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EDSPBS
00464439

Communication Manual

PROFIBUS-DP

Lenze

1 Preface

Contents

1.1 Introduction

The competitive situation in the mechanical and system engineering sector requires new means to optimise the production costs. This is why modular machine and system engineering is becoming increasingly more important, since individual solutions can now be set up easily and cost-effectively from a single modular system.

Lenze fieldbus systems in industrial applications

For an optimal communication between the single modules of a system, fieldbus systems are increasingly used for process automation. Lenze offers the following communication modules for the standard fieldbus systems:

- CAN (Lenze system bus)
- CANopen
- PROFIBUS-DP
- Interbus
- INTERBUS loop
- DeviceNet
- LON
- AS-i

The communication modules are especially designed for Lenze drive components and flexible use. You can use the same communication modules for Lenze servo inverters and Lenze frequency inverters.

This means for you: Easy communication.

- You must only know one communication system.
- Handling is always the same.
- You reduce your costs because you can make use of the knowledge gained once.
  - Training is only required once.
  - The planning time becomes shorter.

Decision support

The decision for a fieldbus systems depends on many different factors. The following overviews will help you to find the solution for your application.

PROFIBUS-DP

For bigger machines with bus lengths of more than 100 metres, INTERBUS or PROFIBUS-DP (PROFIBUS-**D**ecentralised **P**eriphery) are frequently used. The PROFIBUS-DP is always used together with a master control (PLC) – here the PROFIBUS master transmits e. g. the setpoints to the single PROFIBUS devices (e. g. Lenze controller).

When using the data baud rate of 1.5 Mbits/s typical for the PROFIBUS-DP, the sensors and actuators receive the process data. Due to the data transmission mode and the telegram overhead, a bus cycle time results at 1.5 Mbits/s, which is sufficient to control e. g. conveyors. If, for technical reasons, the process data must be transmitted faster to the sensors and actuators, the PROFIBUS can also be operated with a data transmission rate of maximally 12 Mbits/s.

Interbus

The INTERBUS proves its worth primarily in commercial sized installation with many nodes, for example in the automotive industry. The ring structure offers excellent diagnostic functions. It can be exactly detected, which node telegram is destroyed by electromagnetic interferences or if the INTERBUS cable is affected by a short circuit or earth fault. Moreover, the INTERBUS with a baud rate of 500 kbits/s is more efficient in the process data transmission than other bus systems with the same baud rate. If data is to be transmitted extremely fast, the INTERBUS can also be operated with 2 Mbits/s.

Lenze system bus (CAN)

With the 9300 servo controller series, Lenze has implemented the system bus based on CAN (**C**ontroller **A**rea **N**etwork). In this connection, functions of the CANopen communication profile according to DS301 were integrated. The main task of the system bus is to exchange data between the controllers and to easily communicate with sensors, actuators and operating/display units without the need of a master control. Furthermore, you can realise applications in which controllers are synchronised to each other by means of the system bus.

The CAN bus is available at a reasonable price and is suitable for smaller machines.

CANopen

CANopen is a communication protocol specified to the CiA (**C**AN **i**n **A**utomation) user group. Lenze can provide communication modules for communicating with CANopen masters. These modules are compatible with the specification DS 301 V4.01.

DeviceNet

The American automation specialist Allan Bradley developed the DeviceNet fieldbus based on the CAN controller. This communication profile is published by the ODVA user organisation. A great amount of sensors and actuators are available. Similar to CANopen, a DeviceNet master is used to control the DeviceNet.

LON

The Echelon company (USA) has developed the **L**ocal **O**peration **N**etwork for distributed industrial applications with non-time critical demands. This bus system is mainly used in building automation. Each device has an own intelligence so that a master control system is only required in a restricted way or not at all.

AS-i

The AS-i (**A**ctuator-**S**ensor-**I**nterface) bus is frequently used at the lowest sensor and actuator level. Binary I/O signals can be transmitted very cost-effectively this way. The bus system is user-friendly, easy to configure and flexible in terms of installation. The data and the auxiliary power for the connected AS-i devices are transmitted via the two-core AS-i cable.

INTERBUS loop

The INTERBUS Loop was developed as a pure sensor/actuator bus and provides a quick and easy means of connecting digital and analog devices via insulation piercing connecting devices. INTERBUS Loop is located lower down the hierarchy than INTERBUS (remote bus) and can be easily connected to it via a bus terminal.

1.2 Comparison of industrial fieldbus systems

	CAN / CANOpen	DeviceNet	PROFIBUS-DP	AS-i	Interbus	INTERBUS loop	LON
Topology	Line with terminating resistors	Line with terminating resistors	Line with terminating resistors	Line, tree, ring (possible)	Ring	Ring	Line (2 wire) or any other
Bus management	Multi master	Single master	Single master	Single master	Single master	only together with INTERBUS-S; single master (bus terminal)	Multi master
Max. number of devices (master and slaves)	64	64	124 (4 segments, 3 repeaters), max. 32 per segment	124 sensors/actors 1 master	512 slaves, 1 master	32 slaves	32385 devices distributed to 255 subnetworks with 127 devices each
Max. distance between devices without repeater	Dependent on the baud rate 1 km (50 kbits/s) 25 m (1 Mbits/s)	100 m (500 kbits/s) 250 m (250 kbits/s) 500 m (125 kbits/s)	1.2 km (93.75 kbits/s) 100 m (12 Mbits/s)	100 m	1.5 m (local bus) 400 m (remote bus) 2.5 km (optical fibre)	10 m (max. 100 m cable length without repeater)	2 km at 78 kbits/s (twisted pair), 6.1 km at 5.48 kbits/s (optical fibre plastics)
Max. distance between devices with repeater	General length reduction Dependent on the repeater used	Not specified	10 km (93.75 kbits/s)	300 m (2 repeaters)	13 km (remote bus), 100 km (optical fibre)	No repeater required	Almost any Expandable by subnetworks (without repeaters)
Transfer medium	Shielded, twisted pair cable	Shielded, twisted pair cable	Shielded, twisted pair cable	Unshielded and untwisted flat pair cable	Shielded, twisted 5-wire cable Optical fibre, infrared	Unshielded, twisted pair cable	Unshielded and untwisted pair cable Radio, optical fibre, power line
Auxiliary energy supply via bus cable	Possible via additional wires in the bus cable	Possible via additional wires in the bus cable	Possible via additional wires in the bus cable	Current supply via data cable (2 to 8 A)	Group via bus terminal (remote bus)	Current supply via data cable (approx. 1.5 A)	Possible via additional wires in the bus cable
Baud rate	10 kbits/s - 1 Mbit/s	125 kbits/s, 250 kbits/s, 500 kbits/s	9.6 kbits/s - 12 Mbits/s	167 kbits/s	500 kbits/s oder 2 Mbits/s	500 kbits/s	78 kbits/s - 1.25 Mbits/s
Typical update time (e.g. 8 devices, 4 bytes user data)	Approx. 1.32 ms at 1 Mbit/s (high priority)	Approx. 2.64 ms at 500 kbits/s (high priority)	Approx. 2.5 ms at 500 kbits/s	Typically 5 ms (every 4 bits)	At least 2 ms (process data)	At least 2 ms (process data)	Approx. 70 ms
Telegram length (user data)	0 to 8 bytes	0 to 8 bytes	0 to 246 bytes	4 bits	1 to 64 bytes data; up to 246 bytes parameters	1 to 64 bytes data; up to 246 bytes parameters	1 to 228 bytes data; typically approx. 11 bytes
Telegram length (total)	106 bits at 8 bytes user data	106 bits at 8 bytes user data	User data + 6 to 11 bytes	21 bits, of which: 14 bits master, 7 bits slave	User data + 6 bytes	User data + 6 bytes	max. 255 bytes, User data + 27 bytes
Bus access methods	CSMA/CA message oriented	CSMA/CA message oriented	Cyclic polling	Cyclic polling	Time grid / distributed shift register	Time grid / distributed shift register	Modified CSMA/CD

	CAN / CANOpen	DeviceNet	PROFIBUS-DP	AS-i	Interbus	INTERBUS loop	LON
Lenze communication modules for Lenze basic devices							
• 9300 Servo Inverter and Servo PLC	on board (only parts of CANopen) CANopen 2175 (pluggable	2175 (pluggable)	2133 (pluggable)	Not available	2111 and 2113 (both pluggable)	2112 (pluggable)	2141 (pluggable)
• 8200 vector frequency inverter	Function module System bus (only parts of CANopen) E82ZAFCC010 E82ZAFCC100 or E82ZAFCC210 or pluggable 2175 (CANopen) 2171, 2172 (parts of CANopen)	Function module (in preparation) Pluggable 2175	Function module E82ZAFPC010 or 2133 (pluggable)	E82ZAFFC010 function module	Function module E82ZAFIC010 (can be integrated) or 2111 or 2113 (both pluggable)	2112 (pluggable)	2141 (pluggable)
• Frequency inverter 8200 motec	Function module System bus (only parts of CANopen) E82ZAFCC001	(In preparation)	Function module E82ZAFPC001	Function module E82ZAFFC001	Function module E82ZAFIC001 (can be integrated)	-	-
• Drive PLC	Function module System bus (only parts of CANopen) E82ZAFCC010 or 2175 (pluggable)	2175 (pluggable)	2133 (pluggable)	-	2111 and 2113 (both pluggable)	2112 (pluggable)	2141 (pluggable)
• starttec	Function module System bus (only parts of CANopen) E82ZAFCC001	(In preparation)	Function module E82ZAFPC001	Can be integrated into the basic device as variant	Function module E82ZAFIC001 (can be integrated)	-	-

1.3 About this Communication Manual

Target group

This Manual is intended for all persons who plan, install, commission, and maintain a network for a machine.

Contents

This Manual only describes Lenze communication modules of a bus system.

The Manual completes the Mounting Instructions coming with the device.

- The features and functions of the communication modules are described in detail.
- Typical applications are shown by examples.
- It also contains
  - safety instructions which must be observed at any means.
  - the essential technical data of the communication module.
  - information about versions of the basic Lenze devices to be used. Basic devices include servo inverters, frequency inverters, Drive PLC and (starttec) motor starters.
  - notes on troubleshooting and fault elimination.

This Manual does not describe software of a third party manufacturer. Lenze does not take responsibility for corresponding data given in this Manual. Information on how to use the software can be obtained from the documentation of the master system.

The theoretical background is only explained if absolutely necessary to understand a function of the corresponding communication module.

All brand names used in this Manual are trademarks of their respective owners.

How to find information

Every chapter is about a certain topic and gives you all necessary information.

- The table of contents and the index help you to find information on a certain topic.
- Descriptions and data of the Lenze products (controllers, Drive PLC, Lenze geared motors, Lenze motors) are included in the corresponding catalogues, Operating Instructions, and Manuals. You can either order the documentation required from your Lenze representative or download it from the Internet as a PDF file.

Paper or PDF

The Manual is designed as a loose-leaf collection so that we are able to inform you quickly and specifically about news and changes of our communication modules. Each page is marked by a publication date and a version number.

Tip!

Current documentations and software updates for Lenze products can be found on the Internet in the "Downloads" area under

http://www.Lenze.com

1.4 Legal regulations

Labelling

Lenze communication modules and Lenze function modules are unambiguously identified by their nameplates.

Manufacturer

Lenze Drive Systems GmbH, Postfach 101352, D-31763 Hameln

CE conformity

Conforms to the EC Low Voltage Directive

Application as directed

The communication module and the function module

- must only be operated as described in this Communication Manual and under the conditions stated.
- are accessory modules which are used for Lenze controllers and Drive PLCs as an option. More details can be found in chapter ”General information”.
- must be connected and mounted in a way that it fulfils its function without being a hazard for persons.

Observe all notes given in the chapter ”Safety information”.

Please observe all notes and information on the corresponding communication module and function module given in this Communication Manual.This means:

- Read this part of the Communication Manual carefully before you start working on the system.
- This Communication Manual must always be available while the communication module or function module is in operation.

Any other use shall be deemed as inappropriate!

Liability

The information, data, and notes given in the Communication Manual met the state of the art at the time of printing. Claims on modifications referring to communication modules or function modules which have already been supplied cannot be derived from the information, illustrations, and descriptions.

The specifications, processes, and circuitry in this Communication Manual are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals.

The indications given in this Communication Manual describe the features of the product without warranting them.

Lenze does not accept any liability for damage and operating interference caused by:

- Disregarding the Communication Manual
- Unauthorised modifications to the communication module/function module
- Operating faults
- Improper working on and with the communication module/function module

Warranty

See Sales and Delivery Conditions of Lenze Drive Systems GmbH.

Warranty claims must be made immediately after detecting defects or faults.

The warranty is void in all cases where liability claims cannot be made.

Waste disposal

Material	recycle	dispose
Metal	●	-
Plastic	●	-
Assembled PCBs	-	●
Short Instructions/Operating Instructions	●	-

2 Safety instructions

Contents

2.1 Persons responsible for safety

Operator

An operator is any natural or legal person who uses the drive system or on behalf of whom the drive system is used.

The operator or his safety personnel is obliged

- ► to ensure the compliance with all relevant regulations, instructions and legislation.
- ► to ensure that only qualified personnel works on and with the drive system.
- ► to ensure that the personnel has the Operating Instructions available for all work.
- ► to ensure that all unqualified personnel are prohibited from working on and with the drive system.

Qualified personnel

Qualified personnel are persons who - due to their education, experience, instructions, and knowledge about relevant standards and regulations, rules for the prevention of accidents, and operating conditions - are authorised by the person responsible for the safety of the plant to perform the required actions and who are able to recognise potential hazards.
(Definition for skilled personnel to VDE 105 or IEC 364)

2.2 General safety instructions

- These safety instructions do not claim to be complete. If you have any questions or problems please contact your Lenze representative.
- The communication module meets the state of the art at the time of delivery and generally ensures safe operation.
- The data in this manual refer to the stated hardware and software versions of the communication modules.
- The communication module may create a hazard for personnel, for the equipment itself or for other property of the operator, if:
  - non-qualified personnel work on and with the communication module.
  - the communication module is used improperly.
- The specifications, processes, and circuitry described in this Manual are for guidance only and must be adapted to your own specific application.
- Provide appropriate measures to prevent injury to persons or damage to material assets.
- The drive system must only be operated when it is in perfect condition.
- Retrofitting or changes of the communication module are generally prohibited. In any case, Lenze must be contacted.
- The communication module is a device intended for use in industrial power systems. During operation, the communication module must be firmly connected to the corresponding controllers. In addition, all measures described in the Manual of the controller used must be taken. Example: Mounting of covers to ensure protection against accidental contact.

2.3 Definition of notes used

The following signal words and symbols are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:

Pictograph and signal word!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

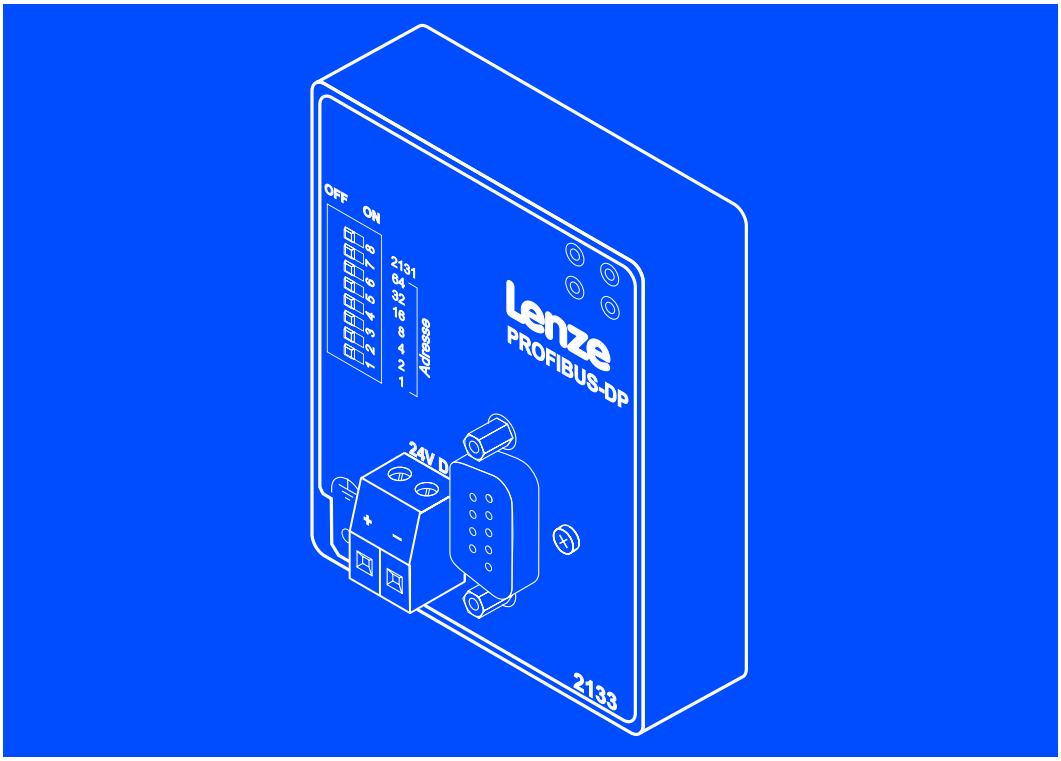
Pictograph and signal word	Meaning
 **Danger!**	**Danger of personal injury through dangerous electrical voltage.** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 **Danger!**	**Danger of personal injury through a general source of danger** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 **Stop!**	**Danger of property damage.** Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 **Note!**	Important note to ensure trouble-free operation
 **Tip!**	Useful tip for simple handling
	Reference to another documentation

EDSPBS

PROFIBUS-DP



Communication module EMF2133IB

Lenze

5 EMF2133IB communication module (PROFIBUS-DP)

Contents

5.1 Before you start

Tip!

Current documentations and software updates for Lenze products can be found on the Internet in the ”Downloads” area under

http://www.Lenze.com

5.1.1 Your opinion is important to us

These Instructions were created to the best of our knowledge and belief to give you the best possible support for handling our product.

If you have suggestions for improvement, please e-mail us to:

feedback-docu@Lenze.de

Thank you for your support.

Your Lenze documentation team

5.1.2 What is new / what has changed in these Instructions?

Date published	Changed contents	Notes
11/2001		First edition
06/2004	Code table	As of software version 1.2: Code C1882 added.
	All	Complete revision due to • Layout change • New German orthography

5.2 General information

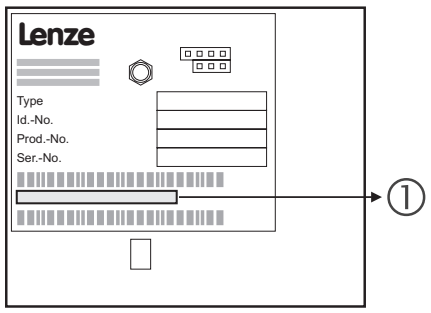
Validity

These Instructions are valid for

- EMF2133IB communication modules (PROFIBUS-DP) as of version Vx. 0x.

These Instructions are only valid together with the Operating Instructions for the basic devices that are permissible for the application.

