. It also refers to information which should be observed to avoid possible serious injury or death to operating personnel.

1 About this product

System overview

The generic type code for interface modules shows the device's position among the Klöckner-Moeller family of products:

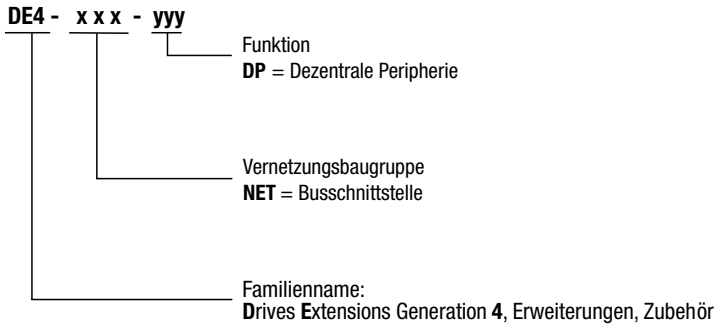


Figure 1: Type code for PROFIBUS-DP interface modules

The DE 4-NET-K PROFIBUS-DP interface module is used to connect DF 4 series frequency inverters to PROFIBUS-DP. This makes it easy to interface them to an automation system. You can then access all frequency inverter parameters from any PROFIBUS-DP master.

Features of the PROFIBUS-DP interface module

The DE 4-NET-DP interface module has the following features:

Communication profile	PROFIBUS-DP (DIN 19 245 part 1 and part 3)
Profile control word/status word	DRIVECOM Profile 20
Hardware interface	RS 485
Status in PROFIBUS-DP line	Slave
Data transfer rate	9.6 – 93.75 kBaud for 1200 m data cable 187.5 kBaud for 1000 m data cable 500 kBaud for 400 m data cable 1500 kBaud for 120 m data cable 12000 kBaud for 25 m data cable
Baud rate detection	Automatic
Process data	2 or 3 words DF 4: 2 words of input data/ 2 words of output data
Process data exchange	Cyclic
Access to all parameters	Via parameter channel
Max. number of stations	Depends on master type
Power requirements	24 VDC ±10%; max. 60 mA DF 4-120 external power feed only DF 4-340 internal or external power feed DF 4-341 internal or external power feed
Diagnosis LEDs	2
Simple assembly	Yes

03/98 AWB 823-1290-D

Construction

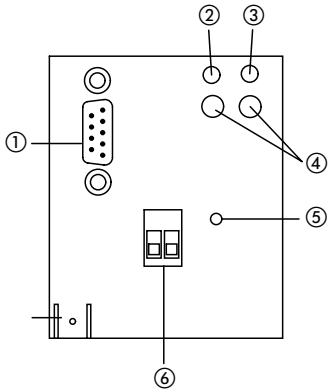


Figure 2: Construction of the DE 4-NET-DP PROFIBUS interface module

① 9-pin Sub-D connector fro PROFIBUS-DP

② Green power LED for the power feed:

ON = interface module is supplied with power
OFF = no power feed to interface module - frequency inverter or external power feed is switched off
FLASHING = interface module is supplied with power but cannot communicate with the frequency inverter

Yellow bus LED for communication status:

ON = interface module is initialised, no PROFIBUS-DP communication with master at present
OFF = interface module is not yet initialised
FLASHING = PROFIBUS-DP communication with master is active, no faults

③ Two operating status LEDs for the frequency inverter

④ Mounting screw

⑤ Plug-in screw terminals for external power feed (24 V DC)

⑥ PE connection; 6.35 mm spade connector, PE cable min. 2.5 mm^2; avoids communication faults in environments with high electromagnetic interference

Manufacturer's certification

The PROFIBUS interface module DE 4-NET-DP described in this manual is commonly described in an industrial environment as a "device" or "unit". However the manufacturer would like to point out that is it is not a ready-to-use unit or machine as covered by the relevant Device Safety or EMC regulations or the EC Machinery Directive, and should be classified instead as a component. The intended use is only determined after this component has been connected to other components provided by the user.

Accordingly, compliance of the final construction with existing legal regulations is the responsibility of the user.

Intended use

The DE 4-NET-DP interface module may be used as an accessory for the frequency inverter models DF 4-120, DF 4-340 and DF 4-341.

The DE 4-NET-DP interface module is used to connect a DF 4-series frequency inverter to a higher-level controlling computer (PLC or PC) through PROFIBUS-DP and functions as a PROFIBUS-DP Slave.

The interface module may only be used when it is in perfect working order.

Any changes or modifications to the interface module are forbidden.

The interface module described in this manual is intended for use in industrial power installations. It must be rigidly attached to and electrically connected with the frequency inverter in such a way that it meets its intended function when the equipment operates correctly and it does not present any danger to operating personnel

03/98 AWB 823-1290-D

It is also necessary to observe all measures which are specified in the manual of the frequency inverter model which is being used.

You may only use the DE 4-NET-DP interface module under the specified conditions of use which are described in this manual.

The manual must be made available to operating personnel in its entirety and should be in good readable condition.

During operation of the equipment, the manual should always be available in the vicinity of the interface module for reference by operating personnel.

All personnel who work on or with the DE 4-NET-DP interface module must have ready access to the manual during their work.

Read the entire manual carefully before starting the work and observe the relevant information and warnings.

Suitable measures should be provided to ensure that there is no danger to operating personnel or risk of damage to equipment if a failure of the interface module should occur.

All other usage is forbidden.

Persons responsible for safety

At the timepoint of initial delivery, the interface module complies with the current state of the art and is safe to use without exception.

The interface module can present a hazard if:

- unskilled persons work on or with the interface module;
- The interface module is improperly used.

Operator

The operator is any natural or legal person that uses the interface module or for whom the interface module is used on his/her order.

The operator and/or his/her safety officer must ensure that

- all regulations, warnings and national laws are observed;
- only qualified personnel are allowed to work on and with the interface module;
- this manual is available to operating personnel during all phases of work;
- unauthorised persons are prevented from accessing and working on and with the interface module.

Qualified personnel

Qualified personnel includes persons who as a result of their training, experience and instruction and their knowledge of relevant standards, regulations, safety standards and the operational environment have been authorised by the person responsible for the safety of the equipment to perform the required work and are able to recognise and avoid potential dangers (definition of qualified operators from VDE 105 or IEC 364).

Please contact the responsible Klöckner-Moeller Branch Office if you have any questions or problems.

03/98 AWB 823-1290-D

Recycling

The DE 4-NET-DP interface module is manufactured from a variety of materials.

The following materials can be recycled:

metal;

plastic;

assembly Instructions

The assembled printed circuit board is manufactured from materials which need to be recycled separately.

03/98 AWB 823-1290-D

2 Engineering

The process engineering information and example circuit diagrams described in this manual are suggestions whose suitability for the respective application must be checked by the user.

Attention! Suitable measures must be implemented to ensure that, if the interface module fails, there is no risk of injury to personnel or damage to equipment.

RS 485 Interface

Pin assignments

The following table describes the pin assignments of the 9 pin Sub-D PROFIBUS-DP socket:

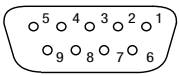


Figure 3: 9-pin Sub-D socket *for RS 485*

Pin	Designation	Description
1	PE	Protective earth
2	unused	–
3	RxD/TxD-P	Data signal -B
4	RTS	Request to send
5	M5V2	Signal earth **0 V**
6	P5V5	5 V DC [1)]
7	unused	–
8	RxD/TxD-N	Data signal -A
9	unused	–

[1)] Total current ca. 60 mA

Required PROFIBUS interface cable

9-pin Sub-D plug for the RS 485 interface

Connect to the RS 485 socket using a PROFIBUS interface cable and 9-pin Sub-D plug with the following pin assignments:

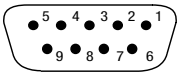


Figure 4: 9-pin Sub-D plug for RS 485 (view from solder side)

Pin	Designation	Description
1	PE	Protective earth
3	RxD/TxD-P	Data signal -B
5	M5V2	Signal earth potential
6	P5V2	5 V DC
8	RxD/TxD-N	Data signal -A

Communication times

The communication times are dependent on the data transfer time and the processing time in the frequency inverter.

Data transfer times

The data transfer time is dependent on the data transfer rate (baud rate) and the length of the user data.

Processing time required by the controller

Processing time of the DF 4-120

In the DF 4-120 series frequency inverter, a series of steps are processed cyclically.

03/98 AWB 823-1290-D

Each cycle consists of

Write control word or setpoint if the value has changed

Alternately read status word and actual value

Read or write individual parameters on request

The cyclic reading of status word and actual value can lead to imprecise timing.
Set bit 15 of the DRIVECOM control word (PI update inhibit) to inhibit the alternate reading of status word and actual value and thus ensure that control information is transmitted with more precise timing.

PI refresh inhibit = 0:
Status word and actual value are updated

PI refresh inhibit = 1:
Status word and actual value are not updated

The following table shows the times required for each of the processing steps:

Processing step	**Max. processing time in ms**			
	PI update inhibit = 0	Tolerance	**PI update inhibit = 1**	Tolerance
Read parameter	55	+48	55	+8
Control word or setpoint	27	+48	27	+8
Control word and setpoint	54	+56	54	+16
Write parameter	108	+32	–	–
Status word and actual value	200	+40	200	–

Processing time of the DF 4-34x

With the DF 4-34x frequency inverter models, the parameter data and process data are independent of each other.

Parameter data: 30 ms + 20 ms tolerance
Process data: ca. 3 ms+ 2 ms tolerance

Power feed for the interface module

Warning!
If you connect the power feed to the DE 4-NET-DP interface module with incorrect polarity, the interface module will be destroyed.

The interface module can be supplied with power in two different ways:

external 24 V DC ±10% power feed connected to the plug-in screw terminals

internal power feed from the frequency inverter; the power feed connection is made automatically when the interface module is plugged onto the frequency inverter (this option is not possible with frequency inverter model DF 4-120)

External power feed

Pin assignments

If you want to use an external power feed for the interface module, connect up using a 2-pin plug-in screw terminal as follows:

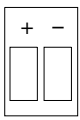


Figure 5: Plug-in screw terminal for the external power feed

Pin	Designation	Input/output	Description
+	V_{cc} 24	Input	External power feed 24 V DC/ ± 10%, 60 mA
–	GND 24	–	Reference earth 0-V for external power feed

03/98 AWB 823-1290-D

Galvanic Isolation

With frequency inverter models DF 4-120 and DF 4-340, additional galvanic isolation is required between the frequency inverter and the control computer (PC) if you need double basic insulation according to VDE 0160.

This can be achieved e.g. using a module for the control computer which provides additional galvanic isolation (refer to the respective manufacturer's specifications for details).

When installing the cabling the between the interface module and the PC, remember to provide galvanic isolation for the external power feed too (if used).

In the case of the frequency inverter model DF 4-341, double basic insulation is already provided in accordance with VDE 0160 and additional galvanic isolation is not necessary.

Screening with an additional PE cable

With the DF 4- series frequency inverters, electromagnetic radiation can impair the communication with the interface module. In order to ensure reliable communication, use an additional external PE cable as shown in Figure 6.

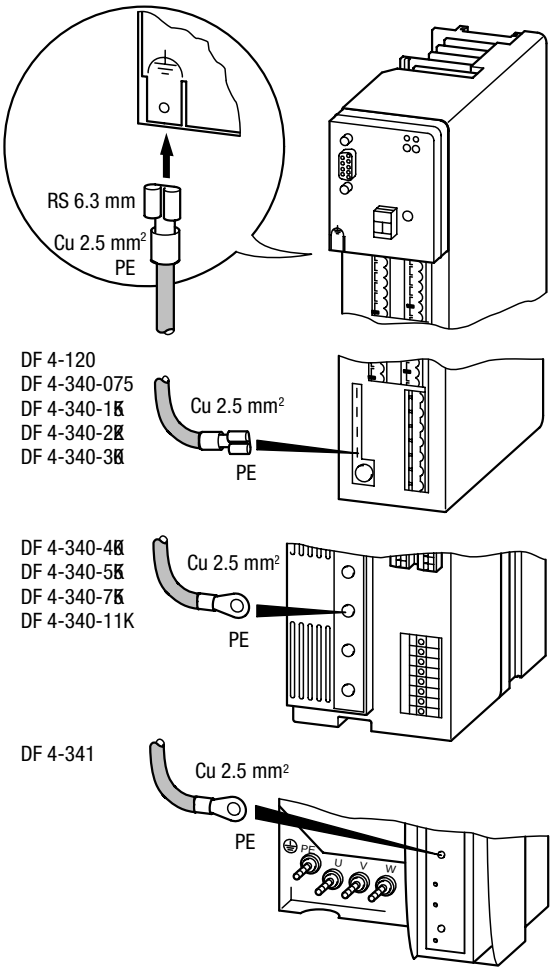


Figure 6: Screening with an additional PE cable

03/98 AWB 823-1290-D

Networking of several frequency inverters

Networking of interface modules via the PROFIBUS-DP interface can be useful if the plant contains several frequency inverters.

Only use PROFIBUS cable which complies with the PROFIBUS-DP specifications.

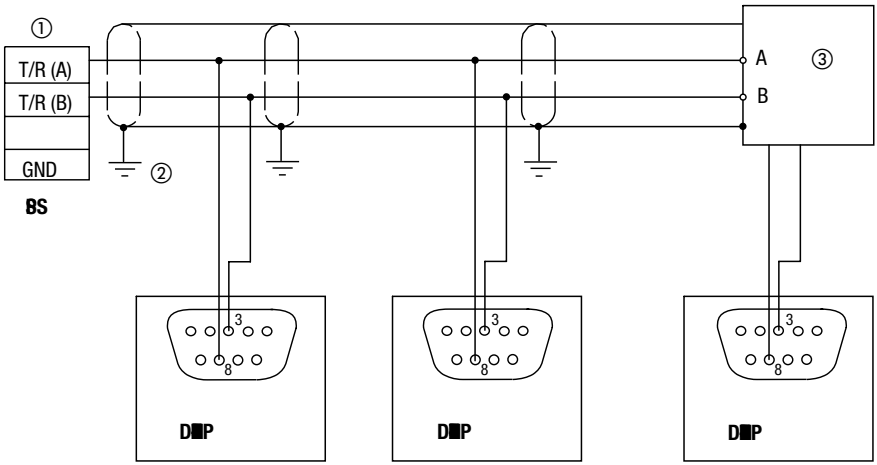


Figure 7: Networking through the RS485 interface

① Enable bus terminating resistors

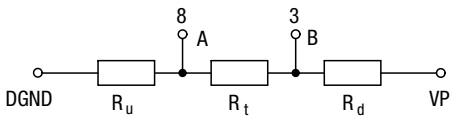
② Connect the screen to the case of the frequency inverter

③ See section “Bus terminating resistors”

Bus terminating resistors

Bus terminating resistors must be fitted and/or enabled if the interface module is installed at the beginning or end of the PROFIBUS line. The bus terminating resistors can be fitted inside the PROFIBUS plug or be provided as a self-contained active bus terminating device (neither of these options are supplied with the DE 4-NET-DP interface module).

Please observe the following depending on which termination method you are using:

Bus terminating plug	Notes
Klöckner-Moeller terminating PROFIBUS plug type ZB4-209-DS2	PROFIBUS plug with switchable bus terminating resistors
Standard 9-pin Sub-D plug fitted with resistors [1]	

[1] The following resistor values are recommended for a bus supply voltage VP of +5 V±5%:

R_t = 150 Ω ±2%, min. ¼ W
$R_u = R_d$ = 390 Ω ±2%, min. ¼ W

The bus supply voltage VP should have a minimum current rating of 10 mA in case of short-circuit of the bus cable.

The bus system still functions correctly even if the power feed to the interface module is interrupted. However, the frequency inverter is then no longer accessible from the control computer. If it is required to switch off individual stations on the bus, it is necessary to ensure that the bus termination at the beginning and end of the PROFIBUS line remains active (i.e. supplied with power).

03/98 AWB 823-1290-D

3 Assembly

Scope of delivery

After receiving the equipment, check immediately whether the delivered items match the delivery documents. Klöckner-Moeller cannot be responsible for guarantee claims made at a later date.