Identification



99371BC013

Type code	① →	33.2133IB	Vx	0x
Device series				
Hardware version				
Software version				

Application range

The communication module can be used in conjunction with basic devices with the following nameplate data:

Type	Design	Version HW	Version SW	Variant	Explanation
33.820X	E.	2x.	1x.		(8201 - 8204)
33.820X	E./C.	2x.	1x.	Vxxx	(8201 - 8204)
33.821X	E.	2x.	2x.		(8211 - 8218)
33.821X	E./C.	2x.	2x.	Vxxx	(8211 - 8218)
33.822X	E.	1x.	1x.		(8221 - 8225)
33.822X	E.	1x.	1x.	Vxxx	(8221 - 8227)
33.824X	E.	1x.	1x.		(8241 - 8246)
33.824X	E./C.	1x.	1x.	Vxxx	(8241 - 8246)
82EVxxxxxBxxxXX		Vx	1x		(8200 vector)
82CVxxxxxBxxxXX		Vx	1x		(8200 vector, cold plate)
82DVxxxKxBxxxXX		Vx	1x		(8200 vector, thermal separation)
EPL 10200	E	1x	1x		(Drive PLC)
33.93XX	xE.	2x	1x	Vxxx	(9321 - 9332)
33.938X	xE.	1x	0x		(9381 - 9383)
33.93XX	xC.	2x	1x	Vxxx	(9321 - 9332, cold plate)
33.93XX	EI / ET	2x	1x	Vxxx	(9300 Servo PLC)
33.93XX	CI / CT	2x	1x	Vxxx	(9300 Servo PLC, cold plate)

Features

- Plug-on communication module for Lenze basic devices
  - 82XX
  - 8200 vector
  - 93XX
  - 9300 Servo PLC
  - Drive PLC
- Slave interface module for the PROFIBUS communication system with PROFIBUS-DP communication profile (DIN19245 part 1 and part 3)
- DIP switch can be accessed from the front
- Automatic detection of the baud rate
- Baud rate of 9.6 kBit/s to 12 MBit/s
- Optionally up to 12 process data words (depending on the basic device)
- Access to all Lenze parameters
- Application profiles:
  - DRIVECOM Profile 20
  - PROFIDRIVE version 2
- Connection of an external power supply possible

5.3 Technical data

5.3.1 General data and operating conditions

Field	Values
Order designation	EMF2133IB
PUO ID number	2133_{hex}
Communication profile (DIN 19245 part 1 and part 3)	PROFIBUS-DP
Communication media	RS485
Drive profile	• DRIVECOM Profile 20, can be switched off • PROFIDrive version 2, can be switched off, (status machine and PKW interface)
Network topology	Without repeater: line / with repeater: line or tree
PROFIBUS-DP device	Slave
Baud rate for cable type A (EN 50170)	9.6 kBit/s to 12 MBit/s (automatic detection)
Process data words (PZD), 16 bits	1 word ... 12 words
DP user data length	Parameter data channel (4 words) + process data words (1 .... 12 words)
Max. number of devices	Standard: 32 (= 1 bus segment) / with repeaters: 125
Max. cable length per bus segment	1200 m (depending on the baud rate and cable type used)
External voltage supply	24 V DC ± 10 %, max. 120 mA
Type of protection	IP20
Ambient temperature	Operation: 0 °C to 55 °C Transport: -25 °C to 70 °C Storage -25 °C to 60 °C
Climatic conditions	Class 3K3 acc. to EN 50178 (without condensation, average relative humidity 80 %)
Degree of pollution	VDE0110, part 2, pollution degree 2

5.3.2 Protective insulation

Protective insulation between bus and ...	Type of insulation
• Ground reference plane / PE	Functional insulation
• External supply (terminal 39/59)	Functional insulation
• Power stage	
– 820X / 821X	Basic insulation
– 822X / 8200 vector	Double insulation
– 93XX	Double insulation
• Control terminals	
– 820X / 8200 vector	Functional insulation
– 821X	Functional insulation
– 822X	Basic insulation
– 93XX	Basic insulation

5.3.3 Communication times

Tip!

The communication time is the time between the start of a request and the arrival of the corresponding response.

The PROFIBUS communication times depend on:

- Processing time in the controller
- Transmission delay time
  - Transmission rate (baud rate)
  - Telegram length

Processing time 820X

For the 820X series several processing steps are required in the controller, which are processed cyclically.

A processing cycle consists of:

- Writing of control word or setpoint if the value has changed
- Alternating reading of status word and actual value
- Processing of parameter accesses if there is a job

If the processing time caused by cyclic reading of the status word/actual value is too large, the alternating reading of status word and actual value can be suppressed. This is controlled by bit 15 (PI inhibit) of the DRIVECOM control word:

- PI inhibit = 0:
  Status and actual value update active
- PI inhibit = 1:
  Status and actual value update not active

A suppression of the processing of parameter accesses is not necessary, since this is controlled by the user.

In the following table the times for the processing steps are listed:

Processing step	Max. processing time in [ms]			
	PI-inhibit = 0	Tolerance	PI-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	-

Note!

A setpoint sign reversal also results in writing the control word.

Processing times 821X/822X/824X/8200 vector

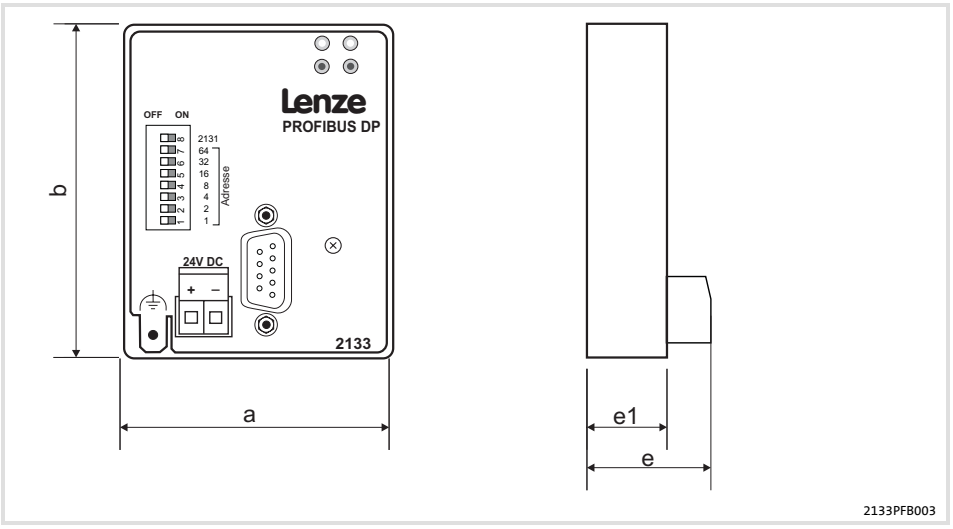
Parameter data	Process data
30 ... 50 ms	2 ... 3 ms

Processing time 93XX

The parameter data and process data are independent of each other.

Parameter data	Process data
Approx.30 ms + 20 ms tolerance (typical) The processing time can be longer for some codes (see the 9300 Manual).	2 ms + 1 ms tolerance

5.3.4 Dimensions



a	61 mm
b	75 mm
e	28 mm
e1	18 mm

5.4 Installation

5.4.1 Communication module components

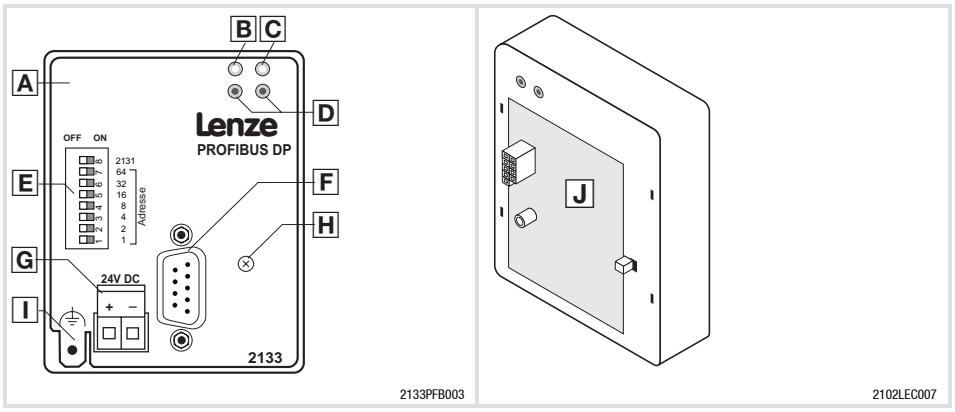


Fig. 5.4-1 Communication module 2133

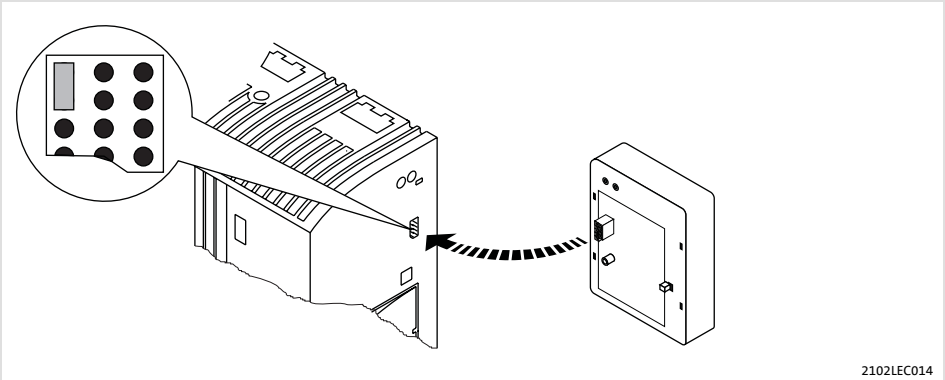
Pos.	Name	Notes
A	Communication module 2133	
B	Status display (green) for voltage supply	
C	Status display (yellow) for PROFIBUS-DP communication	📖 5.5-15
D	Status display (red, green) for the drive	
E	DIP switch for addressing the bus devices	📖 5.5-11
F	PROFIBUS-DP connection, Sub-D socket connector, 9-pole	📖 5.4-8
G	Plug connector, external voltage supply connection, 2-pin	📖 5.4-10
H	Fixing screw	
I	PE connection (only with 82XX)	Note below
J	Nameplate	📖 5.2-1

Note!

Only for 820X and 821X:

If required, use an additional PE shield cable which avoids EMC-related communication interference in surroundings with extreme disturbances.

5.4.2 Mechanical installation



- Plug the communication module onto the basic device (here: 8200 vector).
- Fasten the communication module with the fixing screw onto the basic device to ensure a good PE connection.

Note!

For the internal supply of the communication module through the 8200 vector frequency inverter, the jumper in the interface slot must be adapted (see fig. above). Please observe the notes (📖 5.4-9).

5.4.3 Electrical installation

Wiring to a host

Danger!

An additional electrical isolation is required if

- ► a 820X and 821X controller are connected to a master computer and
- ► a safe electrical isolation (double insulation) to VDE 0160 is necessary.

The design of the PROFIBUS-DP bus system is shown in the survey drawing.

Basic wiring of PROFIBUS

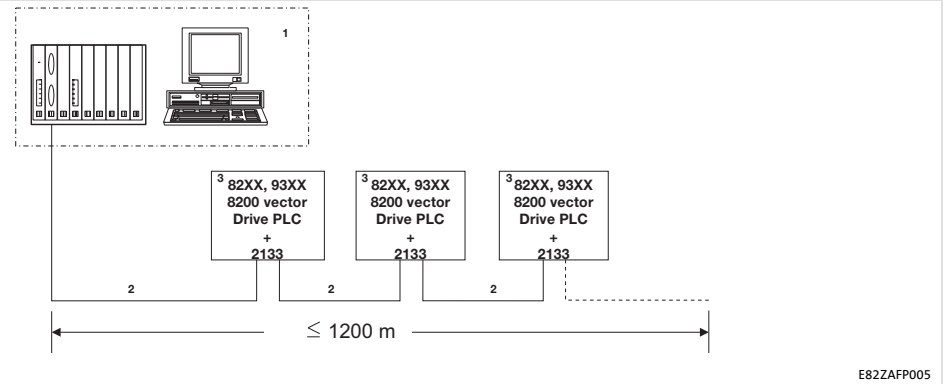


Fig. 5.4-2 PROFIBUS-DP with RS485 cabling (without repeater)

No.	Element	Note
1	Master computer	E.g. PC or PLC with PROFIBUS-DP master interface module
2	Bus cable	Adapt baud rate to bus cable length
3	PROFIBUS-DP slave	Basic device to be used with 2133 communication module

Note!

When using a repeater, max. 125 devices can communicate via the PROFIBUS.

EMC-compliant wiring

For wiring according to EMC please observe the following points:

Note!

- ► Separate control cables from motor cables.
- ► In the case of cables with *digital signals*, connect the control cable and data cable shields *on both sides*.
- ► Use an equalising conductor with a cross-section of at least 16 mm^2 (reference: PE) to avoid potential differences between decentralised systems.
- ► Please observe the other notes concerning EMC-compliant wiring given in the Instructions of the basic device.

Wiring procedure

Note!

- ► The bus system still operates even if the voltage supply of the communication module fails. In this case the basic device connected to the bus cannot be contacted by the host system.
- ► If you want to disconnect individual bus devices, ensure that the bus terminators at the cable ends remain active.

► Only use cables which correspond to the listed specifications, see (📖 5.4-7).

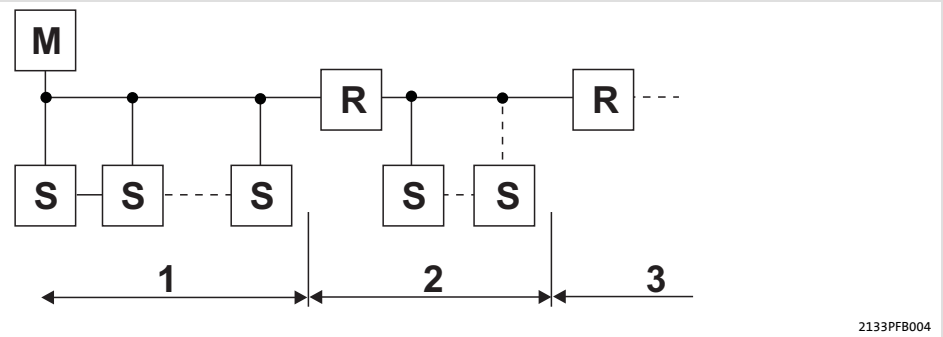
► Provide connection to the controllers by means of the bus connector. The bus system will not be interrupted if the bus connector is pulled out of the controller.

► Observe the wiring notes given in the documentation for the control system.

► Adapt baud rate to the bus cable length.

► Check bus terminating resistors and activate if necessary.

Number of bus devices



Segment	Master (M)	Slave (S)	Repeater (R)
1	1 2	31 30	- -
2	-	31	1
3	-	31	1

Tip!

Repeaters do not have their own addresses but they are taken into account when determining the max. number of slaves.

Repeaters can be used to build up line and tree topologies. In this case, the maximum total bus system expansion depends on

- ► the baud rate used
- ► the number of repeaters used

Baud rate / bus cable length

Baud rate [kBit/s]	Length [m]
9.6 - 93.75	1200
187.5	1000
500	400
1500	200
3000 - 12000	100

Tip!

For high baud rates we recommend to consider the application of optical fibres.

Advantages of optical fibres:

- External electromagnetic interferences on the transmission path remain ineffective.
- Bus lengths of several kilometres are also possible with higher baud rates. The bus length is
  - independent of the baud rate.
  - dependent on the optical fibre used.

Specification of the transmission cable

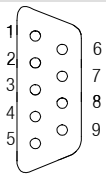
Please observe our recommendations for signal cables.

Specification bus cable	
Cable resistance	135 - 165 Ω/km, (f = 3 - 20 MHz)
Capacitance per unit length	≤ 30 nF/km
Loop resistance	< 110 Ω/km
Wire diameter	> 0.64 mm
Wire cross-section	> 0.34 mm^2
Wires	double twisted, insulated and shielded

5.4.4 Communication connection

Sub-D socket assignment

Connection of PROFIBUS to 9-pole Sub-D socket

View	Pin	Name	Explanation
	1	free	-
	2	free	-
	3	RxD/TxD-P	Data cable B (receive / transmit data plus)
	4	RTS	Request To Send (receive / transmit data, no differential signal)
	5	M5V2	Data reference potential (ground to 5V)
	6	P5V2	5 V DC / 30 mA (bus termination)
	7	free	-
	8	RxD/TxD-N	Data cable A (receive / transmit data minus)
	9	free	-

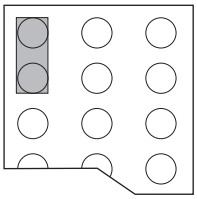
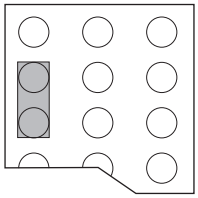
5.4.5 Voltage supply

Internal DC voltage supply

Note!

Basic devices with an extended AIF interface slot (front of the 8200 vector) can be internally supplied. The part of the drawing marked in grey shows the jumper position.

- ► With Lenze setting, the frequency controllers are not internally supplied.
- ► For internal voltage supply, put the jumper in the position indicated below.

Lenze setting (only external voltage supply)	**Internal voltage supply**
	

External voltage supply

If necessary, supply the communication module with a separate voltage of 24 V DC ±10 % via the two-pin plug connector.

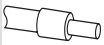
Use a separate supply unit in every control cabinet if the distance between the control cabinets is larger than normal.

Plug connector	Name	Explanation
+	Vcc24	External supply 24 V DC ± 10 %, 120 mA
-	GND24	Reference potential for external voltage supply

Controller	External voltage supply
820X	Always required
821X / 822X / 824X / 93XX / 9300 Servo PLC / Drive PLC	Only required if the mains supplying the corresponding controller is to be switched off but the communication ring must not be interrupted. With these basic devices the internal voltage supply can be used.
8200 vector	See notes given in “Internal DC voltage supply” 🕮 5.4-9

Connect the communication module to the bus system according to the description (🕮 5.4-4).

Terminal data

Electrical connection	Plug connector with screw connection
Possible connections	 rigid: 1.5 mm² (AWG 16)
	flexible:
	 without wire end ferrule 1.5 mm² (AWG 16)
	 with wire end ferrule, without plastic sleeve 1.5 mm² (AWG 16)
	 with wire end ferrule, with plastic sleeve 1.5 mm² (AWG 16)
Tightening torque	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)
Bare end	6 mm

5.5 Commissioning

Tip!

You will find the current GSE file for this Lenze product in the Internet in the ”Downloads” area under

http://www.Lenze.com

5.5.1 Before switching on

Stop!

Please check the following before you switch on the basic device together with the function module for the first time in the PROFIBUS-DP network:

- ► Completeness of the wiring, earth fault, and short circuit.
- ► Whether the bus system is terminated at the first and last physical bus device with an integrated active bus terminating resistor.

5.5.2 First switch-on

Note!

Keep to the switch-on sequence!

Step-by-step commissioning of the communication module with DRIVECOM device control is described below.