The following components are supplied with the interface module:

DE 4-NET-DP interface module in case (protection class IP 20)

Mounting kit

Assembly instructions AWA 823-1573

The following components are supplied with the documentation:

User Guide AWB 823-1290 (this manual)

3 1/2 ” diskette with the GSD file (device master data)

Making claims:

If there is any visible transport damage, please contact the supplier immediately.

If there are any visible faults or if some of the items are missing, please contact your local Klöckner-Moeller agent immediately

Attaching device to DF 4-series frequency inverters

Proceed as follows to attach the interface module to the frequency inverter:

- ▶ Push the interface module carefully onto the front of the frequency inverter until it clicks into place.
- ▶ Securely attach the interface module to the frequency inverter using the mounting screw provided. Use a size 1 cross-head screw driver.

- Provide a PE connection between the frequency inverter and the interface module (min. cable cross-section of the PE cable 2.5 mm^2)

Ensure that the interface module is pushed into place and tightened up without using excessive force.

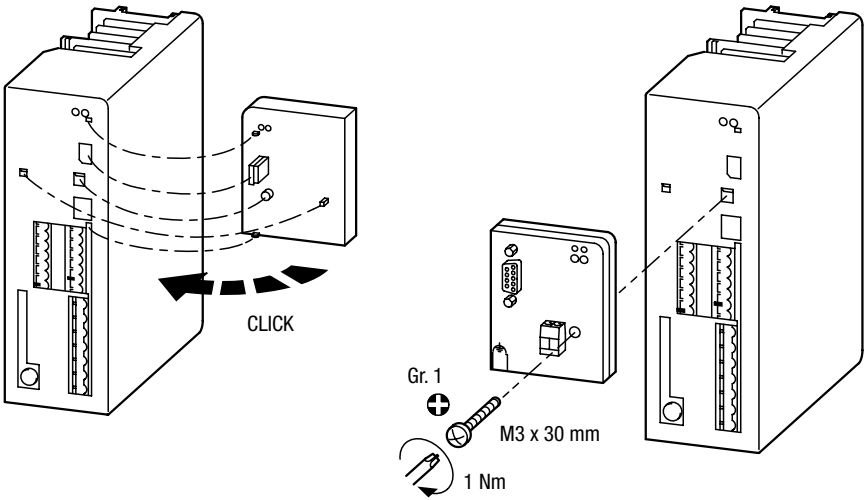


Figure 8: Attaching the DE 4-NET-DP interface module to the frequency inverter

Tighten up the mounting screw with the specified torque to ensure a reliable PE connection between the interface module and the frequency inverter.

03/98 AWB 823-1290-D

4 Configuration

PROFIBUS-DP configuration

The length of the PROFIBUS-DP user data is specified during the DP configuration.

The same user data length must be used for input data and output data. The following abbreviations are used in the text:

PIW: Process input word
(data from controller to master)

POW: Process output word
(data from master to controller)

The DF 4 series frequency inverters only support 2 words of process input data and 2 words of process output data.

2 words of process data;
ID = 71_{hex} (113)

2 words of process data consistent##;
ID = $F1_{hex}$ (241)

PIW/POW 1		**PIW/POW 2**	
Byte 1	Byte 2	Byte 3	Byte 4

3 words of process data;
ID = 72_{hex} (114)

3 words of process data consistent;
ID = $F2_{hex}$ (242)

PIW/POW 1		**PIW/POW 2**		**PIW/POW 3**	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6

4 words DP parameter channel + 2 words process data; ID = 73_{hex} 71_{hex} (115, 113)

8 bytes DP parameter channel + 2 words process data; ID = 37_{hex} 71_{hex} (55, 113)

4 words DP parameter channel consistent + 2 words process data; ID = $F3_{hex}$ 71_{hex} (243, 113)

8 bytes DP parameter channel consistent + 2 words process data; ID = $B7_{hex}$ 71_{hex} (183, 113)

4 words DP parameter channel + 2 words process data consistent; ID = 73_{hex} $F1_{hex}$ (115, 241)

8 bytes DP parameter channel + 2 words process data consistent; ID = 37_{hex} $F1_{hex}$ (55, 241)

4 words DP parameter channel consistent + 2 words process data consistent; ID = $F3_{hex}$ $F1_{hex}$ (243, 241)

8 bytes DP parameter channel consistent + 2 words process data consistent; ID = $B7_{hex}$ $F1_{hex}$ (183, 241)

DP parameter channel								**PIW/POW 1**		**PIW/POW 2**	
Byte 1							Byte 8	Byte 9	Byte 10	Byte 11	Byte 12

03/98 AWB 823-1290-D

4 words DP parameter channel + 3 words process data; ID = 73_{hex} 72_{hex} (115, 114)

8 Byte DP parameter channel + 3 words process data; ID = 37_{hex} 72_{hex} (55, 114)

4 words DP parameter channel consistent + 3 words process data; ID = $F3_{hex}$ 72_{hex} (243, 114)

8 Byte DP parameter channel consistent + 3 words process data; ID = $B7_{hex}$ 72_{hex} (183, 114)

4 words DP parameter channel + 3 words process data consistent; ID = 73_{hex} $F2_{hex}$ (115, 242)

8 Byte DP parameter channel + 3 words process data consistent; ID = 37_{hex} $F2_{hex}$ (55, 242)

4 words DP parameter channel consistent + 3 words process data consistent; ID = $F3_{hex}$ $F2_{hex}$ (243, 242)

8 Byte DP parameter channel consistent + 3 words process data consistent; ID = $B7_{hex}$ $F2_{hex}$ (183, 242)

DP parameter channel								**PIW/POW 1**		**PIW/POW 2**	
Byte 1							Byte 8	Byte 9	Byte 10	Byte 11	Byte 12

Bus address/station address

A unique address must be assigned in the PROFIBUS-DP network for each station on the bus (station address). The station address is used to address the frequency inverter and can be assigned in two ways:

Via the optional LCD keypad or the serial interface module DE 4-COM-2X and the DE 4-CFG-1 PC software:

- Specify the station address for the frequency inverter with the parameter PNU 0009. The valid range of this parameter is 3 ... 99.

Using a PROFIBUS-DP master (class 2) and the DE 4-NET-DP interface module:

The factory setting for PNU 0009 is 1 (station address = 126).

Specify PNU 0009 = 2 to configure station addresses 100 ... 125.

Only one PROFIBUS-DP station must be active on the bus during this process. This can be achieved by using a special switch-on sequence.

The following table shows the assignment of station addresses for the frequency inverter:

PROFIBUS-DP station address	PNU 0009 (device address)
1 – 2	cannot be specified (reserved for master addresses)
3 – 99	PNU 0009 = 3 – 99
100 – 125	PNU 0009 = 2
126 (factory setting)	PNU 0009 = 1

03/98 AWB 823-1290-D

Configuring an S5 control system

A diskette is provided this manual which is inserted in the third cover page. Separate sub-directories on the diskette contain the GSD files (device master data) which are needed to configure the bus system. The diskette also contains example files with function blocks for the Siemens SIMATIC S5 and S7 controllers.

When fitted with DE 4-NET-DP interface modules, the Klöckner-Moeller series of frequency inverters function as PROFIBUS-DP stations which fully comply with the PROFIBUS standards. The frequency inverters can communicate with SIMATIC S5 controllers if the following Siemens hardware and software components are available:

S5 interface module IM308-B or IM308-C
and
COM-ET200 programming software

The COM-ET200 programming software is available for both DOS (COM-ET200 DOS) and Windows (COM-ET200 WIN).

Configuration for COM-ET200 DOS

The diskette provided contains the files you need to configure the frequency inverter for use with SIMATIC S5. Proceed as follows under COM-ET200 DOS:

- ▶ Copy the file LE00AATD.200 from the diskette to the COM-ET200 working directory.
- ▶ Start the software
- ▶ Choose ‹Bus profile› under ‹ET200 system parameters› and specify “DP standard”
- ▶ Choose ‹Station type› under ‹Configure› and specify “Lenze 2131 Vxx”

- Specify the following under ‹Configuration›:
  User data with DP parameter channel:
  0. = 115; 1. = 113 or
  0. = 115; 1. = 114
  User data without DP parameter channel:
  0. = 113 or 0. = 114

Configuration for COM-ET200 WIN

Proceed as follows to configure the frequency inverter under COM-ET200 WIN:

- Copy the file LE00AAAX.200 from the diskette to the COM-ET200 working directory
- Start the software
- Choose ‹Drives› in the ‹Slave Family› menu and choose interface module 2131IB
- Choose ‹Station type› under ‹Configure› and choose “Lenze 2131 Vxx”
- Specify the following under ‹Configuration›:
  User data with DP parameter channel:
  0. = 115; 1. = 113 or
  0. = 115; 1. = 114
  User data without DP parameter channel:
  0. = 113 or 0. = 114

03/98 AWB 823-1290-D

Example program

To simplify commissioning, the diskette provided contains an example program (file: 213XIBST.S5D) in the STEP5 programming language. The example program contains the following function blocks:

FB182: Process data communication

This function block implements a simplified drive control system whereby the standard controller functions are mapped to the DRIVECOM profile.