Step	Procedure	See
1.	Provide software compatibility to the communication module ● 2133: Switch S8 = OFF ● 2131: Switch S8 = ON (Continue with 2131 communication module commissioning with this setting) **Lenze setting: S8 = OFF**	📖 5.5-4
2.	Carry out drive-specific settings	Controller documentation
3.	Prepare basic device for communication	📖 5.5-5
4.	Configure host system for communication with the 2133 communication module.	📖 5.5-7
5.	Check bus termination ● Check at first and last bus device whether switch at plug is active. **Lenze setting: OFF**	📖 5.5-11
6.	The baud rate does not require any manual settings. The communication module automatically adapts itself to the baud rate of the master.	
7.	Switch on the controller's mains supply and, if necessary, the separate power supply of the communication module. **Reaction** Green LED (bus) at the front of the communication module is lit.	📖 5.5-12
8.	Bus device addressing Every bus device needs its own address.	📖 5.5-13
9.	Communication with the controller is now possible, i.e. all codes can be read and all changeable codes can be modified. If necessary, adapt the codes to your application (see Operating Instructions of the basic device). **Reaction** Yellow LED on the communication module blinks if PROFIBUS-DP is active.	
10.	Enable the controller via terminal: Terminal 28 = HIGH	
11.	Enter the setpoint. ● Master transmits setpoint via process data output word 2 (POW 2).	
12.	Enable drive via PROFIBUS-DP	
13.	Change to status "READY FOR OPERATION" ● Master receives DRIVECOM status word: xxxx xxxx x01x 0001_{bin}	📖 5.6-25
14.	Controller is "READY TO SWITCH ON" ● Master transmits DRIVECOM control word: $0000\ 0000\ 0111\ 1110_{bin} = 007E_{hex}$	
15.	Change to status "OPERATION ENABLED" ● Master transmits DRIVECOM control word: $0000\ 0000\ 0111\ 1111_{bin} = 007F_{hex}$	
The drive is now running.		

5.5.3 Software compatibility setting

Note!

The switch S8 is for the functionality of the Lenze 2131 PROFIBUS-DP communication module. Only set S8=ON for this application.

5.5.4 Preparing the basic device for communication

82XX / 8200 vector frequency inverter

Step	Procedure	See
1.	The controller can be enabled through PROFIBUS-DP if the Lenze parameter operating mode (C0001) is changed from 0 to 3. This can be done by using the keypad or directly via PROFIBUS-DP. Examples for PROFIBUS-DP Write (C0001=3): – Index = $5FFE_{hex}$ (results from $5FFF_{hex} - (C0001)_{hex}$; see Lenze codes addressing – Subindex: 0 – Value: 30000_{dez}	📖 5.6-3 📖 5.6-37 📖 5.6-45
2.	Terminal 28 (CINH) is always active and must be set to HIGH level during PROFIBUS-DP operation (see Operating Instructions of the controller). – Otherwise, the controller cannot be enabled through PROFIBUS-DP (DRIVECOM device status ”OPERATION ENABLED”). – For 821X, 8200vector and 822X the QSP function (quick stop) is always active. If QSP is assigned to an input terminal (Lenze setting: not assigned), the terminal must be set to HIGH level during PROFIBUS-DP operation (see Operating Instructions of the controller).	
3.	The controller now accepts control and parameter-setting data from the PROFIBUS-DP.	
4.	Select speed setpoint unequal to 0.	📖 5.6-4
5.	Change to the status ”READY TO SWITCH ON“. Value selection in DRIVECOM control word: 0000 0000 0111 1110bin ($007E_{hex}$).	
6.	Waiting for status ”READY TO SWITCH ON” to be reached. Value for DRIVECOM status word: xxxx xxxx x01x 0001_{bin}.	
7.	Change to status ”OPERATION ENABLED”. Value selection in DRIVECOM control word: 0000 0000 0111 1111_{bin} ($007F_{hex}$)	
8.	Waiting for ”OPERATION ENABLED”	📖 5.6-25

93XX servo inverter

Step	Procedure	See
1.	The drive can be controlled through PROFIBUS-DP if the Lenze parameter signal configuration (C0005) is set to xxx3. This can be done using the 9371BB keypad or directly via PROFIBUS-DP. Lenze recommends to select the signal configuration 1013 (speed control) for first commissioning. Examples for PROFIBUS-DP Write (C0005=1013): – Index = $5FFA_{hex}$ (results from $5FFF_{hex} - (C0005)_{hex}$ – Subindex: 0 – Value: $10\ 130\ 000_{dez}$ (results from $1013x10^4$)	📖 5.6-37 📖 5.6-45
2.	Set the parameter C0142 to 0.	Start option, see 📖 5.5-12
3.	Terminal 28 (RFR = controller enable) is always effective and must be set to HIGH level during PROFIBUS-DP operation (see Operating Instructions of the controller). Otherwise the controller cannot be enabled through PROFIBUS-DP (DRIVECOM device status "OPERATION ENABLED"). – With the signal configuration C0005=1013 (speed control), the QSP function (quick stop) and the CW/CCW changeover are assigned to the digital input terminals E1 and E2 and thus always active. For PROFIBUS-DP operation, E1 must be set to HIGH level (see Operating Instructions of 93XX). **Note:** With signal configuration C0005=xx13, terminal A1 is switched as a voltage output. Therefore only the following terminals must be connected via a cable: ● X5.A1 with X5.28 (ctrl. enable) ● X5.A1 with X5.E1 (CW/QSP)	
4.	The controller now accepts control and parameter-setting data from the PROFIBUS-DP.	
5.	Select speed setpoint unequal to 0.	📖 5.6-4
6.	Change to the status "READY TO SWITCH ON". Value selection in DRIVECOM control word: 0000 0000 0111 1110bin ($007E_{hex}$).	
7.	Waiting for status "READY TO SWITCH ON" to be reached. Value for DRIVECOM status word: xxxx xxxx x01x 0001_{bin}.	
8.	Change to status "OPERATION ENABLED". Value selection in DRIVECOM control word: 0000 0000 0111 1111_{bin} ($007F_{hex}$)	
9.	Waiting for "OPERATION ENABLED"	📖 5.6-25

5.5.5 Configuration of the host

The host must be configured before communication with the communication module is possible.

Master settings

For configuring the PROFIBUS-DP, the device data base file (*.GSE) of the communication module must be read into the master.

Device data base file

In the device data base file (LENZ2133.GSE) you will find the configurations:

DRIVECOM control and DRIVECOM parameter data channel

Selection text in LENZ2133.GSE	Parameter data		Process data		Occupied I/O memory
	without consistency	with consistency	without consistency	with consistency	
PAR(Cons.) + PZD(n Words I/O)		•	n words		4 + n words
PAR(Cons.) + PZD(n Words Cons)				n words	4 + n words
PAR + PZD (n Words I/O)	•		n words		4 + n words
PAR + PZD (n Words Cons.)				n words	4 + n words
PZD (n Words I/O)	without parameter data channel		n words		n words
PZD(n Words Cons.)				n words	n words

n = 1 ... 12

Device control and DRIVECOM parameter data channel

Selection text in LENZ2133.GSE	Parameter data		Process data		Occupied I/O memory
	without consistency	with consistency	without consistency	with consistency	
PAR(Cons.)+PZD(nWordsI/O)AR		•	n words		4 + n words
PAR(Cons.)+PZD(nWordsCon)AR				n words	4 + n words
PAR + PZD (n Words I/O) AR	•		n words		4 + n words
PAR + PZD (n Words Con) AR				n words	4 + n words
PZD (n Words I/O) AR	without parameter data channel		n words		n words
PZD(n Words Cons.) AR				n words	n words

n = 1 ... 12

PPOFIDRIVE control and PROFIDRIVE parameter data channel (PKW)

Selection text in LENZ2133.GSE	Parameter data		Process data		Occupied I/O memory
	without consistency	with consistency	without consistency	with consistency	
PPO1		•	2 words		6 words
PPO2			6 words		10 words
PPO5			10 words		14 words
PPO3	without parameter data channel		2 words		2 words
PPO4			6 words		6 words
PPO1 (processdata consistenz)		•		2 words	6 words
PPO2 (processdata consistenz)				6 words	10 words
PPO5 (processdata consistenz)				10 words	14 words
PPO3 (processdata consistenz)	without parameter data channel			2 words	2 words
PPO4 (processdata consistenz)				6 words	6 words

n = 1 ... 12

Example of the selection text of the device data base file

PAR (Cons) + **PZD (7W)** **AR**

- Lenze device control
- Process data words (7 words)
- Parameter data channel (4 bytes consistent)

PAR (Cons) + **PZD (8W)**

- Without “AR”: Control with DRIVECOM Profile 20
- Process data words (8 words)
- Parameter data channel (4 bytes consistent)

Note!

Use overall consistency

- ► We recommend to use exclusively configurations with consistency for the parameter data channel to avoid data conflicts between PROFIBUS-DP master and host CPU.
- ► Please note that the processing of consistent data varies between hosts. This must be considered in the PROFIBUS-DP application program.
- ► Detailed description of consistency: (📖 5.10-1)

Defining user data length

The user data length is defined during the DP initialisation phase (configuration). Up to 12 process data words can be configured (depending on the basic device used).

Optionally you can activate the parameter data channel. If the parameter data channel is active, it additionally occupies 4 words of the process data inputs and outputs.

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

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

The user data lengths for process input data and process output data are identical. The selection takes place via identification bytes in the configuration software for the PROFIBUS-DP system.

Without parameter data channel	Process data channel
Identification / user data length	**Identification / user data length**
-	• Identification – without consistency: 70_{hex} ... $7B_{hex}$ (112 ... 123) – with consistency: $F0_{hex}$ ... FB_{hex} (240 ... 251) • User data length: 1 ... 12 words (POW1/PIW1 ... POW12/PIW12)

With parameter data channel	Process data channel
Identification / user data length	**Identification / user data length**
• Identification – without consistency: 73_{hex} (115) – with consistency: $F3_{hex}$ (243) • User data length: 4 words (word 1 ... word 4)	• Identification – without consistency: 70_{hex} ... $7B_{hex}$ (112 ... 123) – with consistency: $F0_{hex}$ ... FB_{hex} (240 ... 251) • User data length: 1 ... 12 words (POW1/PIW1 ... POW12/PIW12)

General structure of the identification byte

MSB							LSB
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**

Data length
00 1 byte or 1 word
...
15 16 bytes or 16 words

Input/Output
00 Specific identification format
01 Input
10 Output
11 Input and output

Length/Format
0 Byte
1 Word

Consistency
0 Byte or word
1 Total length

5.5.6 Activation of bus terminating resistor

Activation of bus terminating resistor

Place a bus terminating resistor only at the first and last physical bus device.

The bus terminating resistor is integrated into the bus connector and can be activated via a switch.

Note!

Please note that the bus termination is no longer active if

- ► the connector has been disconnected e.g. in service case,
- ► the module supply has been switched off.

5.5.7 Switching on the controller's mains voltage

Note!

If the external voltage supply of the communication module is used, the supply must be switched on as well.

At the communication module front the following LEDs must be lit:

► Upper green LED: "Voltage supply status display"

► Lower green LED: "Drive status display"

If the LEDs are not lit as expected, see (📖 5.7-1).

Protection against uncontrolled restart

Note!

In some cases, the controller should not restart after a fault (e.g. after a short mains failure).

► The drive can be inhibited by setting C0142 = 0 if
- the corresponding controller sends an LU message and
- the fault is active for more than 0.5 seconds.

Parameter function:

► C0142 = 0
- the controller remains inhibited even after the fault has been eliminated
- the drive restarts in a controlled mode: LOW-HIGH edge at terminal 28 (CINH)

► C0142 = 1
- An uncontrolled restart of the controller is possible.

5.5.8 Addressing of the bus devices

To address the controllers, each bus device must be allocated a definite address.

Note!

- If S1 - S7 = OFF, the configurations under *code C0009* become active with switching on.
- As soon as one of the switches S1 ... S7 = ON, the configurations of *all switch positions* become active with switching on.

The Lenze setting of the switches (S1 - S8) is **OFF**.

Switch off the voltage supply of the communication module and then on again in order to activate changed settings.

Valid address range: 3 … **126**
(Lenze setting: 126, provided that C0009 = 1)

The address can be set via

- switch at the front (📖 5.5-11)
- keypad or PC (📖 5.5-14) or
- the master (class 2) (📖 5.5-14)

Address settings through the front DIP switch

The address (decimal number) is calculated by inserting the switch status of switches S1 ... S7 ('0' = OFF and '1' = ON) into the equation:

$$Address_{dec} = S_1 \cdot 2^0 + S_2 \cdot 2^1 + S_3 \cdot 2^2 + S_4 \cdot 2^3 + S_5 \cdot 2^4 + S_6 \cdot 2^5 + S_7 \cdot 2^6$$

The equation also indicates the valency of an activated switch (see front labelling). The sum of valencies makes the device address to be set:

Switch	S1	S2	S3	S4	S5	S6	S7
Valency	1	2	4	8	16	32	64

Example 1:

Switch	S1	S2	S3	S4	S5	S6	S7
Switch position	1	1	1	0	0	0	0
Address (= 7)	1	2	4	0	0	0	0

Example 2:

Switch	S1	S2	S3	S4	S5	S6	S7
Switch position	1	0	0	1	1	0	0
Address (= 25)	1	0	0	8	16	0	0

Address settings through keypad or PC

Addresses are set using code C0009 (see controller code table)

DIP switches S1 - S7 must be in OFF position (= delivery state).

Address settings through master class 2

In this case, only one PROFIBUS-DP device must be connected to the bus. This can be achieved by a special switch-on sequence.

Master settings (only master class 2) have an effect on the setting in code C0009.

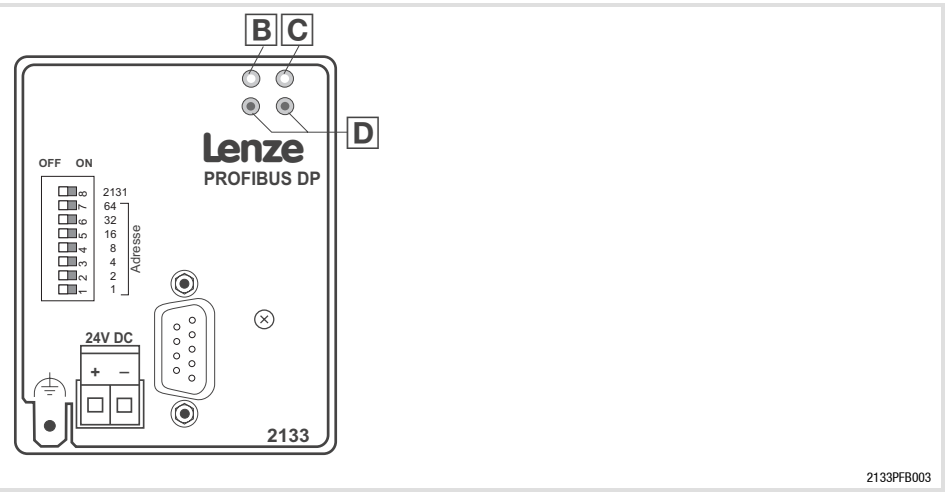
PROFIBUS-DP station address	Mapping to code C0009 (LECOM node address)
1-2	No (master addresses)
3-99	Yes (3-99)
100-125	Yes (C0009=2)
126 (**LENZE setting**)	Yes (**C0009=1**)

Tab. 5.5-1 Station address assignment for the controllers

Note!

In the "Power On" status, the class 2 master can set a device address via the "Set_Slave_Address" telegram.

5.5.9 Status display



Pos	LED status	Explanation
B	**Green LED** (voltage supply)	
	ON	Communication module is supplied with voltage and connected to the drive controller.
	OFF	Communication module is not supplied with voltage. Controller or external voltage supply is switched off.
	BLINKING	Communication module is supplied with voltage, but not (yet) connected to the controller because ● communication module has not correctly been attached to the controller ● data transfer to/from the controller is not yet possible (e.g. controller initialisation phase).
C	**Yellow LED** (communication)	
	OFF	Communication module is not yet initialised
	BLINKING	Communication via the communication module has been set up.
D	**Red and green Drive LEDs** indicate the operating status of the basic devices 82XX, 8200 vector, 93XX, Servo PLC 9300 and Drive PLC (see Operating Instructions of the corresponding basic device)	

5.6 Data transfer

5.6.1 General information

PROFIBUS-DP transfers two different data types between the master computer and the controllers.

► Parameter data

► Process data

As indicated in the table, these data are distributed into communication channels according to their time-critical response.

Process data
● Process data are transferred via the process data channel.
● Use process data to control the drive controller.
● The master computer has direct access to the process data. In the PLC, for instance, the data are directly assigned to the I/O area. An exchange between the master drive and the controller is required in the shortest possible time with small amounts of data being transferred cyclically.
● Process data are – not stored in the controller. – transferred between the host and the controllers in order to exchange current input and output data continuously.
● Process data are, for instance, setpoints and actual values.
An exchange between the master drive and the controller is required in the shortest possible time with small amounts of data being transferred cyclically.

Parameter data
● Parameter data are transferred via the parameter data channel.
● If the parameter data channel is active, it additionally occupies 4 words of input and output process data.
● Observe the notes on code C0003 when saving parameter changes.
● In general, the transfer of parameters is not time-critical.
● Parameter data are, for instance, operating parameters, diagnostics information and motor data.

Tab. 5.6-1 Distribution of parameter data and process data into different communication channels

5.6.2 Device control

5.6.2.1 Process data transfer

Process data telegrams between master and controllers connected to the bus are divided according to their direction into:

- Process data telegrams **from** the drive (process data input word, PIW)
- Process data telegrams **to** the drive (process data output word, POW)

Process data telegram from drive

The function block used for the cyclic process data telegram *from* the drive is called AIF-OUT. The status word included in the process data telegram (byte 1 and byte 2) is sent to the master via this function block.

Process data telegram to drive

The function block used for the cyclic process data telegram *to* the drive is called AIF-IN. The control word included in the process data telegram (byte 1 and byte 2) is processed in the basic device via this function block.

5.6.2.2 Setpoint source selection

82XX frequency inverter

For these controllers the setpoint source selection is determined under code C0001 (index: $5FFE_{hex}$). An evaluation of process data is only possible if code C0001 is set to “3” when the controller is operated together with the communication module. The process data channel which defines the frequency setpoint (mapping to C0046) and the control word (C0135) is the *setpoint source*.

Note!

Please ensure that the setpoint source (C0001) is the same in all parameter sets.

8200 vector frequency inverter

For these controllers the setpoint source is determined under code C0001 (index: $5FFE_{hex}$). An evaluation of process data is only possible if code C0001 is set to “3” when the controller is operated together with the communication module (selection: process data channel of a communication module). The process data channel which defines the frequency setpoint (mapping to C0046) and the control word (C0135) is the *setpoint source*.

Check in C0412/x whether the assignment of setpoint source and analog signal is correct and change, if necessary.

Note!

Please ensure that the setpoint source (C0001) is the same in all parameter sets used.

93XX controller

The value in code C0005 must be set to ”xxx3” for bus operation (x = wildcard for selected preconfiguration).

Servo PLC 9300 / Drive PLC

Communication requires that the system blocks AIF-IN 1 ... 3 or AIF-OUT1 ... 3 *and, if available,* the AIF management are part of the control configuration of the IEC61131 project.

5.6.2.3 Process data signals for 82XX frequency inverter

Process data telegram from drive

Byte 1	Byte 2	Byte 3	Byte 4
Status word		Actual value	
High byte	Low byte	High byte	Low byte

Note!

- Frequency and speed values are scaled with ±24000 ≡ ±480 Hz.
- Torque values are scaled with 16384 ≡ 100%.