FB183: Parameter data communication:

This function block supports the DP parameter channel and allows you to write and read all DRIVECOM and controller parameters.

Configuring an S7 control system

Adding the type files to the hardware catalog

When you configure a frequency inverter as a slave with the programming device for the first time, you must add the type files to the hardware catalog and then update it. A type file forms the “connection/interface” between the PLC (master) and the frequency inverter (slave) in the L2-DP network.

Proceed as follows:

- Copy the type files to the hardware catalog. the type files and further programs can be installed/ unpacked from the supplied diskette using the installer menus.
- Enter A:\install. Choose the ‹PROFIBUS files› menu and copy the type files to a standard directory (default: C:\PROFIBUS).
- Now use “File Manager” or “Windows Explorer” to copy LE00AAAX.200 from the standard directory (C:\PROFIBUS) to the directory (C,D,...):\Step7_V2\S7DATA\Typefile.

- ▶ Choose the menu item ‹Hardware Configuration → Extras → Update DP Type File›
- ▶ Exit the Step_7 program and start the program again. This is necessary to be able to use the new type files.

The new type files should now be present in the hardware catalog in the path

PROFIBUS\NORMSLAVE\ANTRIEBE\Lenze 2131

Adding the frequency inverter as a slave to the L2-DP network

In the SIMATIC-S7 program package, frequency inverters (slaves) are added to an L2-DP network via the “Hardware Configuration”. A master system is created. This is necessary to be able to address the frequency inverter(s).

- ▶ Choose the menu item ‹Open Project → Insert → Subnetwork → SINEC L2 NETZ› to automatically create an L2-DP network.
- ▶ Create a new station with ‹Open Project → Insert → Hardware → SIMATIC-X00 Station.
- ▶ Configure the SIMATIC station with the components from the hardware catalog with ‹Open Project → SIMATIC X00-Station → SC›.
- ▶ If you are using a CPUxxx-DP, then you must choose it.
- ▶ If you are using a CPxxx-xDP, open it and choose DP Master.
- ▶ Open the dialog box “Properties L2 nodes” with ‹Edit → Master system → Open› and specify the address of the master (Standard 2).
- ▶ Specify the L2 address and select the L2 network.

03/98 AWB 823-1290-D

- Confirm with “OK”. The configuration item (icon) of a frequency inverter as a slave is shown.
- Choose ‹PROFIBUS-DP → NORMSLAVE → ANTRIEBE → Lenze 2131› from the Hardware Catalog. This opens the dialog box “Properties L2 nodes” where you should specify the address of the slave (Standard 3).
- Specify the L2 address and select the L2 network.
- Confirm with “OK”. The slave is now inserted but not yet addressed.
- Click the first slot (0) and assign it to ‹Hardware Catalog → Lenze 2131 → Standard module›. Double click on this slot to get the dialog box “Properties L2 Slave”.
- Enter the required ID (DP process data and/or DP parameter data) and confirm. The dialog box “Properties L2 Slave” is shown again with the specified parameters. The software prompts the peripheral starting address, which you can change if required.

Do not change the other default values

If you want to use the functions (e.g. S7 - PROFIBUS - frequency inverter), you must choose the same peripheral starting address (e.g. EW40 and AW40).

If you want to transfer DP process data and parameter data, you also need to assign a standard module to slot 1 and enter the required ID in the same way as for module 0.

You can add further slaves (frequency inverters) to the L2 using the same procedure.

03/98 AWB 823-1290-D

5 Parameter setting

Setting parameters through PROFIBUS-DP

When the frequency inverter communicates through PROFIBUS using the PROFIBUS interface module, the data to be transferred can be subdivided into process data and parameter data

Process data channel

Process data assignments

Process data is the time critical data from the process (i.e. the frequency inverter or variable speed drive). Such data often changes rapidly and needs to be up to date. A number of parameters are assembled to a data telegram, which allows them to be transferred quickly. Process data is continuously transferred without needing to be explicitly requested. The control computer can access the process data directly. In a PLC it is typically stored in the I/O area.

Process data is subdivided into:

- Process output (PO) data (e.g. DRIVECOM control word, frequency setpoint)
- Process input (PI) data (e.g. DRIVECOM status word, actual frequency)

Process input and process output are considered from the viewpoint of the master, i.e. PO data is data sent to the frequency inverter (drive) and PI data is data received from the drive.

The frequency inverter receives control information from the master and responds with status information.

Depending on the configuration, the process data channel occupies the first 4 bytes or bytes 9-12 of the input and output data telegrams.

Process data assignments for DF 4

Structure of the PO data telegram (data to the drive)

Byte 1 or **Byte 9**	**Byte 2** or **Byte 10**	**Byte 3** or **Byte 11**	**Byte 4** or **Byte 12**
DRIVECOM control word HIGH byte	DRIVECOM control word LOW byte	Frequency setpoint HIGH byte	Frequency setpoint LOW byte

DRIVECOM control word

The bit-mapped commands in the control word are dependent on the status of other bits. The table on page 43 shows which bits must be set to carry out the chosen command.

Structure of the DRIVECOM control word

Bit	**Name (DRIVECOM)**	**Significance**
0	Switch on	0 = Controller inhibit 1 = Controller enable
1	Inhibit voltage	0 = Inhibit voltage active 1 = Inhibit voltage not active
2	Quickstop	0 = Quickstop active 1 = Quickstop not active
3	Enable operation	0 = Controller inhibit active 1 = Controller inhibit not active
4	Inhibit RG	Inhibit RG (ramp generator). This activates quickstop but without the controller changing its status. 0 = Inhibit RG active (Quickstop) 1 = Inhibit RG not active
5	Pause RG	DF 4-120: unused DF 4-340, DF 4-341: The output of the ramp generator (speed setpoint integrator) is frozen. 0 = Pause RG active 1 = Pause RG not active

03/98 AWB 823-1290-D

6	RG to zero	DF 4-120: unused DF 4-340, DF 4-341: The input of the ramp generator is set to 0. This causes the controller to decelerate with the specified braking ramp. 0 = RG to zero active 1 = RG to zero not active
7	Reset trip	Reset trip (fault). This requires a bit status change from 0 to 1. With the DF 4, the controller is then re-initialized. The controller does not accept any commands during this time.
8	Reserved	unused
9	Reserved	unused
10	Reserved	unused
11	Manufacturer-specific	unused
12	Manufacturer-specific	Change to other parameter set 0 → 1 = Parameter set 2 1 → 0 = Parameter set 1
13	Manufacturer-specific	DC injection brake (DCB): 0 = DCB not active 1 = DCB active
14	Manufacturer-specific	unused
15	Manufacturer-specific	DF 4-120: PI update inhibit inhibit update of the controller output data (data from controller to master). This inhibits the alternate reading of status word and actual value to ensure that control information is transmitted with more precise timing.

Frequency setpoint

The frequency setpoint is used to specify the required motor speed. The maximum output frequency of the controller is limited by the setting of f_{max}. Valid values for frequency setpoint are 0 to ±24000, which corresponds to an output frequency of 0 to ±480.0 Hz. A positive sign prefix corresponds to clockwise rotation and a negative sign prefix corresponds to anti-clockwise rotation.

Example:

An output frequency of 45.5 Hz is required (clockwise rotation).

$$\frac{24000}{480} \times 45,5 = 2275_{dez} = 08E3_{hex}$$

Byte 3 or **Byte 11**	**Byte 4** or **Byte 12**
Frequency setpoint HIGH byte	Frequency setpoint LOW byte
08	E3

Structure of the PI data telegram (data from the drive)

03/98 AWB 823-1290-D

Byte 1 or **Byte 9**	**Byte 2** or **Byte 10**	**Byte 3** or **Byte 11**	**Byte 4** or **Byte 12**
DRIVECOM status word HIGH byte	DRIVECOM status word LOW byte	Actual frequency HIGH byte	Actual frequency LOW byte

DRIVECOM status wor

The actual controller status is indicated by a combination of the 6 bits in the control word as shown in the table on page 44. The flowcharts on pages 40 and 41 show how the status word is derived.

Structure of the DRIVECOM status word

Bit	**Name (DRIVECOM)**	**Significance**
0	Ready to switch on	0 = Status less than “READY TO SWITCH ON” 1 = Status at least “READY TO SWITCH ON”
1	Switched on	0 = Status less than “SWITCHED ON” 1 = Status at least “SWITCHED ON”
2	Operation enabled	0 = Status less than “OPERATION ENABLED” 1 = Status “OPERATION ENABLED”
3	Trip	0 = No trip (fault) 1 = Trip has occurred
4	Voltage inhibited	0 = Command is active 1 = Command is not active
5	Quickstop	0 = Command is active 1 = Command is not active
6	Switch-on inhibited	0 = Status not “SWITCH-ON INHIBITED” 1 = Status “SWITCH-ON INHIBITED”
7	Warning	Group warning 0 = No warning 1 = Warning (overtemperature)
8	Message	Group message; automatic setting and resetting of controller inhibit in the status “OPERATION ENABLED” 0 = No message 1 = Message (IMP)
9	Remote	Bus access permission depends on PNU 0001 (operating mode): 0 = (PNU 0001 ≠ 3) 1 = (PNU 0001 = 3)

10	Setpoint reached	Status of the speed/frequency deviation 0 = (RG_{input} ≠ RG_{output}) 1 = (RG_{input} = RG_{output})
11	Limit value	Status of the DRIVECOM speed limitation 0 = Limit not activated 1 = Limit activated
12	Reserved	unused
13	Reserved	unused
14	Manufacturer-specific	Status of current limit reached (I_{max}) 0 = Current limit not reached 1 = Current limit exceeded
15	Manufacturer-specific	Frequency message 0 = $f_2 \leq f_1$ 1 = $f_2 > f_1$

Actual frequency

The actual frequency parameter indicates the actual output frequency (motor speed). The valid range of the actual frequency parameter is 0 to ±24000, which corresponds to an actual output frequency of 0 to ±480.0 Hz. A positive sign prefix corresponds to clockwise rotation and a negative sign prefix corresponds to anti-clockwise rotation.

Example:

Byte 3 or **Byte 11**	**Byte 4** or **Byte 12**
Actual frequency HIGH byte	Actual frequency LOW byte
F6	3C

$F63C_{hex} = -2500_{dez}$

$$\frac{480}{24000} \times -2500 = -50$$

The actual output frequency is –50.0 Hz (anti-clockwise).

03/98 AWB 823-1290-D

DRIVECOM device control

When fitted with DE 4-NET-DP interface modules and controlled through PROFIBUS-DP, the Klöckner-Moeller frequency inverters comply with the standard device status parameters described in DRIVECOM profile 20. Information on the actual device states (see flowcharts on pages 40 and 41) is contained in the DRIVECOM status word. Commands issued in the DRIVECOM control word are used to change the device state. In the flowcharts, these commands are shown in boxes with rounded corners.

Controller state	**Significance**
NOT READY TO SWITCH ON	The controller is being initialised and is not yet ready to operate. It will then automatically switch to the status “READY TO SWITCH ON”
SWITCH-ON INHIBITED	The controller is inhibited (NEN) and waiting for the command “Shut down”
READY TO SWITCH ON	The controller is inhibited (NEN) and waiting for the command “Switch on”
SWITCHED ON	The controller is inhibited (NEN) and waiting for the command “Enable operation“
OPERATION ENABLED	The controller is enabled (EN). However, controller inhibit can be set automatically in this status.
TRIP REACTION ACTIVE	A trip was detected and a time-controlled fault response was initiated.
TRIP	The controller is in the trip (fault) status.
QUICKSTOP ACTIVE	The quickstop command was received in the “Operation enabled” status. The controller is decelerating using the specified quickstop ramp. After this, it will automatically switch to the “Switch-on inhibited” status.

Command (see Fig. page 40 and 41)	**Control word**	**Significance**
2, 6, 8 Shut down	Bit 0 = 0	Command to change from the states “Switch-on inhibited”, “Switched on” and “Operation enabled” to the state “Ready to switch on”
3 Switch on		Command to change to the state “Switched on”
4 Enable operation		Command to change to the state “Operation enabled”. Controller inhibit is deactivated.
5 Inhibit operation		Command to change to the state “Switched on”. Controller inhibit is activated.
7, 9, 10, 12, 15 Inhibit voltage	Bit 1 = 0	Command to change to the state “Switch-on inhibited”: Controller inhibit is activated.
7, 10,11 Quickstop (QSP)	Bit 2 = 0	Command to change to the state “Switch-on inhibited”. If the controller was enabled, it is decelerated## using the specified quickstop ramp.
13 Trip		The controller has detected a fault. Some faults then require controlled deceleration (device-dependent). After this, it will automatically switch to the “Trip” status.
14 Reset trip	Bit 7 = (0→1)	For the DF 4-340 series, this command is used to clear a trip. The controller then switches to the “Switch-on inhibit” status if a fault is no longer detected.

03/98 AWB 823-1290-D

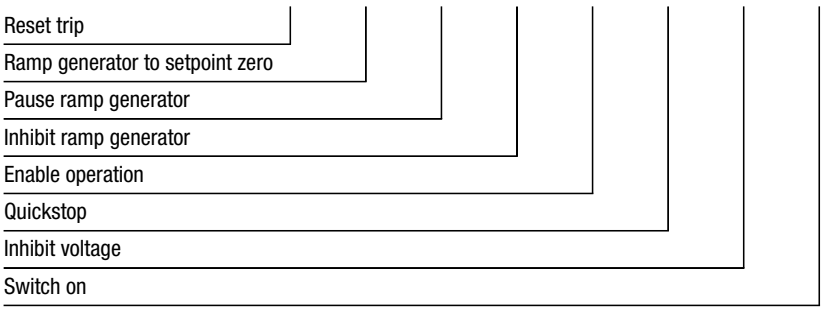
x

x

03/98 AWB 823-1290-D

The bit-mapped commands in the control word are dependent on the status of other bits. The following table shows which bits must be set to carry out the chosen command.

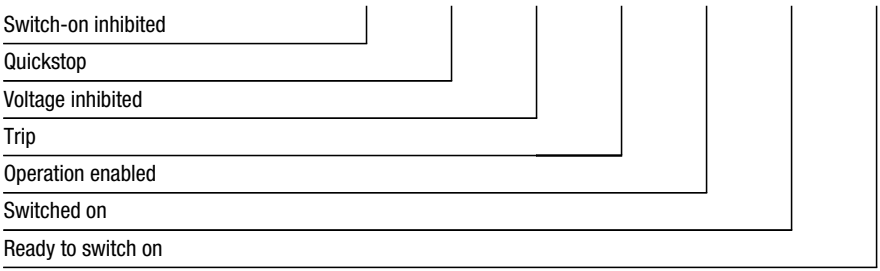
	Bits in the control word							
Controller status command	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Shut down						1	1	0
Switch on						1	1	1
Enable operation					1	1	1	1
Inhibit operation					0	1	1	1
Inhibit voltage							0	
Quickstop						0	1	
Reset trip	0 → 1							



Explanation:
0 = bit state must be 0
1 = bit state must be 1
blank = bit state undefined and has no effect

The actual controller status is indicated by a combination of the 6 bits in the control word as shown in the following table.

Controller status	Bits in the control word						
	6	5	4	3	2	1	0
NOT READY TO SWITCH ON	0			0	0	0	0
SWITCH-ON INHIBITED	1			0	0	0	0
READY TO SWITCH ON	0	1		0	0	0	1
SWITCHED ON	0	1		0	0	1	1
OPERATION ENABLED	0	1		0	1	1	1
TRIP	0			1	0	0	0
TRIP REACTION ACTIVE	0			1	1	1	1
QUICKSTOP ACTIVE	0	0		0	1	1	1



Explanation:
0 = bit state must be 0
1 = bit state must be 1
blank = bit state undefined and has no effect

03/98 AWB 823-1290-D

PROFIBUS-DP parameter channel

The PROFIBUS-DP parameter channel is used for setting/reading controller parameters and for diagnosis. It allows you to write and read all controller parameters. In contrast to process data, parameter data is only transferred on request. If the PROFIBUS-DP parameter channel is active, it occupies the first 8 bytes of the process input and process output data structures. The data structure is the same in both directions of transfer.