Device status word AIF-STAT for 82XX (Lenze code C0150, index $5F69_{hex}$)

820X		821x, 822x, 824X	
Bit	**Assignment**	**Bit**	**Assignment**
0	**Actual parameter set**	**0**	**Actual parameter set**
0	Parameter set 1 or 3 active	0	Parameter set 1 or 3 active
1	Parameter set 2 or 4 active	1	Parameter set 2 or 4 active
1	**IMP** (pulse inhibit)	**1**	**IMP** (pulse inhibit)
0	Pulses for power stage enabled	0	Pulses for power stage enabled
1	Pulses for power stage inhibited	1	Pulses for power stage inhibited
2	**I_{max}** (current limit reached)	**2**	**I_{max}** (current limit reached)
0	Current limit not reached	0	Current limit not reached
1	Current limit reached	1	Current limit reached
3	**Not assigned**	**3**	**$f_d = f_{dset}$**
		0	$f_d \neq f_{dset}$
		1	$f_d = f_{dset}$
4	**$f_d = f_{dset}$**	**4**	**RFG on = RFG off**
0	$f_d \neq f_{dset}$	0	RFG-On ≠ RFG-Off
1	$f_d = f_{dset}$	1	RFG on = RFG off
5	**Qmin ($f_d \leq f_{dQmin}$)**	**5**	**Qmin** ($f_d \leq f_{dQmin}$)
0	Qmin not active	0	Qmin not active
1	Qmin active	1	Qmin active
6	**$f_d = 0$** (actual frequency value = 0)	**6**	**$f_d = 0$** (actual frequency value = 0)
0	$f_d \neq 0$	0	$f_d \neq 0$
1	$f_d = 0$	1	$f_d = 0$
7	**CINH** (controller inhibit)	**7**	**CINH** (controller inhibit)
0	No controller inhibit	0	No controller inhibit
1	Controller inhibit	1	Controller inhibit
11...8	**Device status**	**11...8**	**Device status**

Bit 11	10	9	8	
0	0	0	0	Device initialisation
1	0	0	0	Error active

Bit 11	10	9	8	
0	0	0	0	Device initialisation
0	0	1	0	Switch-on inhibit
0	0	1	1	Operation inhibited
0	1	0	0	Flying-restart circuit active
0	1	0	1	DC injection brake active
0	1	1	0	Operation enabled
0	1	1	1	Message active
1	0	0	0	Error active
1	1	1	1	Communication with basic device not possible

12	**Overtemperature warning**	**12**	**Overtemperature warning**
0	No warning	0	No warning
1	Warning	1	Warning
13	**U_{Gmax}** (DC bus overvoltage)	**13**	**U_{Gmax}** (DC bus overvoltage)
0	No overvoltage	0	No overvoltage
1	Overvoltage	1	Overvoltage
14	**Direction of rotation**	**14**	**Direction of rotation**
0	CW rotation	0	CW rotation
1	CCW rotation	1	CCW rotation
15	**Ready for operation**	**15**	**Ready for operation**
0	Not ready for operation	0	Not ready for operation
1	Ready for operation	1	Ready for operation

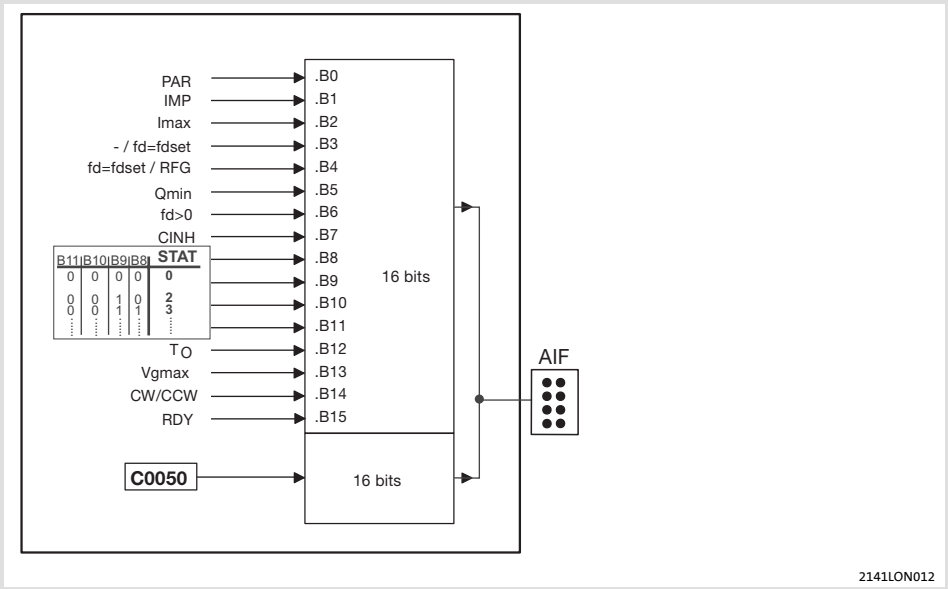


Fig. 5.6-1 Read access to status word and actual frequency in 82XX (fixed assignment)

Process data telegram to drive

Byte 1	Byte 2	Byte 3	Byte 4
Control word		Setpoint	
High byte	Low byte	High byte	Low byte

Note!

- Frequency and speed values are scaled with ±24000 ≡ ±480 Hz.
- Torque values are scaled with 16384 ≡ 100%.

Device control word AIF-CTRL for 82XX (Lenze code C0135, index $5F78_{hex}$)

820X		821x, 822x, 824X	
Bit	**Assignment**	**Bit**	**Assignment**
0 / 1	**JOG values** Bit 1 0 0 0 C0046 active 0 1 JOG1 in C0037 active 1 0 JOG2 in C0038 active 1 1 JOG3 in C0039 active	**0 / 1**	**JOG values** Bit 1 0 0 0 C0046 active 0 1 JOG1 in C0037 active 1 0 JOG2 in C0038 active 1 1 JOG3 in C0039 active
2	**CW/CCW** (CW rotation/CCW rotation) 0 CW rotation 1 CCW rotation	**2**	**CW/CCW** (CW rotation/CCW rotation) 0 CW rotation 1 CCW rotation
3	**QSP** (quick stop) 0 QSP not active 1 QSP active	**3**	**QSP** (quick stop) 0 QSP not active 1 QSP active
4...8	**Reserved**	**4**	**RFG stop** (stop of the ramp function generator) 0 RFG stop not active 1 RFG stop active
		5	**RFG zero** (deceleration along the T_{if} ramp C0013) 0 RFG zero not active 1 RFG zero active
		6	**UP function for motor potentiometer** 0 UP not active 1 UP active
		7	**DOWN function for motor potentiometer** 0 DOWN not active 1 DOWN active
		8	**Reserved**
9	**CINH** (controller inhibit) 0 No controller inhibit 1 Controller inhibit	**9**	**CINH** (controller inhibit) 0 No controller inhibit 1 Controller inhibit
10	**Reserved**	**10**	Reserved
11	**Reserved**	**11**	**TRIP reset** 0 -> 1: Edge from 0 to 1
12	**PAR1** (parameter set changeover) 0 -> 1: Parameter set 1 -> 0: Parameter set	**12**	**PAR1** (parameter set changeover) 0 -> 1: Parameter set 1 -> 0: Parameter set
13	**Reserved**	**13**	**Reserved**
14	**DC brake** (DC injection brake) 0 DC brake not active 1 DC brake active	**14**	**DC brake** (DC injection brake) 0 DC brake not active 1 DC brake active
15	**Reserved**	**15**	**Reserved**

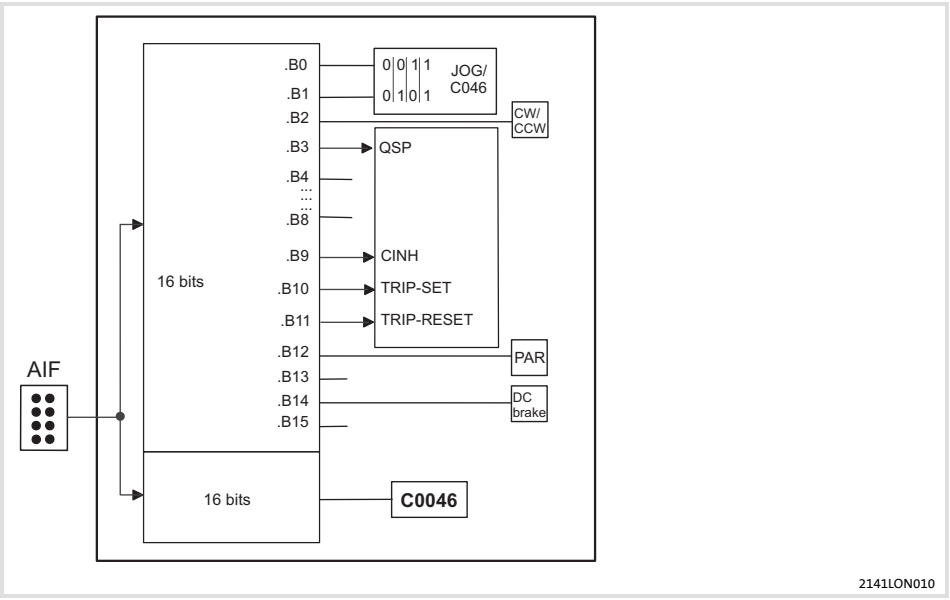


Fig. 5.6-2 Access to control word and actual frequency in 82XX (fixed assignment)

Special features

Stop!

Reset a TRIP only via PROFIBUS-DP!

The drive might start running for a short period if a fault is reset via terminal 28 while the controller is being operated with PROFIBUS-DP control (C0001 = 3) and has assumed the device status ”FAULT”.

The 820X controller is initialised after the ”error reset” command. During this time the controller does not accept any other commands.

Stop!

If the setpoint and the direction of rotation are changed simultaneously via the DRIVECOM speed setpoint, a speed change in the wrong direction of rotation may occur for a short time.

For this reason always send a low rotation direction setpoint first, followed by the new setpoint if the direction of rotation is changed.

This is because first the setpoint is sent to the controller as a unipolar value, followed by the information on the change of the rotation direction.

5.6.2.4 Process data signals for 8200 vector frequency inverters

General information

Digital and analog input and output signal can be configured freely (see Operating Instructions “8200 vector”: codes C0410, C0412, C0417 and C0421).

The change of code C0001 to 3 starts the preconfiguration of the process data words in the controller (📖 5.6-3).

Process data telegram from drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Status word		AIF-OUT.W1		AIF-OUT.W2	
High byte	Low byte	High byte	Low byte	High byte	Low byte

AIF-OUT.Wx see C0421.

Device status word AIF-STAT for 8200 vector (Lenze code C0150, index $5F69_{hex}$)

Bit	Assignment (Lenze setting)	Set in C0417 / ..
0	**Actual parameter set** (DCTRL-PAR-B0)	1
1	**Pulse inhibit** (DCTRL1-IMP)	2
2	**I_{max} limit** (MCTRL1-IMAX)	3
3	**Output frequency = frequency setpoint** (MCTRL1-RFG1=NOUT)	4
4	**Ramp function generator input = Ramp function generator output1** (NSET1-RFG1-I=0)	5
5	**Q_{min} threshold** (PCTRL1-QMIN)	6
6	**Output frequency = 0** (DCTRL1-NOUT=0)	7
7	**Controller inhibit** (DCTRL1-CINH)	8
11...8	**Device status** (DCTRL1-Stat*1 ... STAT*8)	Reserved

Bit	11	10	9	8	
	0	0	0	0	Device initialisation
	0	0	1	0	Switch-on inhibit
	0	0	1	1	Operation inhibited
	0	1	0	0	Flying-restart circuit active
	0	1	0	1	DC injection brake active
	0	1	1	0	Operation enabled
	0	1	1	1	Message active
	1	0	0	0	Error active
	1	1	1	1	Communication with basic device not possible

12	**Overheat warning** (DCTRL1-OH-WARN)	13
13	**DC bus overvoltage** (DCTRL1-OV)	14
14	**Direction of rotation** (DCTRL1-CCW)	15
15	**Ready for operation** (DCTRL1-RDY)	16

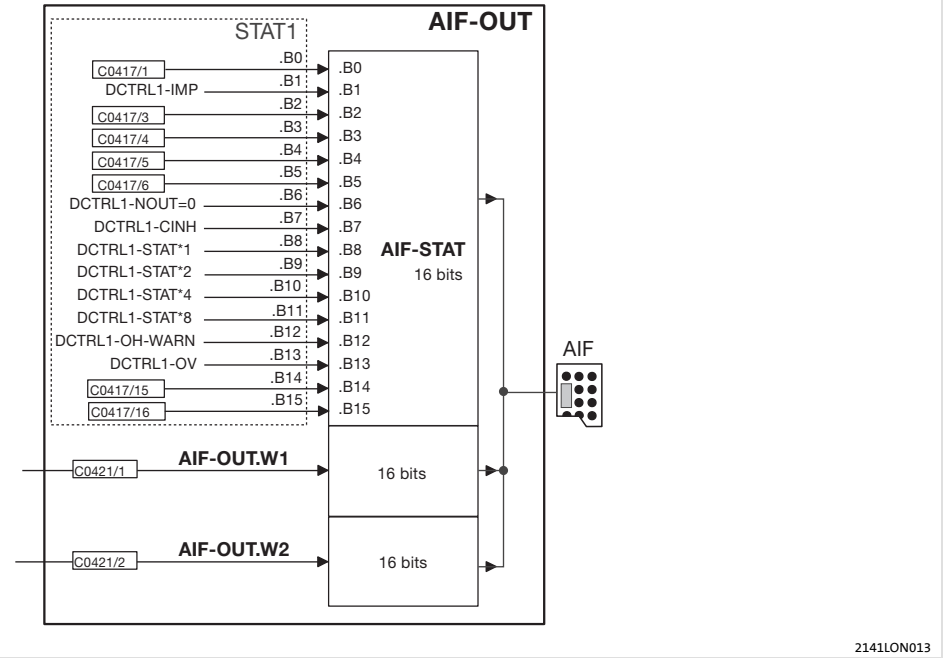


Fig. 5.6-3 Function block AIF-OUT in 8200 vector (freely programmable assignment)

Process data telegram to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Control word		AIF-IN.W1		AIF-IN.W2	
High byte	Low byte	High byte	Low byte	High byte	Low byte

AIF-IN.Wx see C0412.

Note!

- Frequency and speed values are scaled with ±24000 ≡ ±480 Hz.
- Torque values are scaled with 16384 ≡ 100%.

Device control word AIF-CTRL for 8200 vector (Lenze code C0135, index 5F78$_{hex}$)

Bit	Assignment (Lenze setting) C0001=3 with C0007 ≤ 51	C0001=3 with C0007 > 51	Set in C0410 /
0 / 1	**JOG values** Bit 1 0 0 0 00 = C0046 active 0 1 01 = NSET1-JOG1 (C0037) active 1 0 10 = NSET1-JOG2 (C0038) active 1 1 11 = NSET1-JOG3 (C0039) active	**Freely configurable**	1 2
2	**Current direction of rotation** (DCTRL1-CW/CCW) 0 Not active 1 Active	**Freely configurable**	3
3	**Quick stop** (AIF-CTRL-QSP) 0 Not active 1 Active	**Quick stop** (AIF-CTRL-QSP) 0 Not active 1 Active	4
4	**Stop ramp function generator** (NSET1-RFG1-STOP) 0 Not active 1 Active	**Freely configurable**	5
5	**Ramp function generator input = 0** (NSET1-RFG1-0) 0 Not active 1 Active	**Freely configurable**	6
6	**UP function motor potentiometer** (MPOT1-UP) 0 Not active 1 Active	**Freely configurable**	7
7	**DOWN function motor potentiometer** (MPOT1-DOWN)	**Freely configurable**	8
8	**Freely configurable**	**Freely configurable**	9
9	**Controller inhibit** (AIF-CTRL-CINH) 0 Not active 1 Active	**Controller inhibit** (AIF-CTRL-CINH) 0 Not active 1 Active	10
10	**External fault** (AIF-CTRL-TRIP-SET) 0 Not active 1 Active	**External fault** (AIF-CTRL-TRIP-SET) 0 Not active 1 Active	11
11	**Reset fault** (AIF-CTRL-TRIP-RESET) 0 -> 1 Edge from 0 to 1	**Reset fault** (AIF-CTRL-TRIP-RESET) 0 -> 1 Edge from 0 to 1	12
12	**Change over parameter set** (DCTRL1-PAR2/4) 0 Not active 1 Active	**Freely configurable**	13
13	**Change over parameter set** (DCTRL1-PAR3/4) 0 Not active 1 Active	**Freely configurable**	14
14	**DC injection brake** (MCTRL1-DCB) 0 Not active 1 Active	**Freely configurable**	15
15	**Freely configurable**	**Freely configurable**	16

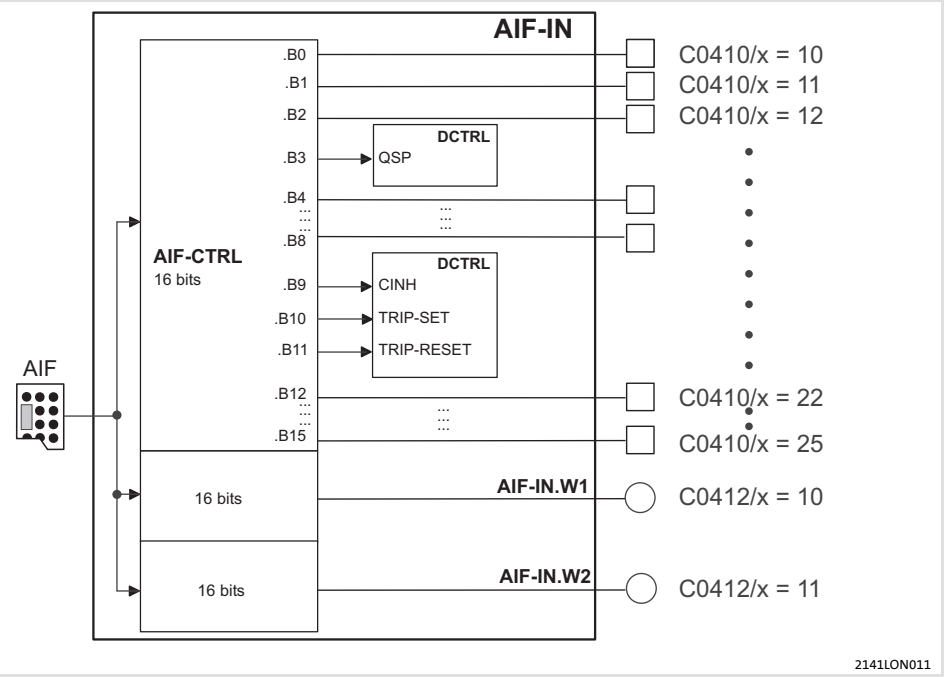


Fig. 5.6-4 Function block AIF-IN in 8200 vector (freely configurable/programmable assignment)

5.6.2.5 Process data signals for 9300 servo inverter

With the 93XX controller the process data assignment can be changed by configuring the function blocks AIF-IN and AIF-OUT.

Process data telegram from drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
DRIVECOM status word		AIF-OUT.W1		AIF-OUT.W2		AIF-OUT.W3	
High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte

Assignment of AIF-OUT depending on the signal configuration selected under C0005:

Signal configuration (C0005)	AIF-OUT.W1	AIF-OUT.W2	AIF-OUT.W3	AIF-OUT .D1
Speed control				
1003 1013 1113	MCTRL-NACT Actual speed value ±100%=±16383	MCTRL-MSET2 Torque display ±100%=±16383	MCTRL-NSET2 Speed controller input ±100%=±16383	Not assigned
Torque control				
4003 4013 4113	MCTRL-MSET2 Torque display ±100%=±16383	MCTRL-NACT Actual speed in % ±100%=±16383	MCTRL-NSET2 Speed controller input ±100%=±16383	Not assigned
DF master				
5003 5013 5113	MCTRL-NACT Actual speed value ±100%=±16383	MCTRL-MSET2 Torque display ±100%=±16383	MCTRL-NSET2 Speed controller input ±100%=±16383	Not assigned
DF-slave bus				
6003 6013 6113	MCTRL-NACT Actual speed value ±100%=±16383	MCTRL-PHI-ACT Actual phase	MCTRL-MSET2 Torque setpoint in % ±100%=±16383	Not assigned
DF-slave cascade				
7003 7013 7113	MCTRL-NACT Actual speed value ±100%=±16383	MCTRL-PHI-ACT Actual phase	MCTRL-MSET2 Torque setpoint in % ±100%=±16383	Not assigned
Not equal to xxx3 (except self configurations)	MCTRL-NACT Actual speed value ±100%=±16383	MCTRL-MSET2 Torque display ±100%=±16383	MCTRL-PHI-ACT Actual phase	Not assigned

For detailed description of the 93XX signal configurations see the Operating Instructions for 93XX (only the main configurations: 1000, 4000, 5000, etc.) or the 93XX Manual.

In the controller, other signals can be assigned to the signals AIF-OUT.W1 to AIF-OUT.W3. For this, the function block configuration method that is described in the 93XX Manual is used. The function block AIF-OUT determines the output data of the controller as the data interface to the communication module.

For more detailed information about the function block AIF-OUT, see the 93XX Manual.

Device status word AIF-STAT for 93XX

Bit	9300 servo inverter			
	C0005 = 1xx3	C0005 = 4xx3	C0005 = 5xx3	C0005 = 6xx3, 7xx3
0	DCTRL-PAR1-0	DCTRL-PAR1-0	DCTRL-PAR1-0	DCTRL-PAR1-0
1	DCTRL-IMP	DCTRL-IMP	DCTRL-IMP	DCTRL-IMP
2	MCTRL-IMAX	MCTRL-IMAX	REF-OK	REF-OK
3	MCTRL-MMAX	Not assigned	MCTRL-MMAX	Not assigned
4	NSET-RFG-I=0	MCTRL-IMAX negated	NSET-RFG-I=0	MCTRL-IMAX negated
5	QMIN	QMIN	REF-BUSY	REF-BUSY
6	DCTRL-NACT=0	DCTRL-NACT=0	DCTRL-NACT=0	DCTRL-NACT=0
7	DCTRL-CINH	DCTRL-CINH	DCTRL-CINH	DCTRL-CINH
11...8	Device status			

Bit 11	10	9	8	
0	0	0	0	Device initialisation
0	0	1	0	Switch-on inhibit
0	0	1	1	Operation inhibited
0	1	0	0	Flying-restart circuit active
0	1	0	1	DC injection brake active
0	1	1	0	Operation enabled
0	1	1	1	Message active
1	0	0	0	Fault active
1	0	1	0	Fail-QSP (only 9300 servo position controller)
1	1	1	1	Communication with basic device not possible

12	DCTRL-WARN	DCTRL-WARN	DCTRL-WARN	DCTRL-WARN
13	DCTRL-MESS	DCTRL-MESS	DCTRL-MESS	DCTRL-MESS
14	DCTRL-CW/CCW	DCTRL-CW/CCW	DCTRL-CW/CCW	Not assigned
15	DCTRL-RDY	DCTRL-RDY	DCTRL-RDY	DCTRL-RDY

Bit	9300 POS	9300 CRV	9300 vector		
	C0005 = 2xxx3	C0005 = xxx3	C0005 = 1xxx, 2xxx, 3xxx, 5xxx, 10xxx, 11xxx	C0005 = 4xx3	C0005 = 6xx3, 7xx3
0	Not assigned	CERR1-ERR	DCTRL-PAR1-0	DCTRL-PAR1-0	DCTRL-PAR1-0
1	DCTRL-IMP	DCTRL-IMP	DCTRL-IMP	DCTRL-IMP	DCTRL-IMP
2	POS-REF-OK	MCTRL-IMAX	MCTRL-IMAX	MCTRL-IMAX	MCTRL-IMAX
3	Not assigned	MCTRL-MMAX	MCTRL-MMAX	MCTRL-IMAX negated	MCTRL-MMAX
4	MCTRL-MMAX negated	DCTRL-TRIP	NSET-RFG-I=0	NSET-RFG-I=0	NSET-QSP-OUT
5	POS-IN-TARGET	CDATA-X0	QMIN	QMIN	QMIN
6	DCTRL-NACT=0	DCTRL-NACT=0	DCTRL-NACT=0	DCTRL-NACT=0	DCTRL-NACT=0
7	DCTRL-CINH	DCTRL-CINH	DCTRL-CINH	DCTRL-CINH	DCTRL-CINH
11...8	Device status				

Bit 11	10	9	8	
0	0	0	0	Device initialisation
0	0	1	0	Switch-on inhibit
0	0	1	1	Operation inhibited
0	1	0	0	Flying-restart circuit active
0	1	0	1	DC injection brake active
0	1	1	0	Operation enabled
0	1	1	1	Message active
1	0	0	0	Fault active
1	0	1	0	Fail-QSP (only 9300 servo position controller)
1	1	1	1	Communication not possible

12	DCTRL-WARN	DCTRL-WARN	DCTRL-WARN	DCTRL-WARN	DCTRL-WARN
13	DCTRL-MESS	DCTRL-MESS	DCTRL-MESS	DCTRL-MESS	DCTRL-MESS
14	DCTRL-AIFL-QSP	DCTRL-CW/CCW	DCTRL-CW/CCW	DCTRL-CW/CCW	DCTRL-CW/CCW
15	DCTRL-RDY	DCTRL-RDY	DCTRL-RDY	DCTRL-RDY	DCTRL-RDY

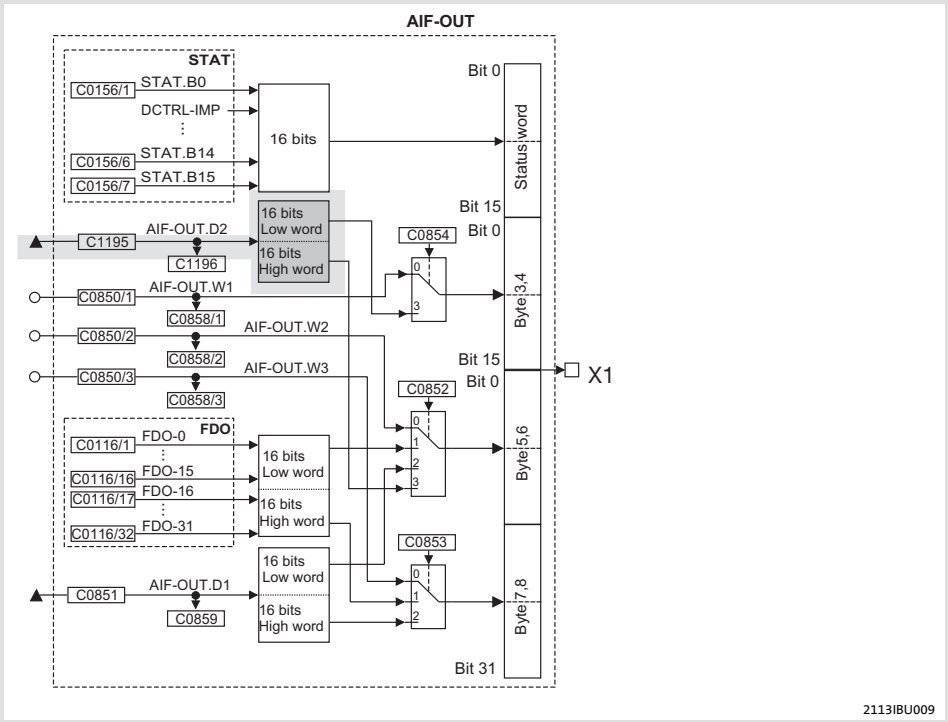


Fig. 5.6-5 Function block AIF-OUT (function block extension on grey background: available as of software version 2.0)

Process data telegram to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Control word		AIF-IN.W1		AIF-IN.W2		AIF-IN.W3	
High byte	Low byte	High byte	Low byte	High byte	Low byte	High byte	Low byte

The assignment of AIF-IN.W1 to AIF-IN.W3 depends on the signal configuration selected under C0005:

Signal configuration (C0005)	AIF-IN.W1	AIF-IN.W2	AIF-IN.W3	AIF-IN.D1
Speed control 1003 / 1013 / 1113	NSET-N Speed setpoint	Not assigned	Not assigned	Not assigned
Torque control 4003 / 4013 / 4113	MCTRL-MADD Torque setpoint	Not assigned		
DF master 5003 / 5013 / 5113	NSET-N Speed setpoint	Not assigned		
DF slave bus 6003 / 6013 / 6113	DFSET-A-TRIM Phase trimming	DFSET-N-TRIM Speed trimming		
DF slave cascade 7003 / 7013 / 7113	DFSET-VP-DIV DF factor	DFSET-A-TRIM Phase trimming		
Not equal to xxx3	Not assigned	Not assigned		

For detailed description of the 93XX signal configuration see the Operating Instructions for 93XX (only the main configurations: 1000, 4000, 5000, etc.) or the 93XX Manual.

In the controller, other signals can be assigned to the signals AIF-IN.W1 to AIF-IN.W3. For this, the function block configuration method that is described in the 93XX Manual is used. The function block AIF-IN determines the input data of the controller as the data interface from the communication module 2133.

For more detailed information about the function block AIF-IN, see the 93XX Manual.

Device control word AIF-CTRL for 93XX

	9300 servo inverter			
Bit	C0005 = 1xx3	C0005 = 4xx3	C0005 = 5xx3	C0005 = 6xx3, 7xx3
0	NSET-JOG*1	Not assigned	NSET-JOG*1	Not assigned
1	NSET-JOG*2	Not assigned	NSET-JOG*2	Not assigned
2	NSET-N-INV	NSET-N-INV	NSET-N-INV	NSET-N-INV
3	AIF-CTRL.QSP	AIF-CTRL.QSP	AIF-CTRL.QSP	AIF-CTRL.QSP
4	NSET-RFG-STOP	NSET-RFG-STOP	NSET-RFG-STOP	NSET-RFG-STOP
5	NSET-RFG-0	NSET-RFG-0	NSET-RFG-0	NSET-RFG-0
6	Not assigned	Not assigned	Not assigned	Not assigned
7	Not assigned	Not assigned	Not assigned	Not assigned
8	Not assigned	Not assigned	Not assigned	Not assigned
9	AIF-CTRL.CINH	AIF-CTRL.CINH	AIF-CTRL.CINH	AIF-CTRL.CINH
10	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET
11	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET
12	DCTRL-PAR*1	DCTRL-PAR*1	DCTRL-PAR*1	DCTRL-PAR*1
13	DCTLR-PAR-LOAD	DCTLR-PAR-LOAD	DCTLR-PAR-LOAD	DCTLR-PAR-LOAD
14	NSET-Ti*1	NSET-JOG*1	REF-ON	REF-ON
15	NSET-Ti*2	NSET-JOG*2	NSET-Ti*1	Not assigned

	9300 POS	9300 CRV	9300 vector		
Bit	C0005 = 2xxx3	C0005 = xxx3	C0005 = 1xxx, 2xxx, 3xxx, 5xxx, 10xxx, 11xxx	C0005 = 4xx3	C0005 = 6xx3, 7xx3
0	Not assigned	CSEL1-CAM*1	NSET-JOG*1	Not assigned	Not assigned
1	Not assigned	CSEL1-CAM*2	NSET-JOG*2	Not assigned	Not assigned
2	Not assigned	CSEL1-CAM*4	NSET-N-INV	Not assigned	Not assigned
3	AIF-CTRL.QSP	AIF-CTRL.QSP	AIF-CTRL.QSP	AIF-CTRL.QSP	AIF-CTRL.QSP
4	POS-PRG-START	CSEL1-EVENT	NSET-RFG-STOP	NSET-RFG-STOP	Not assigned
5	POS-PRG-STOP	CDATA-CYCLE	NSET-RFG-0	NSET-RFG-0	Not assigned
6	Not assigned	CSEL1-LOAD	Not assigned	Not assigned	Not assigned
7	POS-PRG-RESET	CSEL1-LOAD	Not assigned	Not assigned	Not assigned
8	Not assigned	Not assigned	Not assigned	Not assigned	Not assigned
9	AIF-CTRL.CINH	AIF-CTRL.CINH	AIF-CTRL.CINH	AIF-CTRL.CINH	AIF-CTRL.CINH
10	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET	AIF-CTRL.TRIP-SET
11	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET	AIF-CTRL.TRIP-RESET
12	POS-PS-CANCEL	Not assigned	DCTRL-PAR*1	DCTRL-PAR*1	DCTRL-PAR*1
13	POS-PARAM-RD	Not assigned	DCTLR-PAR-LOAD	DCTLR-PAR-LOAD	DCTLR-PAR-LOAD
14	POS-LOOP-ONH	Not assigned	NSET-Ti*1	NSET-JOG*1	Not assigned
15	POS-STBY-STP	Not assigned	NSET-Ti*2	NSET-JOG*2	Not assigned

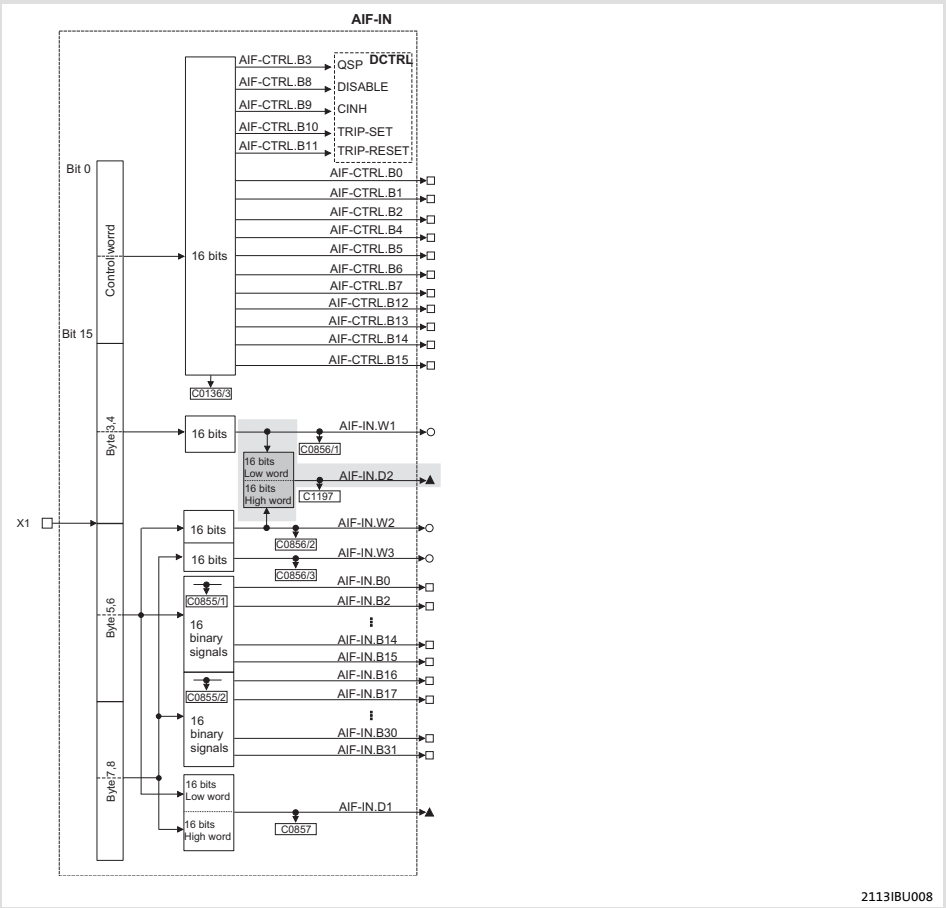


Fig. 5.6-6 Function block AIF-IN (grey: extension available as of software version 2.0)

5.6.2.6 Process data signals for 9300 Servo PLC and Drive PLC

Process data telegram from drive

Name/variable name	Explanation
Device status word (AIF1_wDctrlStat)	
AIF_nOutW1_a	AIF word 1
AIF_nOutW2_a	AIF word 2
AIF_nOutW3_a	AIF word 3
AIF2_nOutW1_a	AIF word 4
AIF2_nOutW2_a	AIF word 5
AIF2_nOutW3_a	AIF word 6
AIF2_nOutW4_a	AIF word 7
AIF3_nOutW1_a	AIF word 8
AIF3_nOutW2_a	AIF word 9
AIF3_nOutW3_a	AIF word 10
AIF3_nOutW4_a	AIF word 11
AIF1_dnOutD1_p	AIF double word 1

Note!

9300 Servo PLC

Link the following in the PLC program of the controller:
AIF1_wDctrlCtrl → DCTRL_wAIF1Ctrl
DCTRL_wStat → AIF1_wDctrlStat

Drive PLC

For the Drive PLC the *device control must* be used.