Parameter changes are automatically stored in the controller (see DF 4 User Guide). This does not apply to the process data.

Structure of the PROFIBUS-DP parameter channel

Byte 1	**Byte 2**	**Byte 3**	**Byte 4**
Command	Subindex	Index HIGH byte	Index LOW byte
Byte 5	**Byte 6**	**Byte 7**	**Byte 8**
Parameter value/ Error code HIGH byte HIGH word	Parameter value/ Error code LOW byte HIGH word	Parameter value/ Error code HIGH byte LOW word	Parameter value/ Error code LOW byte LOW word

Command byte (byte 1)

Command and response control for the DP parameter channel.

Bit	Significance
0, 1	Command to the controller. These two bits are only set by the master. Bit 1 Bit 0 0 0 No command 0 1 Read command (read data from controller) 1 0 Write command (write data to controller)
2, 3	reserved
4, 5	Data length: length of the data in the parameter value/ error code field. Bit 5 Bit 4 0 0 1 Byte 0 1 2 Byte 1 0 3 Byte 1 1 4 Byte
6	Handshake: indicates whether a new command has been received The master toggles this bit with each new command. The controller then copies this bit to its response telegram. The command has been executed if this bit has the same state in both command and response.
7	Status: status information from controller to master to acknowledge the command. It notifies the master whether the command was executed with or without errors. 0 = command executed without errors. The data in the parameter value/error code field should be interpreted as a parameter value. 1 = command not executed. An error has occurred. The data of the parameter value/error code field should be interpreted as an error message.

Subindex (byte 2)

The DF 4 series controllers do not have parameters with subindex; the value is always 0.

03/98 AWB 823-1290-D

Index (bytes 3 and 4)

Two index bytes are used to specify the number of the parameter which should be transferred and/or has been transferred.

Refer to the Appendix and/or to the User Guide for the frequency inverter for a list of valid parameter numbers.

The index is calculated as follows:

$Index_{dez} = 24575_{dez} – PNU_{dez}$

$Index_{hex} = 5FFF_{hex} – PNU_{hex}$

Example:

It is required to address the acceleration time parameter (PNU 0012):

$24575 – 12 = 24563_{dez} = 5FF3_{hex}$

The required index is:

Byte 3: Index HIGH byte = $5F_{hex}$

Byte 4: Index LOW byte = $F3_{hex}$

DF 4 series frequency inverters have 2 parameter sets (PAR1, PAR2), both of which can be accessed directly from PROFIBUS-DP.

Addressing takes place using an offset:

Offset 0 addresses parameter set 1 (PAR1) with the parameter numbers PNU 0000 to PNU 1999

Offset 2000 addresses parameter set 2 (PAR2) with the parameter numbers PNU 2000 to PNU 3999

If a particular parameter is only available in one parameter set (see DF 4 User Guide), then you should use PNU offset 0 to access it.

Example for the parameter maximum output frequency $f_{max:}$

Parameter set 1: PNU 0011
Parameter set 2: PNU 2011

Parameter value/error code (bytes 5 – 8)

Parameter value/error code
These bytes contain the parameter value or, in case of faults, the error code. Bit 7 (status bit) of the command byte (byte 1) indicates whether this field contains a parameter value or error code.

Bit 7 (status bit) of the command byte is 0:
Bytes 5-8 contain a parameter value of 1 to 4 bytes in length (length depends on data format). The most common data format used in frequency inverters is fixed point with 4 decimal places.

The parameter value which is read must be divided by 10000; the parameter value to be written must first be multiplied by 10000.

Example:

It is required to write 150.4 s to the controller's acceleration time parameter (PNU 0012).## could not edit formula to change "," to "."

$150,4 \times 10000 = 1504000_{dez} (= 0016F300_{hex})$

03/98 AWB 823-1290-D

The data is sent in Motorola format.

Byte 5	HIGH-B byte 1	HIGH word	00_{hex}
Byte 6	LOW byte 1		16_{hex}
Byte 7	HIGH byte 2	LOW word	$F3_{hex}$
Byte 8	LOW byte 2		00_{hex}

Error code

Bit 7 (status bit) of the command byte is 1:

Bytes 5-8 contain an error code.

Byte 5: Error class
Byte 6: Error code
Byte 7: Additional code (HIGH byte)
Byte 8: Additional code (LOW byte)

See the table below for details:

Error messages in the error code field

Error class	Error code	Additional code [hex]	Significance
0	0	00	No fault
6	3	00	No access permission
6	5	10	Invalid command parameters
6	5	11	Invalid subindex
6	7	12	Data too long
6	8	00	The object does not exist
6	0	00	Data types do not match
8	0	21	Cannot be executed due to local control
8	0	22	Cannot be executed due to device status
8	0	30	Outside of value range
8	0	40	Collision with other values
8	0	20	Command cannot be executed at present

Exchanging parameter data

Read parameter

- ▶ Determine the user data area of the frequency inverter in the host controller.
- ▶ Specify the index for the required parameter in the index field (bytes 3 and 4) and 0 in the subindex field (byte 2)
  (DP output data).
- ▶ In the command byte (byte 1), set bits 0 and 1 to 01_{bin} (“Read”).
- ▶ In the command byte (byte 1), specify the data length in bits 4 and 5.
- ▶ Toggle bit 6 in the command byte (“Handshake”) to initiate the command.
- ▶ Repeatedly check whether bit 6 (“Handshake“) is the same for the PROFIBUS-DP input data and output data. Consider implementing a timeout here.

  If the “Handshake” bits are not the same, a response has not yet been received

  If the “Handshake” bits are the same, a response has been received.
- ▶ Check whether bit 7 (“Status“) is set in the command byte (byte 1).

  “Status” bit 7 not set: command was executed without errors

  “Status” bit 7 set: command not executed. An error has occurred. The data in the parameter value/error code field should be interpreted as an error message.

Example 1: Read parameter

It is required to read the heatsink temperature parameter (PNU 0061) from the controller.

Command byte (byte 1)

Bit 0 – 1 = 1	Read command	(xxxx xx01)
Bit 2 – 3 = 0	Reserved	(xxxx 0001)
Bit 4 – 5 = 3	Data length 4 bytes	(xx11 0001)
Bit 6 = **X**	Handshake state toggles alternately	(x**X**11 0001)
Bit 7 = 0	Only relevant for response	(0**X**110001)

Subindex (byte 2)

Subindex = 0 (PNU 0061 does not have a subindex)

Index (bytes 3 and 4)

Calculation:

Index = $24575_{dez} – PNU_{dez}$

Index = $24575_{dez} – 61_{dez} = 24514_{dez} = 5FC2_{hex}$

Parameter value (byte 5 – 8)

Parameter value is initially 0 (read command)
Telegram to controller:

Byte 1	**Byte 2**	**Byte 3**	**Byte 4**
Command	Subindex	Index HIGH byte	Index LOW byte
$0x11\ 0001_{bin}$	00_{hex}	$5F_{hex}$	$C2_{hex}$
Byte 5	**Byte 6**	**Byte 7**	**Byte 8**
Parameter value HIGH byte HIGH word	Parameter value LOW byte HIGH word	Parameter value HIGH byte LOW word	Parameter value LOW byte LOW word

00_{hex}	00_{hex}	00_{hex}	00_{hex}

Controller response if there are no errors:

Byte 1	**Byte 2**	**Byte 3**	**Byte 4**
Command	Subindex	Index HIGH byte	Index LOW byte
$0x11\ 0000_{bin}$	00_{hex}	$5F_{hex}$	$C2_{hex}$
Byte 5	**Byte 6**	**Byte 7**	**Byte 8**
Parameter value HIGH byte HIGH word	Parameter value LOW byte HIGH word	Parameter value HIGH byte LOW word	Parameter value LOW byte LOW word
00_{hex}	06_{hex}	$8F_{hex}$	$B0_{hex}$

Index for read command = $5FC2_{hex}$ = PNU 0061

Parameter value returned = 00 06 8F $B0_{hex}$

$$= 430000_{dez}$$

$$\frac{430000}{10000} = 43,0000$$

The heatsink has a temperature of 43 °C.## could not edit formula

Write parameter

- ▶ Determine the user data area of the frequency inverter in the host controller.
- ▶ Specify the index for the required parameter in the index field (bytes 3 and 4) and 0 in the subindex field (byte 2)
- ▶ Specify the value to be written in the “Parameter value” field (bytes 5 – 8).
- ▶ In the command byte (byte 1), set bits 0 and 1 to 10_{bin} (“Write”).
- ▶ In the command byte (byte 1), specify the data length in bits 4 and 5.

03/98 AWB 823-1290-D

- ▶ Toggle bit 6 in the command byte (“Handshake”) to initiate the command.
- ▶ Repeatedly check whether bit 6 (“Handshake“) is the same for the PROFIBUS-DP input data and output data. Consider implementing a timeout here.

  If the “Handshake” bits are not the same, a response has not yet been received

  If the “Handshake” bits are the same, a response has now been received.
- ▶ Check whether bit 7 (“Status“) is set in the command byte (byte 1).

  “Status” bit 7 not set: command was executed without errors

  “Status” bit 7 set: command not executed. An error has occurred. The data in the parameter value/error code field should be interpreted as an error message.

Example 2: Write parameter

It is required to change the acceleration time parameter (PNU 0012) in the controller to 20 s.

Command byte (byte 1)

Bit 0 – 1= 2	Write command	(xxxx xx10)
Bit 2 – 3 = 0	Reserved	(xxxx 0010)
Bit 4 – 5 = 3	Data length 4 bytes	(xx11 0010
Bit 6 = **X**	Handshake state toggles alternately	(x**X**11 0010)
Bit 7 = 0	Only relevant for response	(0**X**110010)

Subindex (byte 2)

Subindex = 0 (PNU 0012 does not have a subindex)

Index (bytes 3 and 4)

Calculation:

Index = 24575_{dez} – PNU

Index = $24575_{dez} - 12_{dez} = 24563_{dez} = 5FF3_{hex}$

Parameter value (bytes 5 – 8)

Calculation of the value for acceleration time:

20 s × 10000 = 200000_{dez} = 00 03 0D 40_{hex}

Telegram to controller:

Byte 1	**Byte 2**	**Byte 3**	**Byte 4**
Command	Subindex	Index HIGH byte	Index LOW byte
0x11 0010_{bin}	00_{hex}	$5F_{hex}$	$F3_{hex}$
Byte 5	**Byte 6**	**Byte 7**	**Byte 8**
Parameter value HIGH byte HIGH word	Parameter value LOW byte HIGH word	Parameter value HIGH byte LOW word	Parameter value LOW byte LOW word
00_{hex}	03_{hex}	$0D_{hex}$	40_{hex}

Controller response if there are no errors:

Byte 1	**Byte 2**	**Byte 3**	**Byte 4**
Command	Subindex	Index HIGH Byte	Index LOW Byte
0x11 0000_{bin}	00_{hex}	$5F_{hex}$	$F3_{hex}$
Byte 5	**Byte 6**	**Byte 7**	**Byte 8**
Parameter value HIGH byte HIGH word	Parameter value LOW byte HIGH word	Parameter value HIGH byte LOW word	Parameter value LOW byte LOW word
00_{hex}	00_{hex}	00_{hex}	00_{hex}

03/98 AWB 823-1290-D

Special parameters

Operating mode (PNU 0001)

For control via PROFIBUS-DP interface module (PNU 0001 = 3), only the operating mode specified in parameter set 1 is relevant.

For control via terminals (PNU 0001 ≠ 3, PNU 2001 ≠ 3), the operating mode can be specified in both parameter sets.

Parameter name (Index)	Subindex	Data type	Significance			
Operating mode ($5FFE_{hex}$ and $582E_{hex}$)	0	I32	Value	Control source:	Setpoint source:	Param. source:
			0	terminals	terminals	DE 4-KEY-1
			1	terminals	DE 4-KEY-1	DE 4-KEY-1
			2	terminals	terminals	PROFIBUS-DP
			3	PROFIBUS-DP	PROFIBUS-DP	PROFIBUS-DP

Reaction to communication error (PNU 126 and PNU 2126)

Parameters PNU 126 and PNU 2126 are used to specify the reaction of the controller if communication with the interface module fails (e.g. the interface module is unplugged) in order to ensure that the motor does not continue to run without being controlled.

PNU 126, PNU 2126 = 0 (factory setting):

No “Trip” occurs if communication between the controller and the interface module fails. The controller continues to operate with the actual settings. The controller is automatically re-initialized when the communication with the interface module is restored again

PNU 126, PNU 2126 = 1:

“Trip CE0” occurs if communication between the controller and the interface module fails. The controller changes to the status “controller inhibit”, i.e. the motor coasts to a halt. The controller is only re-initialized when the communication with the interface module is restored again and “Trip reset” has been executed.

03/98 AWB 823-1290-D

6 Operation/Diagnosis

Commissioning

Only operate the interface module if it is in correct working order.

Warning!

Before switching on the power, check all wiring for short circuits, earth faults and correct wiring.

To ensure safe operation, carefully study the manuals for the master controller and the frequency inverter.

Settings on the master

The master requires a GSD file (device master data) for operation with PROFIBUS-DP.

The diskette provided with this manual (it is inserted in the third cover page) contains the following files:

File name	Usage
L_AR00AA.GSD	GSD file to DIN 19245 part 3
LE00AATD.200	GSD file (Type file) for SIMATIC-S5 COM-ET200 V4.X (IBM308B)
LE00AAAX.200	GSD file (Type file) for SIMATIC-S5 COM-ET200 V5.X (IBM308C) and SIMATIC-S7

▶ The following settings must also be made on the master:

Setting	Significance
Baud rate	Automatic baud rate detection
Communication profile	PROFIBUS-DP DIN 19245 T3
Slave station address	Set the same as parameter PNU 0009
DP configuration data	See “PROFIBUS-DP configuration” in this manual
PNO Ident number	$00AA_{hex}$
DP user data length	See “PROFIBUS-DP configuration” in this manual

Observe the following sequence when commissioning:

▶ Switch on the frequency inverter and the external power feed for the DE 4-NET-DP interface module (if used). The two operating status LEDs for the frequency inverter and the green power LED on the interface module should light up. Refer to “Diagnostics” on page 62 if this is not the case.

▶ Specify the appropriate station address (PNU 0009) for the frequency inverter using the optional LCD keypad or PC software and/or from the master controller through PROFIBUS-DP (see “Bus address/station address” on page 26.). The factory setting is PNU 0009 = 1. If you have networked several frequency inverters, each of them must be uniquely addressable from the master controller. Accordingly, each frequency inverter must be assigned a unique station address (PNU 0009). The address can be specified using the optional LCD keypad.

▶ Terminal 28 (EN = Controller enable) is always active and must always be HIGH during operation,

03/98 AWB 823-1290-D

since it will not otherwise possible to enable the controller from PROFIBUS.

Controlling the drive from PROFIBUS-DP

In order to be able to control the frequency inverter from PROFIBUS-DP, you must also change PNU 0001 (operating mode) from 0 to 3. You can do this either with the optional LCD keypad DE 4-KEY-1 or directly via PROFIBUS-DP:

Index = $5FFE_{hex}$

(calculated from $5FFF_{hex}$ – PNU 0001)

Subindex: 0

Value: 30000_{dez}

(calculated from 3×10^4)

With DF 4-34x series controllers, the QSP (quick-stop) function is always active. If this function is configured on one of the input terminals, the terminal must always be HIGH during PROFIBUS-DP operation (see User Guide for the frequency inverter).

After completing these settings, the frequency inverter should now accept control and parameter data via PROFIBUS-DP.