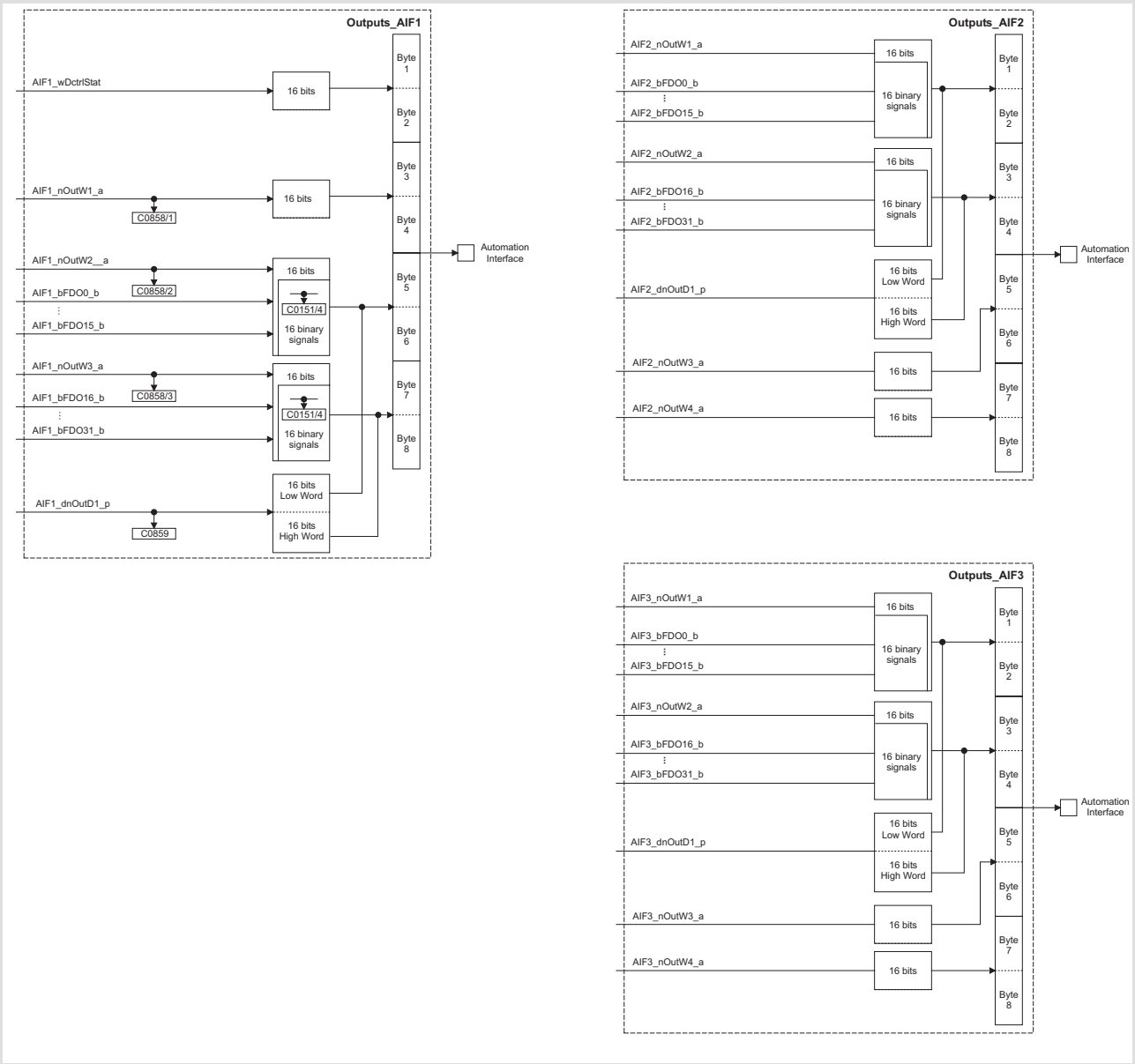


Fig. 5.6-7 Function blocks AIF-OUT1, AIF-OUT2 and AIF-OUT3

Process data telegram to drive

Name/variable name	Explanation
Device control word (AIF1_wDctrlCtrl)	
AIF1_nInW1_a	AIF word 1
AIF1_nInW2_a	AIF word 2
AIF1_nInW3_a	AIF word 3
AIF2_nInW1_a	AIF word 4
AIF2_nInW2_a	AIF word 5
AIF2_nInW3_a	AIF word 6
AIF2_nInW4_a	AIF word 7
AIF3_nInW1_a	AIF word 8
AIF3_nInW2_a	AIF word 9
AIF3_nInW3_a	AIF word 10
AIF3_nInW4_a	AIF word 11
AIF1_dnInD1_p	AIF double word 1

Note!

9300 Servo PLC

Link the following in the PLC program of the controller:
AIF1_wDctrlCtrl → DCTRL_wAIF1Ctrl
DCTRL_wStat → AIF1_wDctrlStat

Drive PLC

For the Drive PLC the *device control must* be used.

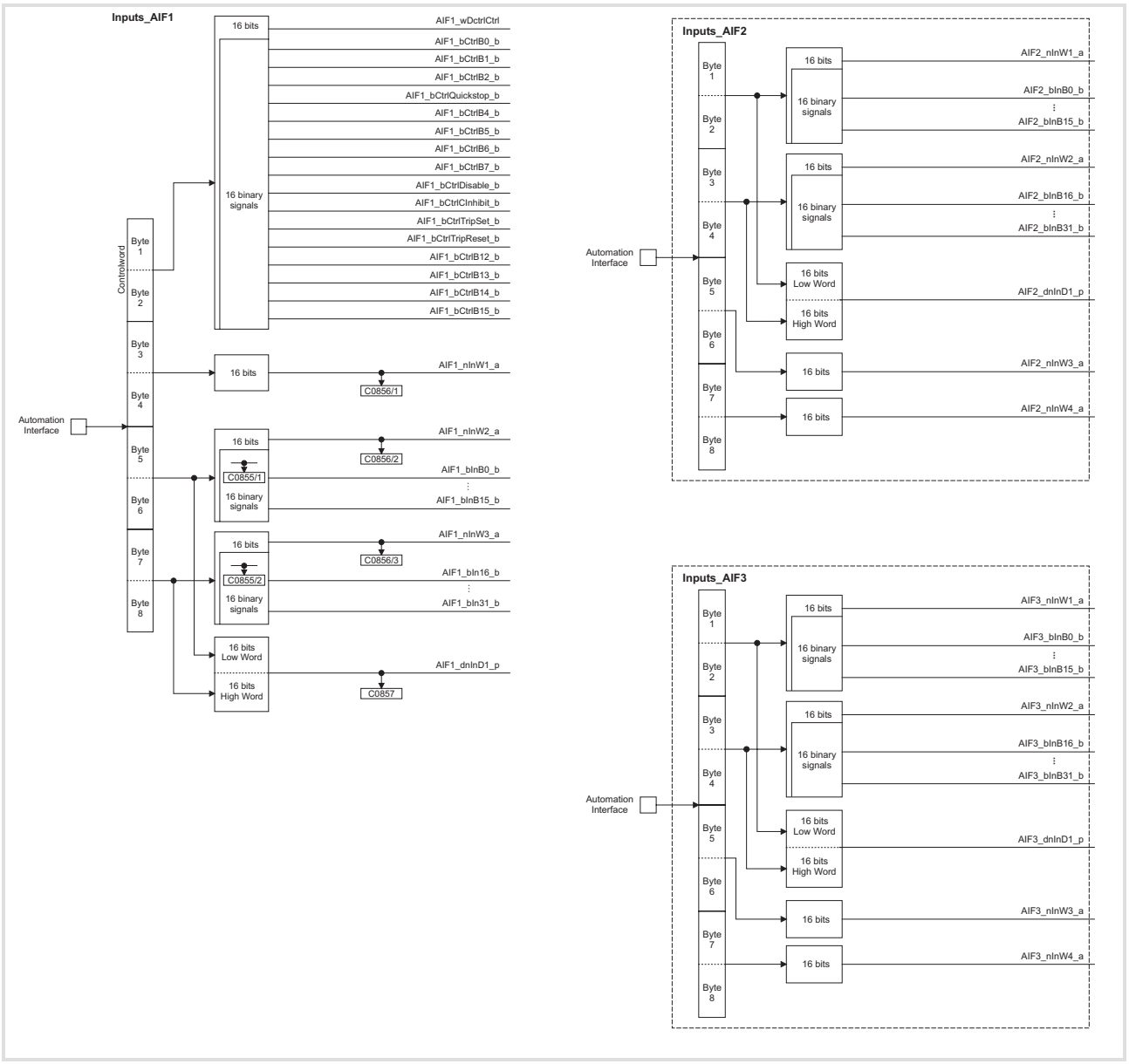


Fig. 5.6-8 Function blocks AIF-IN1, AIF-IN2 and AIF-IN3

5.6.3 DRIVECOM control

5.6.3.1 Provide DRIVECOM compatibility

Drivecom Profile 20 is a non-proprietary definition of important parameters and the controller behaviour.

Apart from DRIVECOM definitions, there are other Lenze specific functionalities which must be adapted to achieve full compatibility to the DRIVECOM Profile.

The device-specific changes are listed in the table below:

Controller	Device-specific changes
820X	With the 820X controller, parameters can only be set if the controller is inhibited. Controller inhibit is active with the following DRIVECOM device states ● ”SWITCH-ON INHIBIT” ● ”READY TO SWITCH ON” ● ”SWITCHED ON” ● ”FAULT”
821X, 8200 vector and 822X	The automatic DC-injection brake must be deactivated in all parameter sets, i.e. ● C0106=0 ● C2106=0 ● C4106=0 (8200 vector only) ● C6106=0 (8200 vector only) If the automatic DC injection brake is not deactivated (holding time of DC injection brake C0106 unequal to 0), the controller automatically switches from the device status ”OPERATION ENABLED” to the status ”SWITCHED ON” when the speed is 0 and the holding time of the DC injection brake has elapsed. If the setpoint is greater than 0, the controller is automatically reset to the status ”ENABLE OPERATION”.
93XX	Set a DRIVECOM speed signal configuration under code C0005 (e.g.: C0005=1013). This configuration corresponds to the signal configuration 1000 with the following changes: ● Setpoint selection via PROFIBUS-DP ● DRIVECOM control via PROFIBUS-DP ● Output X5.A1 is switched as a voltage output for the internal supply of the digital inputs. ● Actual values and status signals for PROFIBUS-DP For detailed description of signal configuration see 93XX Manual.

5.6.3.2 DRIVECOM status machine

82XX, 8200 vector (C0001 = 3) and 93XX

With PROFIBUS-DP control (82XX: C0001 = 3; 93XX: always) and when using the 2133 communication module, Lenze controllers are in the normalised device states according to DRIVECOM Profile 20.

Information on the current device status (marked by rectangles in the diagram) is stored in the DRIVECOM parameter "status word". Commands in the DRIVECOM parameter "control word" can change the device status. These commands are represented by arrows in the following diagram.

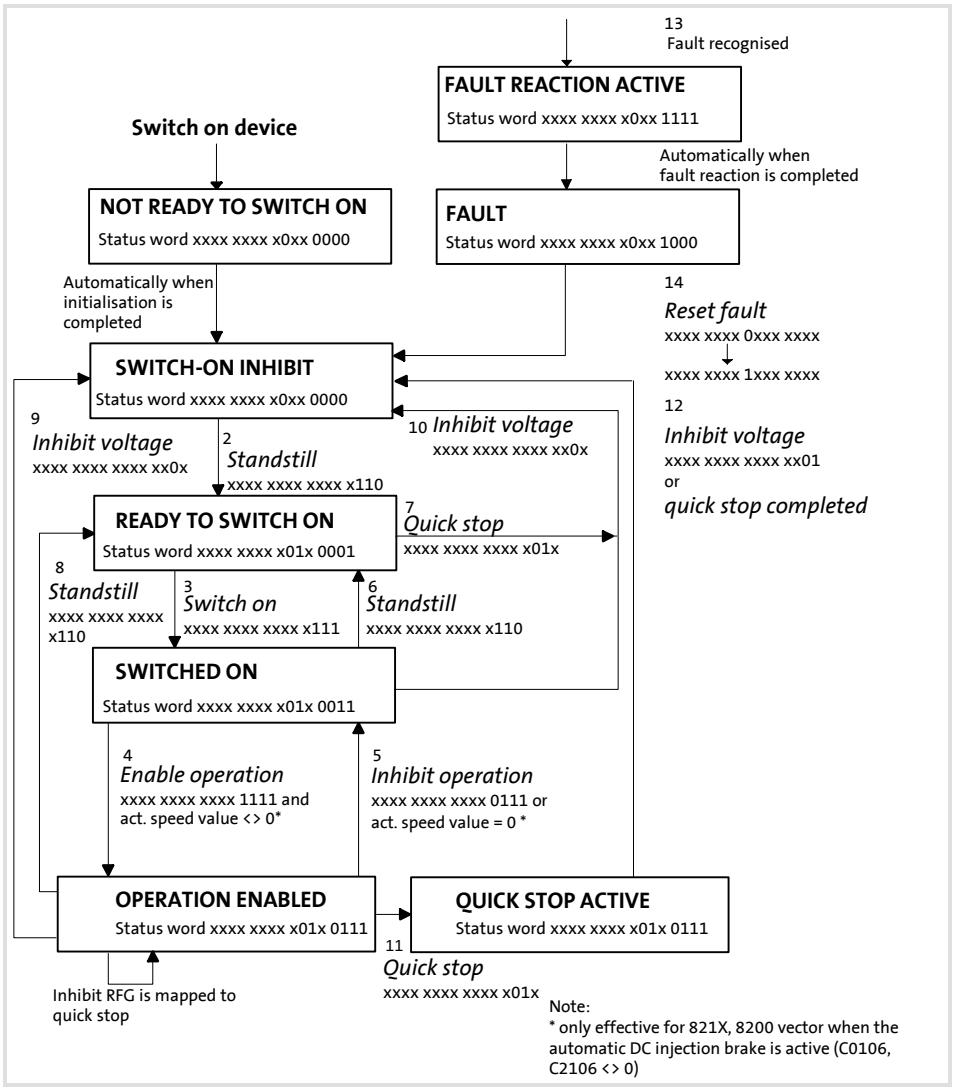


Fig. 5.6-9 Status diagram of DRIVECOM device control

Status	Meaning
NOT READY TO SWITCH ON	Controller is being initialised and not yet ready to operate. Afterwards the device status will automatically change to "READY TO SWITCH ON".
SWITCH-ON INHIBIT	The controller is inhibited (CINH) and waits for command 2 (standstill).
READY TO SWITCH ON	The controller is inhibited (CINH) and waits for command 3 (switch on).
SWITCHED ON	The controller is inhibited (CINH) and waits for command 4 (enable operation).
OPERATION ENABLED	The controller is enabled (contr. enable). In this device status the pulse inhibit can be set automatically.
FAULT REACTION ACTIVE	A fault (TRIP) was recognised and a time-based fault-dependent response has been initiated.
FAULT	The controller is in the device status "FAULT" (TRIP).
QUICK STOP ACTIVE	The "quick stop" command was sent in the device status "OPERATION ENABLED". A controlled deceleration (quick stop ramp) is executed. After deceleration the device changes automatically to the status "SWITCH-ON INHIBIT".

Unequivocal information on the current device status can only be obtained from the combination of the device status bits (bit 0 to 6) explained below.

Device status	Bits of the status word						
Bit	**6**	**5**	**4**	**3**	**2**	**1**	**0**
NOT READY TO SWITCH ON	0			0	0	0	0
SWITCH-ON INHIBIT	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
FAULT	0			1	0	0	0
FAULT REACTION ACTIVE	0			1	1	1	1
QUICK STOP ACTIVE	0	0		0	1	1	1

0: Bit status is 0
1: Bit status is 1
Empty: Any bit status, no influence

Command	Meaning
COMMAND 2, 6, 8 (standstill) Control word: bit 0 = 0	Command to change from different device states to the status ”READY TO SWITCH ON”.
COMMAND 3 (switch on)	Command to change to the device status ”SWITCHED ON”.
COMMAND 4 (enable operation)	Command to change to the device status ”OPERATION ENABLED”. The controller inhibit is deactivated.
COMMAND 5 (inhibit operation)	Command to change to the device status ”SWITCHED ON”. The controller inhibit is activated.
COMMAND 7, 9, 10, 12 (voltage inhibit) Control word: bit 1 = 0	Command to change to the device status ”SWITCH-ON INHIBIT”. The controller inhibit is activated.
COMMAND 7, 10, 11 (quick stop) Control word: bit 2 = 0	Command to change to the device status ”SWITCH-ON INHIBIT”. If the drive was enabled, a controlled deceleration along the quick stop ramp is executed.
COMMAND 13 (fault/TRIP)	The controller detected a fault. Some faults require a controlled deceleration (device-dependent). When it is completed, the device status changes to ”FAULT”.
COMMAND 14 (reset fault/TRIP) Control word: Bit 7 = 0 ⇒ 1	With the series 821X, 8200 vector, the command acknowledges a fault. The controller changes to the device status ”SWITCH-ON INHIBIT” when a fault has been eliminated.

The individual bit control commands of the control word depend on other bit positions. In the following you will find a description of the bits required to effect the selected command.

Device status commands	Bits of the control word							
Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1 Standstill						1	1	**0**
2 Switch on						1	1	**1**
3 Enable operation					**1**	1	1	1
4 Inhibit operation					**0**	1	1	1
5 Voltage inhibit							**0**	
6 Quick stop						**0**	1	
8 Error reset	0→1							

0: Bit status is 0
1: Bit status is 1
Empty: Any bit status, no influence

DRIVECOM control word

Bit	Name	Meaning	
0	Switch on	0 = command 2, 6, 8 (controller inhibit) 1 = command 3 (controller inhibit)	
1	Voltage inhibit	0 = Voltage inhibit active 1 = Voltage inhibit not active	
2	Quick stop	0 = Quick stop active 1 = Quick stop not active	
3	Enable operation	0 = Inhibit operation 1 = Enable operation	
4	RFG inhibit	Inhibit the ramp function generator. The quick stop function is activated, the device status of the drive does not change. 0 = RFG inhibit (quick stop) 1 = RFG inhibit not active	
5	RFG stop	820X:	Not assigned
		821X, 822X:	Output of the RFG (speed setpoint integrator) is ”frozen”. 0 = RFG stop 1 = RFG stop not active
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B4 negated.
6	RFG zero	820X:	Not assigned
		821X, 822X:	Ramp function generator input (speed setpoint integrator) is set to 0. This results in a controlled deceleration along the set ramp. 0 = RFG zero 1 = RFG zero not active
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B5 negated.
7	Error reset	Reset of a fault (TRIP). A bit change from 0 to 1 is required. For 82XX, the controller is initialised. During this time, the controller does not accept any commands.	
8 .. 10	Reserved		
11	Manufacturer	820X, 821x, 822x:	Not assigned
		8200 vector, 93XX:.	Free. Mapping to bit AIF-CTRL.B7
12	Manufacturer	820X, 821x, 822x:	Parameter set changeover: 0 – 1 = Parameter set 2 1 – 0 = Parameter set 1
		8200 vector, 93XX: .	Free. Mapping to bit AIF-CTRL.B12
13	Manufacturer	820X, 821x, 822x:	DC-injection brake: 0 = DCB not active 1 = DCB active
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B13
14	Manufacturer	820X, 821x, 822x:	Not assigned
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B14

Bit	Name	Meaning	
15	Manufacturer	820X:	PI - inhibit Inhibit the update of the PO data of the controller (input data for the master). The updating of status and actual information of the process data channel can be inhibited in order to transmit control information more precisely in time. 0 = Read status and actual value 1 = Do not read status and actual value
		821X,822X:	Not assigned
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B15

DRIVECOM status word

Bit	Name	Meaning	
0	Ready to switch on	Device status information 0 = Status lower than “READY TO SWITCH ON“ 1 = Status at least “READY TO SWITCH ON“	
1	Switched on	Device status information 0 = Status lower than “SWITCHED ON“ 1 = Status at least “SWITCHED ON“	
2	Operation enabled	Device status information 0 = Status lower than “OPERATION ENABLED“ 1 = Status “OPERATION ENABLED“	
3	Fault	Device status information 0 = No fault (TRIP) 1 = Fault (TRIP) occurred	
4	Voltage inhibited	Information about command “Voltage inhibit“ 0 = Command active 1 = Command not active	
5	Quick stop	Information about command “Quick stop“ 0 = Command active 1 = Command not active	
6	Switch-on inhibit	Device status information 0 = Status not “SWITCH-ON INHIBIT“ 1 = Status “SWITCH-ON INHIBIT“	
7	Warning	Collective warning 0 = No warning 1 = Warning	
8	Message	Collective message. Automatic setting and resetting of pulse inhibit in the device status ”OPERATION ENABLED”. Reasons for this can be undervoltage or overvoltage as well as overcurrent (clamp). 0 = No message 1 = Message (IMP)	
9	Remote	82xx, 821x, 822x, 8200 vector:	Bus access right, depends on Lenze parameter ”Operating mode” (C0001) 0 = C0001 <> 3 1 = C0001 = 3
		93XX:	1
10	Setpoint reached	Status of speed / frequency deviation 0 = RFGon <> RFGoff 1 = RFGon = RFGoff	
11	Limit value	Status of DRIVECOM speed limitation Always 0	
12	Reserved	820X, 821X, 822X:	Not assigned
		8200 vector, 93XX:	Mapping to bit C0150.B14
13	Reserved	820X, 821x, 822x:	Not assigned
		8200 vector:	Mapping to bit C0150.B15
		93XX:	Mapping to bit C0150.B3
14	Manufacturer	820X, 821x, 822x:	I max (current limit reached) 0 = Current limit not reached 1 = Current limit exceeded
		8200 vector, 93XX:	Mapping to bit C0150.B2
15	Manufacturer	820X, 821x, 822x:	Q min (f d < dQmin) 0 = Q min not active 1 = Q min active
		8200 vector, 93XX:	Mapping to bit C0150.B5

82XX, 8200 vector (C0001 = 3)

For standard device control you enter the control information via the corresponding control inputs (terminal):

Information on the current device status (see Fig. 5.6-10, marked by rectangles) is stored in the DRIVECOM parameter ”status word“. Commands in the DRIVECOM parameter ”control word“ are switched off and cannot change the device status. The commands to change the device status are specified by the respective control input. These commands are represented by arrows in the following diagram.