Controller enable

The controller is enabled as follows:

- ▶ Specify the required frequency setpoint (value ≠ 0).
- ▶ Use the DRIVECOM control word to change the device status to “READY TO SWITCH ON” (value = $007E_{hex}$).
- ▶ Check the DRIVECOM status word repeatedly until device status “READY TO SWITCH ON” has been reached. (value = xxxx xxxx x01x 0001_{bin})

- ▶ Use the DRIVECOM control word to change the device status to “OPERATION ENABLED”. (value = $007F_{hex}$)
- ▶ Check the DRIVECOM status word repeatedly until device status “OPERATION ENABLED” has been reached (value = xxxx xxxx x01x 0111_{bin})

Notes for DF 4 controllers

To ensure safe operation, carefully study the manual for the respective frequency inverter model.

Notes for DF 4-120 controllers

Parameter setting (parameters without process data) is only possible during controller inhibit (DRIVECOM-device status not “OPERATION ENABLED“). Although parameter settings are accepted during controller inhibit, they are not saved.

Attention!
Only carry out “Reset trip” (reset of faults) via PROFIBUS-DP. If you carry out “Reset trip” using terminal 28 when the controllers is set to operating mode PNU 0001 = 3 (control via PROFIBUS-DP) and device status = TRIP, the drive may start to turn briefly. This does not occur if you reset the fault via PROFIBUS.

The DF 4-120 is re-initialised after the “Trip reset” command. The controller does not accept any commands during this time.

Attention!
When reversing the direction of rotation of the drive,## always send the command to change the direction of rotation together with a low frequency setpoint before specifying the required frequency setpoint.
If the frequency setpoint and the direction of rotation are changed simultaneously using the DRIVECOM speed setpoint parameter, a speed change may occur briefly in the wrong direction of rotation.

Notes for DF 4-340 and DF 4-341 controllers

When you switch on the controller for the first time, you must deactivate the automatic DC injection brake (DCB) in both parameter sets:

PNU 0106 = 0

PNU 2106 = 0

If the automatic DC injection brake is activated (DCB holding time PNU 0106 # 0), the drive will automatically change from status “OPERATION ENABLED” to status “SWITCHED ON” at a speed of 0 and after the DCB holding time is over.

With a frequency setpoint > 0, the drive will automatically change to status “OPERATION ENABLED”.

Diagnostics

If you use an external power feed for the interface module and the initialisation to the controller cannot be completed (e.g. frequency inverter not switched on), this sets the “static diagnostics” bit (station status byte 2, bit 1).

This means that the interface module cannot provide valid user data. The master must then stop the user data transfer and request diagnostics data until the static diagnostics bit is no longer set.

Troubleshooting and fault elimination

Controller cannot be enabled from PROFIBUS-DP

Step		Yes	No
1	PROFIBUS-DP initialisation OK?	Go to step 2	Check PROFIBUS-DP
2	Yellow LED (bus) flashing?	Go to step 3	Check DE 4-NET-DP interface module
3	Set operating mode PNU 0001 to “3”	Go to step 4	–
4	Set POW1 = 0000_{hex}	Go to step 5	–
5	PIW1 = xxxx xxxx x100 0000_{bin}? (Switch-on inhibited)	Go to step 6	PROFIBUS-DP initialisation OK? Reset trip if necessary
6	Set POW1 = $007E_{hex}$	Go to step 7	–
7	PIW1 = xxxx xxxx x011 0001_{bin}? (Ready to switch on)	Go to step 8	Wait for device state “EIN-SCHALTBEREIT”
8	Set POW1 = $00F7_{hex}$	Go to step 9	–
9	PIW1 = xxxx xxxx x011 0111_{bin}? (Operation enabled)	You can select set-point or other control signals	Enable controller with terminal 28 or PNU 0040 (with DF 4-34x and PNU 0106 ≠ 0, select setpoint with POW2)

Check PROFIBUS-DP

The following describes a quick test of the PROFIBUS-DP system if the initialisation has failed. You should continue to check the diagnostics information from the PROFIBUS-DP interface module in the host controller. It can also be useful for troubleshooting to disconnect all other devices from the PROFIBUS line.

Step		Yes	No
1	Are all devices connected to PROFIBUS-DP switched on?	Go to step 2	Switch on all devices or disconnect switched off devices from the bus.
2	Disconnect all devices from PROFIBUS-DP except for the devices concerned.	Go to step 3	–
3	PROFIBUS-DP initialisation OK?	Reconnect the next device to the bus	Replace device

Activate interface module

Activate the interface module and the frequency inverter:

Step		Yes	No
1	Green LED (power) on?	Go to step 2	Switch on controller and/or connect external power feed for DE 4-NET-DP
2	Yellow LED (bus) flashing?	–	Start PROFIBUS-DP and go to step 3
3	Yellow LED (bus) flashing?	Check OK	Are the device ID's correctly set in the master? **Yes**: replace DE 4-NET-DP **No**: Correct the device ID's

03/98 AWB 823-1290-D

Reset TRIP

Trip (fault) reset via PROFIBUS-DP process data

Step		Yes	No
1	Set POW1 = 0080_{hex}	Go to step 2	–
2	PIW1 = xxxx xxxx x100 0000_{bin}? (Switch-on inhibited)	Trip is reset	Set: POW1 = 0000_{hex} then set POW1 = 0080_{hex} Go to step 3
3	PIW1 = xxxx xxxx x100 0000_{bin}? (Switch-on inhibited)	Trip is reset	Repeatedly set POW1 as above until trip is reset.

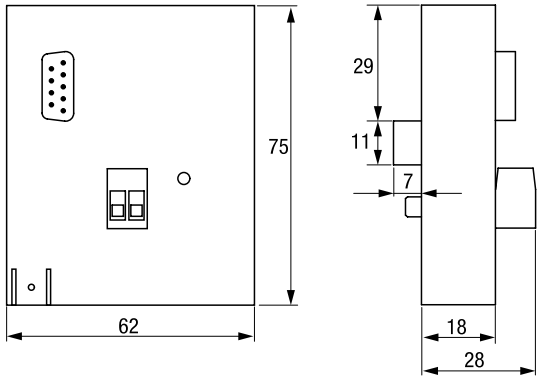
03/98 AWB 823-1290-D

Appendix

Technical specifications

Hardware interface	RS 485
Bus	PROFIBUS-DP
Operating mode	Slave
Network topology	Linear bus
Baud rate	9.6 kBits/s to 12000 kBits/s
Data transfer rate	9.6 – 93.75 kBaud for 1200 m cable length 187.5 kBaud for 1000 m cable length 500 kBaud for 400 m cable length 1500 kBaud for 120 m cable length 12000 kBaud for 25 m cable length
Ambient temperature: operation transport storage	 0 to +50 °C –25 to +70 °C –25 to +55 °C
Admissible moisture	Relative air humidity max. 80%, no condensation
Connection method	9-pin Sub-D connector
Power requirements	24 V DC ±10%; max.60 mA DF 4-120 external power feed only DF 4-340 internal/external power feed DF 4-341 internal/external power feed
Insulation rating: to potential earth/PE to external power feed (terminal +/–) to power section DF 4-120 DF 4-340 DF 4-341 to the control terminals DF 4-120 DF 4-340 DF 4-341	 50 V AC 0 V AC (no galvanic isolation) 270 V AC (simple basic insulation) 270 V AC (simple basic insulation) 270 V AC (double basic insulation) 0 V AC (no galvanic isolation) 50 V AC (simple basic insulation) 270 V AC (simple basic insulation)
Admissible pollution	VDE 0110 part 2 degree of pollution 2

Dimensions



Accessories

The following table lists the optional accessories for the DE 4-NET-DP which are not included in the delivery and must be ordered separately. Please contact your Klöckner-Moeller supplier for the technical specifications.

9-pin Sub-D PROFIBUS plug (with switchable bus terminating resistors)	
Klöckner-Moeller order code	Bus connector PROFIBUS-DP RS-485 ZB4-209-DS2
PROFIBUS-DP data cable	
Characteristic impedance	135 to 165 Ω, at a measurement frequency of 3 to 20 MHz
Cable capacity	< 30 pF per meter
Conductor cross-section	> 0.34 mm^2, corresponds to AWG 22
Cable type	Twisted pair, 1 3 2 or 2 3 2 or 1 3 4 cores
Loop resistance	< 110 Ω per km
Signal attenuation	max. 9 dB over the entire length of the cable segment
Screening	Braided copper or braid and foil screening

03/98 AWB 823-1290-D

Index

04/98 AWB 823-1290-GB

04/98 AWB 823-1290-GB