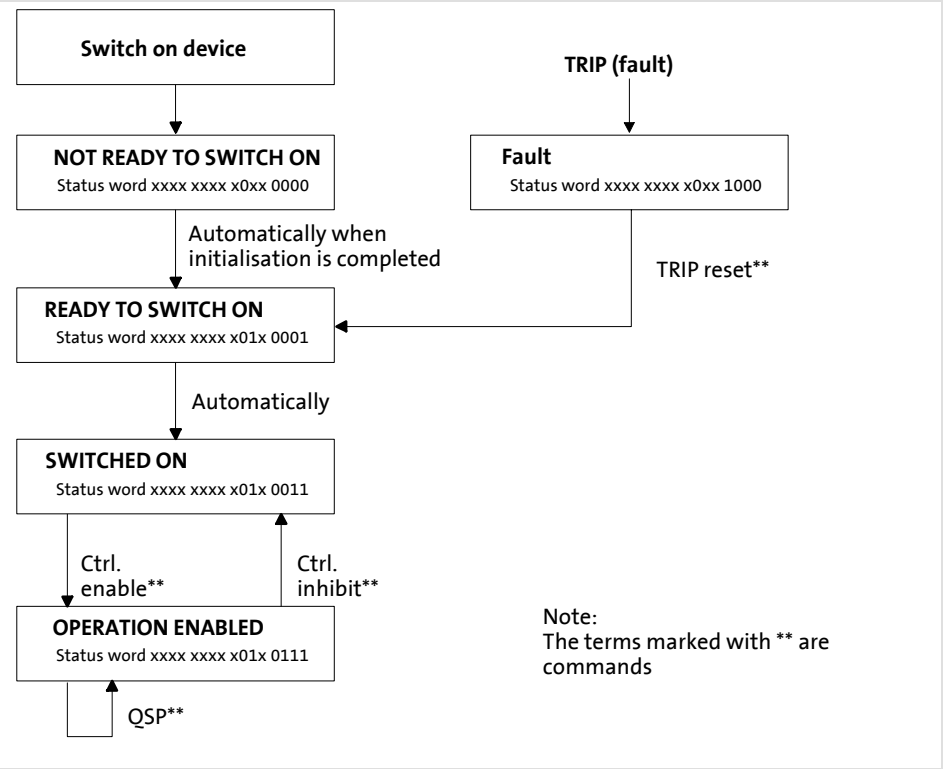


Fig. 5.6-10 Status diagram for standard device control

Status	Meaning
NOT READY TO SWITCH ON	Controller is being initialised and not yet ready to operate. Afterwards the device status will automatically change to ”READY TO SWITCH ON”.
READY TO SWITCH ON	Controller is inhibited (CINH) and waits until the power stage has been charged. Afterwards the device status automatically changes to ”SWITCHED ON”.
SWITCHED ON	The controller is inhibited (CINH) and waits for controller enable.
OPERATION ENABLED	The controller is enabled (contr. enable). In this device status the pulse inhibit can be set automatically.
FAULT	The controller is in the device status ”FAULT“ (TRIP).

5.6.4 PROFIDrive control

5.6.4.1 PROFIDrive status machine

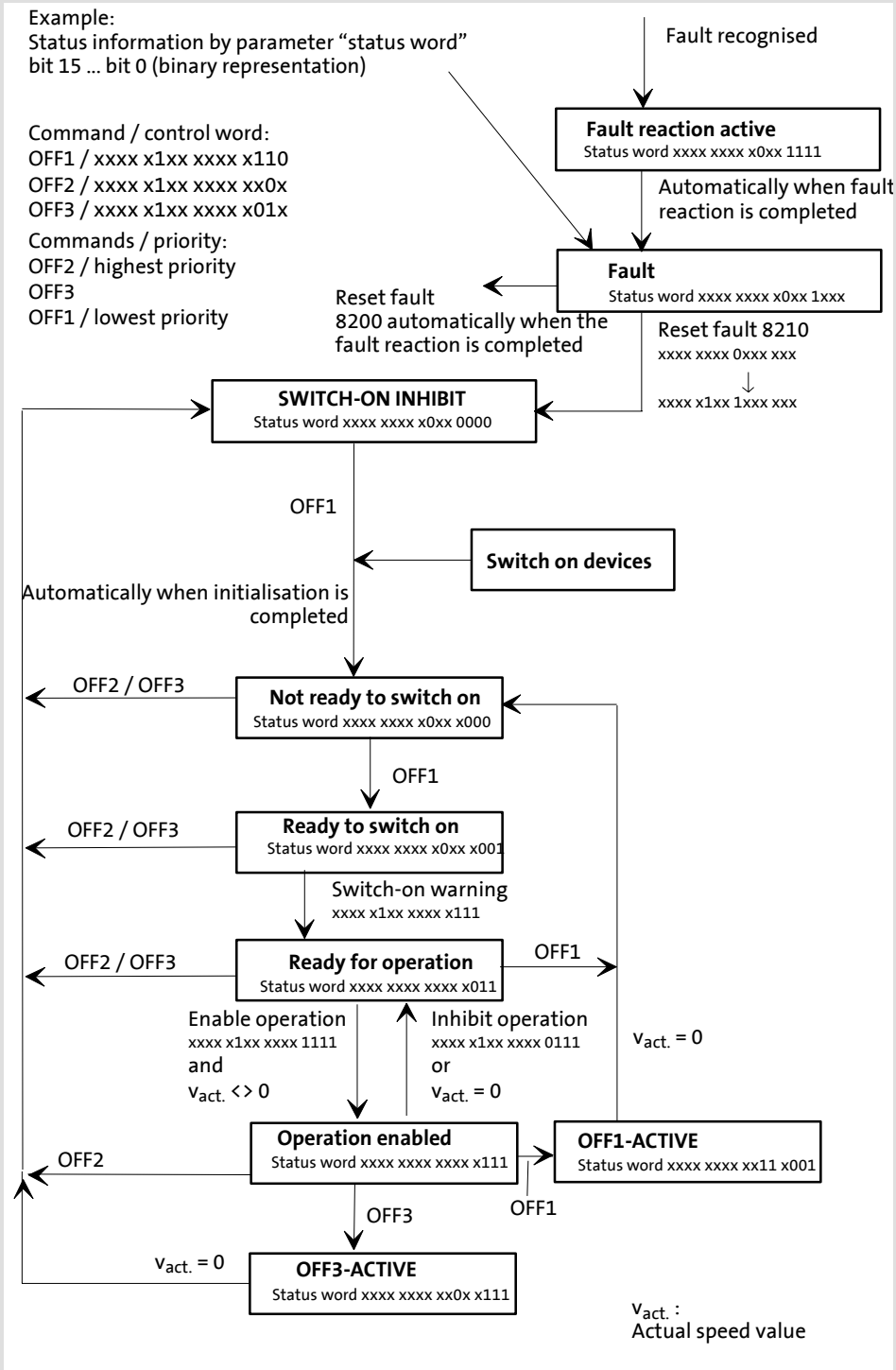


Fig. 5.6-11 Status diagram of PROFIDrive device control

PROFIDRIVE control word

Bit	Name	Meaning	
0	OFF1	0 = OFF1 active; RFG zero, controller inhibit at n=0 1 = OFF1 inactive	
1	OFF2	0 = OFF2 active 1 = OFF2 inactive	
2	OFF3	0 = OFF3 active 1 =OFF3 inactive	
3	Enable operation	0 = Inhibit operation 1 = Enable operation	
4	RFG inhibit	Inhibit the ramp function generator. The quick stop function is activated, the device status of the drive does not change. 0 = RFG inhibit (quick stop) 1 = RFG inhibit not active	
5	RFG stop	820X:	Not assigned
		821X, 822X:	Output of the RFG (speed setpoint integrator) is ”frozen”. 0 = RFG stop 1 = RFG stop not active
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B4 negated.
6	Inhibit setpoint	820X:	Not assigned
		821X, 822X:	Ramp function generator input (speed setpoint integrator) is set to 0. This results in a controlled deceleration along the set ramp. 0 = RFG zero 1 = RFG zero not active
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B5 negated.
7	Error reset	Reset of a fault (TRIP). A bit change from 0 to 1 is required. For 82XX, the controller is initialised. During this time, the controller does not accept any commands.	
8	Jogging 1	Not used	
9	Jogging 2	Not used	
10	Master function from automation device	0 = No master function by automation device 1 = Master function by automation device	
11	Manufacturer	820X, 821x, 822x:	Not assigned
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B7.
12	Manufacturer	820X, 821x, 822x:	Parameter set changeover: 0 – 1 = Parameter set 2 1 – 0 = Parameter set 1
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B12.
13	Manufacturer	820X, 821x, 822x:	DC-injection brake: 0 = DCB not active 1 = DCB active
		8200 vector, 93XX:	Free. Mapping to Bit AIF-CTRL.B13.
14	Manufacturer	820X, 821x, 822x:	Not assigned
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B14.
15	Manufacturer	820X:	PI - inhibit Inhibit the update of the PO data of the controller (input data for the master). Refreshing status and current information of the process channel can be inhibited in order to send control information more precisely in time (see chapter 3.6.2). 0 = Read status and actual value 1 = Do not read status and actual value
		821X,822X:	Not assigned
		8200 vector, 93XX:	Free. Mapping to bit AIF-CTRL.B15

PROFIDRIVE status word

Bit	Name	Meaning	
0	Ready to switch on	Device status information 0 = Status lower than “READY TO SWITCH ON“ 1 = Status at least “READY TO SWITCH ON“	
1	Ready for operation	Device status information 0 = Status lower than “READY FOR OPERATION“ 1 = Status at least “READY FOR OPERATION“	
2	Operation enabled	Device status information 0 = Status lower than “OPERATION ENABLED“ 1 = Status “OPERATION ENABLED“	
3	Fault	Device status information 0 = No fault (TRIP) 1 = Fault (TRIP) occurred	
4	OFF2	Information on command “OFF2“ 0 = Command active 1 = Command not active	
5	OFF3	Information on command “OFF3“ 0 = Command active 1 = Command not active	
6	Switch-on inhibit	Device status information 0 = Status not “SWITCH-ON INHIBIT“ 1 = Status “SWITCH-ON INHIBIT“	
7	Warning	Collective warning 0 = No warning 1 = Warning	
8	Reserved	Always 1	
9	Master function requested	82xx, 821x, 822x, 8200 vector:	Bus access right, depends on Lenze parameter ”Operating mode” (C0001) 0 = C0001 <> 3 1 = C0001 = 3
		93XX:	1
10	Setpoint reached	Status of speed / frequency deviation 0 = RFGon <> RFGoff 1 = RFGon = RFGoff	
11	Reserved	0	
12	Manufacturer	820X, 821X, 822X:	Not assigned
		8200 vector, 93XX:	Mapping to bit C0150.B14
13	Manufacturer	820X, 821x, 822x:	Not assigned
		8200 vector:	Mapping to bit C0150.B15
		93XX:	Mapping to bit C0150.B3
14	Manufacturer	820X, 821x, 822x:	I_{max} (current limit reached) 0 = Current limit not reached 1 = Current limit exceeded
		8200 vector, 93XX:	Mapping to bit C0150.B2
15	Manufacturer	820X, 821x, 822x:	Q min (f d < dQmin) 0 = Q min not active 1 = Q min active
		8200 vector, 93XX:	Mapping to bit C0150.B5

5.6.5 Parameter data channel

The DRIVECOM parameter data channel and the PROFIDRIVE parameter data channel

- ► enable parameter setting and diagnostics of the controller.
- ► allow access to all Lenze parameters (codes).
- ► additionally occupy 4 words of the input and output data words in the master.
- ► have an identical structure for both directions of transmission.

Parameter data (valid for both parameter data channels)

Parameter data are addressed through codes listed in the code table of the corresponding Operating Instructions for your controller.

Lenze parameter sets

<table>
<tr><th>82XX</th><th>8200 vector</th><th>93XX</th></tr>
<tr><td colspan="2">The 82XX and 8200 vector controllers have 2 or 4 parameter sets, the parameters of which can be addressed directly via the PROFIBUS-DP.
They are addressed by means of a code offset:</td><td rowspan="7">93XX controllers have up to 4 parameter sets (depending on the technology variant) for non-volatile storage. Another parameter set is in the user memory of the controller. This is the current parameter set. Only the current parameter set can be addressed directly via PROFIBUS-DP. For the codes, see 93XX Operating Instructions or Manual. Changes in the current parameter set will be lost after switching off the controller. Code C0003 is for saving the current parameter set. After switching on the controller, parameter set 1 is automatically loaded into the current parameter set.</td></tr>
<tr><td colspan="2">● Offset 0 addresses parameter set 1 with the Lenze codes C0000 to C1999
● Offset 2000 addresses parameter set 2 with the Lenze codes C2000 to C3999</td></tr>
<tr><td>No additional parameter sets available.</td><td>● Offset 4000 addresses parameter set 3 with the Lenze codes C4000 to C5999
● Offset 6000 addresses parameter set 4 with the Lenze codes C6000 to C7999</td></tr>
<tr><td colspan="2">If a parameter is available only once (see Operating Instructions for 82XX or 8200 vector), use the code offset 0.</td></tr>
<tr><td colspan="2">Example for C0011 (maximum field frequency):
C0011 in parameter set 1: Lenze code number = 11
C0011 in parameter set 2: Lenze code number = 2011</td></tr>
<tr><td>-</td><td>C0011 in parameter set 3: Lenze code number = 4011
C0011 in parameter set 4: Lenze code number = 6011</td></tr>
<tr><td colspan="2">Parameter changes (see code C0003 of the basic device):
82XX: Automatic storage in the controller
8200 vector: Automatic storage (C0003)</td></tr>
</table>

5.6.5.1 DRIVECOM parameter data channel

Addressing of Lenze parameters

In the case of the DRIVECOM parameter data channel, the parameters of a device are not addressed directly via Lenze code numbers, but via indices (byte 3 / byte 4) and subindices (byte 2).

The Lenze code numbers are converted into indices via an offset (24575_{dez} or $5FFF_{hex}$):

Addressing of Lenze codes	Example of C0001 (operating mode)
– PROFIBUS-DP index = 24575 - Lenze code number	– PROFIBUS-DP index = 24575 - 1 = 24574
– PROFIBUS-DP $index_{hex}$ = $5FFF_{hex}$ - Lenze code $number_{hex}$	– PROFIBUS-DP $index_{hex}$ = $5FFF_{hex}$ - 1_{hex} = $5FFE_{hex}$

Lenze parameters are mainly represented in the fixed point format, data type integer32 with four decimal digits. For this reason, the value of the parameter or the value of the code must be multiplied by 10000 in order to obtain integer values.

This parameter value is entered into the user data (byte 5 - byte 8) of the telegram.

► Example

1. Set C0039 (JOG) = 150.4 Hz
2. Multiply parameter value by 10000.
3. 150.4 x 10000 = 1504000_{dez} ($0016F300_{hex}$)
4. Enter parameter value into user data.

Telegram structure (overview)

The telegram of the DRIVECOM parameter data channel consists of a total of 8 bytes. The individual bytes are described in detail on the following pages.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index High byte	Index Low byte	Data 4 / Error 4	Data 3 / Error 3	Data 2 / Error 2	Data 1 / Error 1

Byte 1: Service
Job and response control for the parameter data channel

7	6	5	4	3	2	1	0

Representation of bits 7 ... 0 in byte 1

2	1	0

Job
Job for the controller. The bits are set only by the master.
- 000 = No job
- 001 = Read job (read data from controller)
- 010 = Write job (write data to controller)

3

(Reserved)

5	4

Data length
Data length in bytes 5...8 (data 1...4 / error 1...4)
- 00 = 1 byte
- 01 = 2 bytes
- 10 = 3 bytes
- 11 = 4 bytes

6

Handshake
Indicates a new job. The master changes this bit for every new job. The controller copies the bit to its response message.

7

Status
Status information from the controller to the master when sending job acknowledgement. This bit informs the master whether the job was carried out without faults.
- 0 = Job completed without fault.
- 1 = Job not completed. A fault occurred. The data in the Data/Error field are interpreted as an error message.

Fig. 5.6-12 Byte 1: Job and response control

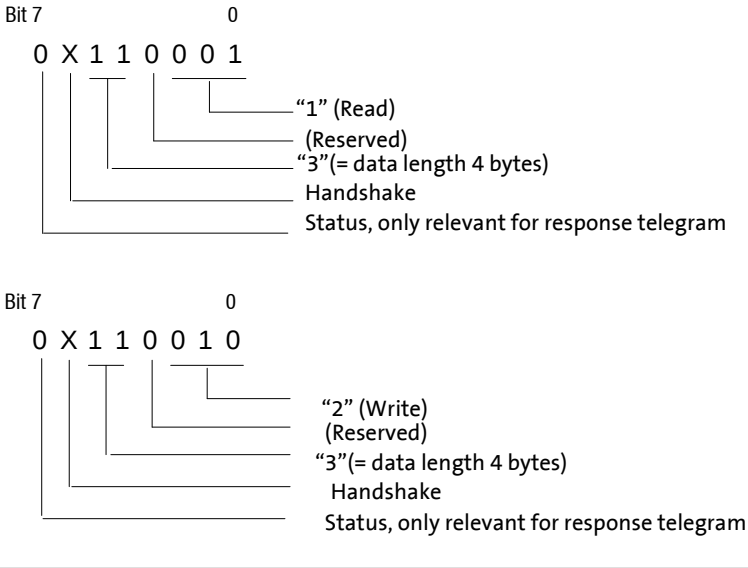


Fig. 5.6-13 Example of byte 1

Byte 2: Subindex

- The 82XX series do not have codes with subindex, the value is always 0.
- Many codes of the 93XX and 8200 vector series require additional addressing of the code (index) via a subindex.
  Example: Code C0039 / subcode 3 addresses “NSET JOG” (50% = default setting)

Byte 3 / 4: Index

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	**Index High byte**	**Index Low byte**	Data 4 / Error 4	Data 3 / Error 3	Data 2 / Error 2	Data 1 / Error 1

The parameters or the Lenze codes are selected with these two bytes according to the formula:

Index = 24575 - Lenze code number

Example:
The parameter C0012 (acceleration time) is to be addressed:

24575 - 12 = 24563 = $5FF3_{hex}$

The entries for this example would be:

- Byte 3: Index high byte = $5F_{hex}$
- Byte 4: Index low byte = $F3_{hex}$

Byte 5 - 8: Parameter value (data) or fault information (error)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index High byte	Index Low byte	**Data 4 / Error 4**	**Data 3 / Error 3**	**Data 2 / Error 2**	**Data 1 / Error 1**

The status of the (”status”) bit 7 in byte 1 (”job”) determines the meaning of this data field:

Meaning of bytes 5 - 8 if	
bit 7 = 0	**bit 7 = 1**
Parameter value (data 1 -4)	Fault information (error 1 - 4) for an invalid access.

Parameter value (data)

Depending on the data format, the length of the parameter value is between 1 to 4 bytes. Data are saved in the Motorola format, i.e. first the high byte or high word, then the low byte or low word.

Byte 5	Byte 6	Byte 7	Byte 8
High byte	Low byte	High byte	Low byte
High word		Low word	
Double word			

Assignment of bytes 5 .. 8 with parameter values of different lengths

Byte 5	Byte 6	Byte 7	Byte 8
Parameter value (length 1)	00	00	00
Parameter value (length 2)		00	00
Parameter value (length 4)			

Note: Strings or data blocks cannot be transmitted.

Error messages

The following error messages may appear:

Data 1	Data 2	Data 4	Meaning
6	3	00_{hex}	No right to access
6	5	10_{hex}	Impermissible job parameter
6	5	11_{hex}	Invalid subindex
6	5	12_{hex}	Data length too large
6	5	13_{hex}	Data length too small
6	6	00_{hex}	Object is no parameter
6	7	00_{hex}	Object does not exist
6	8	00_{hex}	Data types do not correspond
8	0	00_{hex}	Job cannot be executed
8	0	20_{hex}	Job cannot be executed at the moment
8	0	21_{hex}	Not executable because of local control
8	0	22_{hex}	Not executable because of device status
8	0	30_{hex}	Out of value range/parameter can only be changed with inhibited controller
8	0	31_{hex}	Parameter value too large
8	0	32_{hex}	Parameter value too small
8	0	33_{hex}	Sub-parameter out of value range
8	0	34_{hex}	Sub-parameter value too large
8	0	35_{hex}	Sub-parameter value too small
8	0	36_{hex}	Maximum value smaller than minimum value
8	0	41_{hex}	Communication object cannot be mapped on process data
8	0	42_{hex}	Process data length exceeded
8	0	43_{hex}	General collision with other values

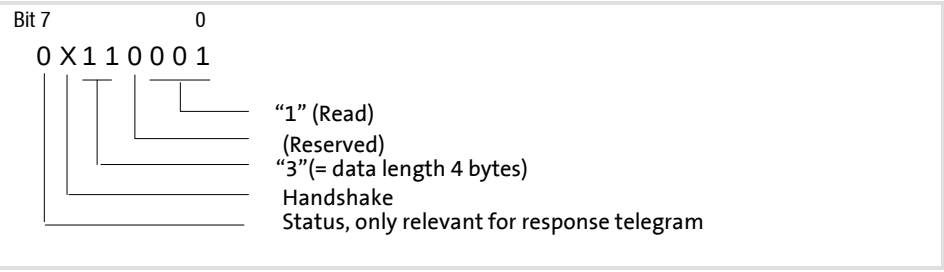
5.6.5.2 Programming of read jobs

Step	Read job
1.	Define user data range of the controller, i.e. define the location of the DP user data in the host (observe manufacturer-specific information).
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Job = Read job. The bit ”Job / handshake“ must be changed (DP output data).
4.	Check whether the bit ”Job / handshake“ is the same for the DP input data and the DP output data. If the bit ”Job / handshake“ is the same, the response has been received. You should implement a time monitoring.
5.	Check whether the bit ”Job / status“ is set. ● If the bit ”Job / status“ is not set: Field ”Data / error“ contains the desired parameter value. ● If the bit ”Job / status“ is set: Read job was not executed correctly. Field ”Data / error“ contains the error information.

Example: Read parameter

The controller heatsink temperature (assumption: ϑ = 43° C) is to be read (C0061).

► Byte 1: Job



► Byte 2: Subindex

Subindex = 0, as there is no subindex under code C0061.

► Byte 3/4: Index (calculation)

Index (of read request) = 24575 - code number
Index = 24575 - 61 = 24514 = 5F $C2_{hex}$ ($5F_{hex}$ = high byte, $C2_{hex}$ = low byte)

► Byte 5 ...8: Data (contained in the response telegram)

Data 1 to data 4 = 43° C x 10000 = 430000 = 00 06 8F $B0_{hex}$

Result:

► Request telegram from master to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
01_{hex} 00000001_{bin}	**00_{hex}** 00000000_{bin}	**$5F_{hex}$** 01011111_{bin}	**$C2_{hex}$** 11000010_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}
Wait for change of handshake bit (bit 6 here: 0 → 1) in the response							

► Response telegram from drive to master (for faultless execution)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
30_{hex} $0011\ 0000_{bin}$	00_{hex} $0000\ 0000_{bin}$	$5F_{hex}$ $0101\ 1111_{bin}$	$C2_{hex}$ $1100\ 0010_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**06_{hex}** $0000\ 0110_{bin}$	**$8F_{hex}$** $1000\ 1111_{bin}$	**$B0_{hex}$** $1011\ 0000_{bin}$

Tab. 5.6-2 Telegram exchange in DRIVECOM parameter data channel

5.6.5.3 Programming of write jobs

Step	Write job
1.	Define user data range of the controller, i.e. define the location of the DP user data in the host (observe manufacturer-specific information).
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Enter parameter value in field ”Data/Error“.
4.	Job / service = Write job and the bit ”Job / handshake“ must be changed (DP output data).
5.	Check whether the bit ”Job / handshake“ is the same for the DP input data and the DP output data. If the bit ”Job / handshake“ is the same, the response has been received. You should implement a time monitoring.
6.	Check whether the bit ”Job / status“ is set: ● If the bit ”Job / status“ is not set: The job was executed faultlessly ● If the bit ”Job / status“ is set: The job was not executed faultlessly if the bit ”Job / status“ is set. Field ”Data / error“ contains the error information.

Example: Write parameter

The controller acceleration time (C0012) is to be set to T_{ir} = 20 s.

► Byte 1: Job

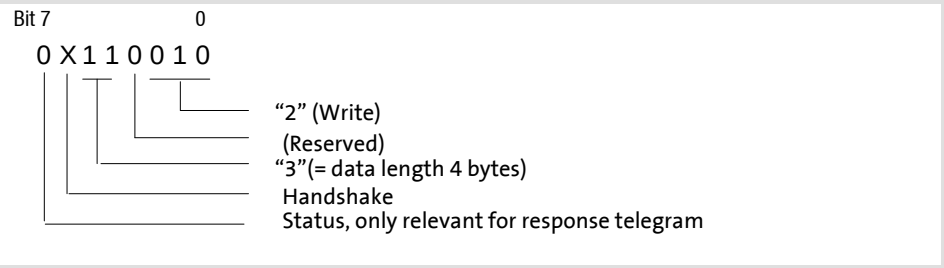


Fig. 5.6-14 Example

► Byte 2: Subindex

Subindex = 0, as there is no subindex under code C0012.

► Byte 3/4: Index (calculation)

Index = 24575 - code number

Index = 24575 - 12 = 24563 = 5F $F3_{hex}$ ($5F_{hex}$ = high byte, $F3_{hex}$ = low byte)

► Byte 5 - 8: Data

Calculation of the acceleration time: 20 s x 10,000 = 200,000 = 00 03 0D 40_{hex}

Result:

► Request telegram from master to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
72_{hex} $0111\ 0010_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**$5F_{hex}$** $0101\ 1111_{bin}$	**$F3_{hex}$** $1111\ 0011_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**03_{hex}** $0000\ 0011_{bin}$	**$0D_{hex}$** $0000\ 1101_{bin}$	**40_{hex}** $0100\ 0000_{bin}$
Wait for change of handshake bit (bit 6 here: 0 → 1)							

► Response telegram from drive to master (for faultless execution)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
70_{hex} $0100\ 0110_{bin}$	00_{hex} $0000\ 0000_{bin}$	$5F_{hex}$ $0101\ 1111_{bin}$	$F3_{hex}$ $1111\ 0011_{bin}$	00_{hex} $0000\ 0000_{bin}$	00_{hex} $0000\ 0000_{bin}$	00_{hex} 00000000_{bin}	00_{hex} $0000\ 0000_{bin}$
Wait for change of handshake bit (bit 6 here: 1 → 0)							

Tab. 5.6-3 Telegram exchange in DRIVECOM parameter data channel

5.6.5.4 PROFIDrive parameter data channel (PKW, profile for variable speed drives, version 2)

Access to the Lenze codes of the controller

Direct access to the codes of the first parameter set (C0000 - C1999) is possible. Conversion is not required.

Enter parameter value

The required parameter value is mapped in the data range.

Lenze parameters are mainly represented in fixed point format with four decimal positions (data type FIX32, transmission as double word). These parameters are multiplied by 10000 to get integer values.

Example:

Set C0039 (JOG) = 150.4 Hz.

► 150.4 x 10000 = 1504000_{dez} ($0016F300_{hex}$)

Telegram structure (overview)

The PROFIDrive parameter data channel is (same as the DRIVECOM parameter data channel) in the first 8 bytes of cyclic data.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	Parameter value (PWE)			

Byte 1 and 2: Parameter identification

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	Parameter value (PWE)			

Parameter identification structure

Byte 1							Byte 2							
4	3	2	1	11	10	9	8	7	6	5	4	3	2	1
Job identification / Response identification				Code										

► Job / response identification (high nibble of byte 1)

PKE	Job identification
0	No job
1	Read simple parameter
2	Write simple parameter (word)
3	Write simple parameter (double word)
6	Read array parameter
7	Write array parameter (word)
8	Write array parameter (double word)

PKE	Response identification	
	Positive	**Negative**
0	No response	
1	Transmit simple parameter value (word)	
2	Transmit simple parameter value (double word)	
4	Transmit array parameter value (word)	
5	Transmit array parameter value (double word)	
4	Transmit array parameter value (word)	
5	Transmit array parameter value (double word)	
7		Job cannot be executed, see error number

► Code (low nibble of byte 1 + byte 2)

Value range: 0 - 2000 (C0001 - C1999)

Byte 3: Lenze subcode

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		**Subcode (IND)**	Reserved	Parameter value (PWE)			

Value range: 0 - 255

Byte 4: 0, reserved

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	**Reserved**	Parameter value (PWE)			

Byte 5 - 8:
Parameter value (data)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	**Parameter value (PWE)**			

Depending on the data format, the length of the parameter value is between 1 to 4 bytes. Data are saved in the Motorola format, i.e. first the high byte or high word, then the low byte or low word.

Byte 5	Byte 6	Byte 7	Byte 8
High byte 1	Low byte 1	High byte 2	Low byte 2
High word		Low word	
Double word			

Assignment of bytes 5 .. 8 with parameter values of different lengths

Byte 5	Byte 6	Byte 7	Byte 8
Parameter value (length 1)	00	00	00
Parameter value (length 2)		00	00
Parameter value (length 4)			

A slave provides the response until the master creates a new job.

For responses containing parameter values, the slave always replies with the current value (cyclic processing).

Byte 7 and 8:
Error number

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	00	00	**Error number**	

Error number	Meaning
0	Wrong code number
1	Parameter value can only be read
2	Value range exceeded
3	Wrong subindex
4	No array
5	Wrong data type (wrong data length)
17	Wrong operating status

5.6.5.5 Programming of read jobs

Step	Read job
1.	Define the user data range of the controller, i.e. define the location of the DP user data in the host system.
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Job/Service = AK
4.	Job/Service = Read job
5.	Check whether index and subindex correspond with the job and whether the job identification is ≠ 0: ● If the criteria are fulfilled, the desired controller data from the field “Parameter value” are transmitted to the master. ● If these criteria are not met, the response identification is negative, i.e. high nibble of byte 1 = 7_{hex} In this case the error information can be read out from the entry in the low word.

Example: Read parameter

The controller heatsink temperature (assumption: ϑ = 43° C) is to be read (C0061).

► Job identification (high nibble in byte 1)
– Read simple parameter: “1”

► Code: (low nibble in byte 1 and byte 2)
– C0061: 61 = $3D_{hex}$

► Lenze subcode (byte 3):
– Subindex = 0, as there is no subindex under code C0061.

► Byte 5 ...8: Data (not contained in the request telegram)
– Data 1 to data 4 = 43° C x 10000 = 430000 = 00 06 8F $B0_{hex}$

Result:

► Request telegram from master to drive

Byte 1*	Byte 1* +2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
1_{hex} 0001_{bin}	**$03D_{hex}$** 000000111101_{bin}	**00_{hex}** 00000000_{bin}	**00_{hex}** 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}
Wait for response identification with code = 03D and subcode 0							

► Response telegram from drive to master (for faultless execution)

Byte 1*	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
2_{hex} 0010_{bin}	$03D_{hex}$ 000000111101_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	**00_{hex}** 0000 0000_{bin}	**06_{hex}** 0000 0110_{bin}	**$8F_{hex}$** 10001111_{bin}	**$B0_{hex}$** 1011 0000_{bin}

Tab. 5.6-4 Telegram exchange in PROFIDrive parameter data channel

5.6.5.6 Programming of write jobs

Step	Write job
1.	Define the user data range of the controller, i.e. define the location of the DP user data in the host system.
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Enter parameter value in field ”Data/Error“.
4.	Job/Service = Write job
5.	Check whether index and subindex correspond with the job and whether the job identification is ≠ 0: ● If the criteria are fulfilled, the desired master data from the field “Parameter value” are accepted by the controller. ● If these criteria are not met, the response identification is negative, i.e. high nibble of byte 1 = 7_{hex} In this case the error information can be read out from the entry in the low word.

Example: Write parameter

The controller acceleration time (C0012) is to be set to T_{ir} = 20 s.

► Job identification (high nibble in byte 1)
– Transmit simple parameter value: “1”

► Code: (low nibble in byte 1 and byte 2)
– C0012: 12 = $0C_{hex}$

► Lenze subcode (byte 3):
– Subindex = 0, as there is no subindex under code C0012.

► Byte 5 ...8: Data
– Data 1 to data 4 = 20 s x 10000 = 200000 = 00 03 0D 40_{hex}

Result:

► Request telegram from master to drive

Byte 1*	Byte 1* +2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
3_{hex} 0011_{bin}	**$00C_{hex}$** 000000001100_{bin}	**00_{hex}** 00000000_{bin}	**00_{hex}** 00000000_{bin}	00_{hex} 00000000_{bin}	03_{hex} 00000011_{bin}	$0D_{hex}$ 00001101_{bin}	40_{hex} 01000000_{bin}
Wait for response identification with code = 00C and subcode 0							

► Response telegram from drive to master (for faultless execution)

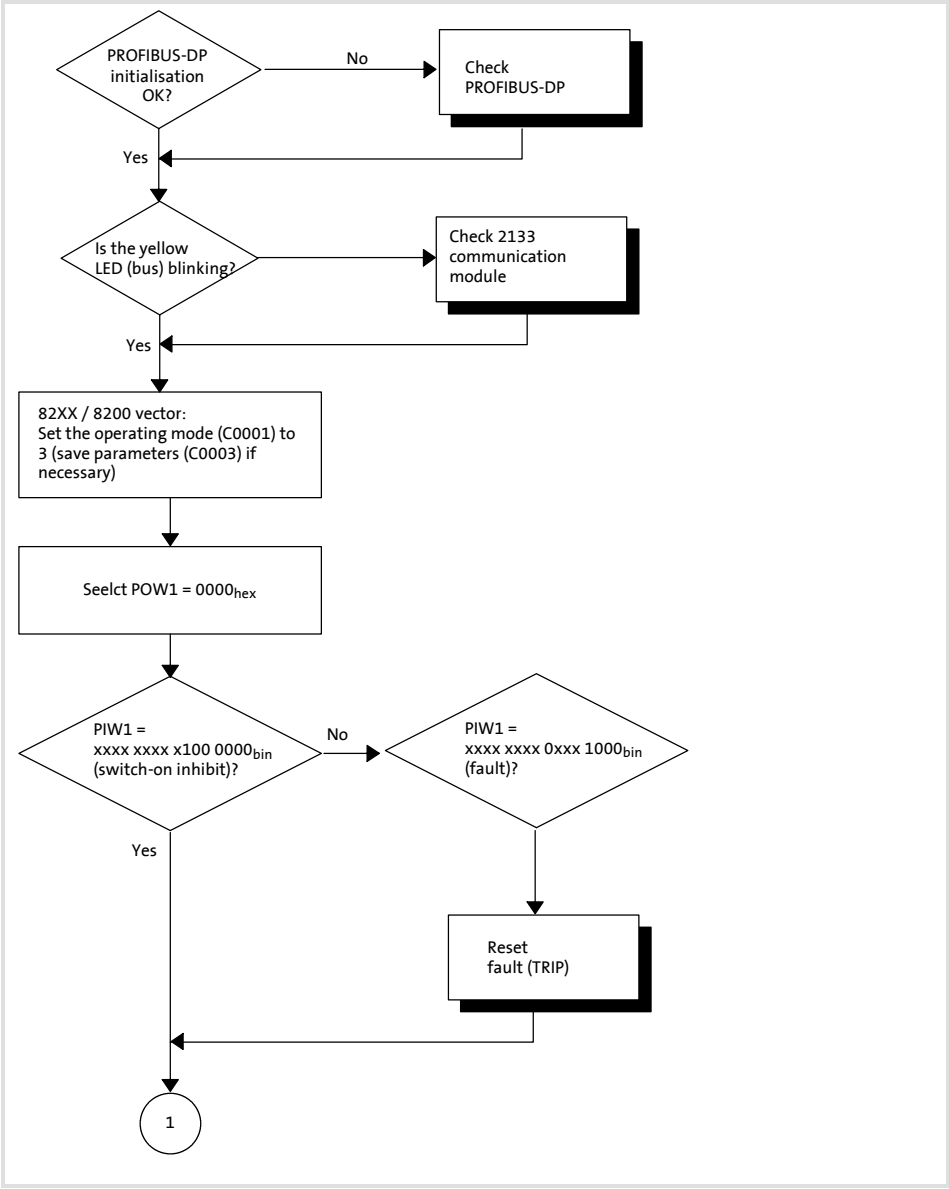
Byte 1*	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
2_{hex} 0010_{bin}	$00C_{hex}$ 000000001100_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	**00_{hex}** $0000\ 0000_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**00_{hex}** 00000000_{bin}	**00_{hex}** $0000\ 0000_{bin}$

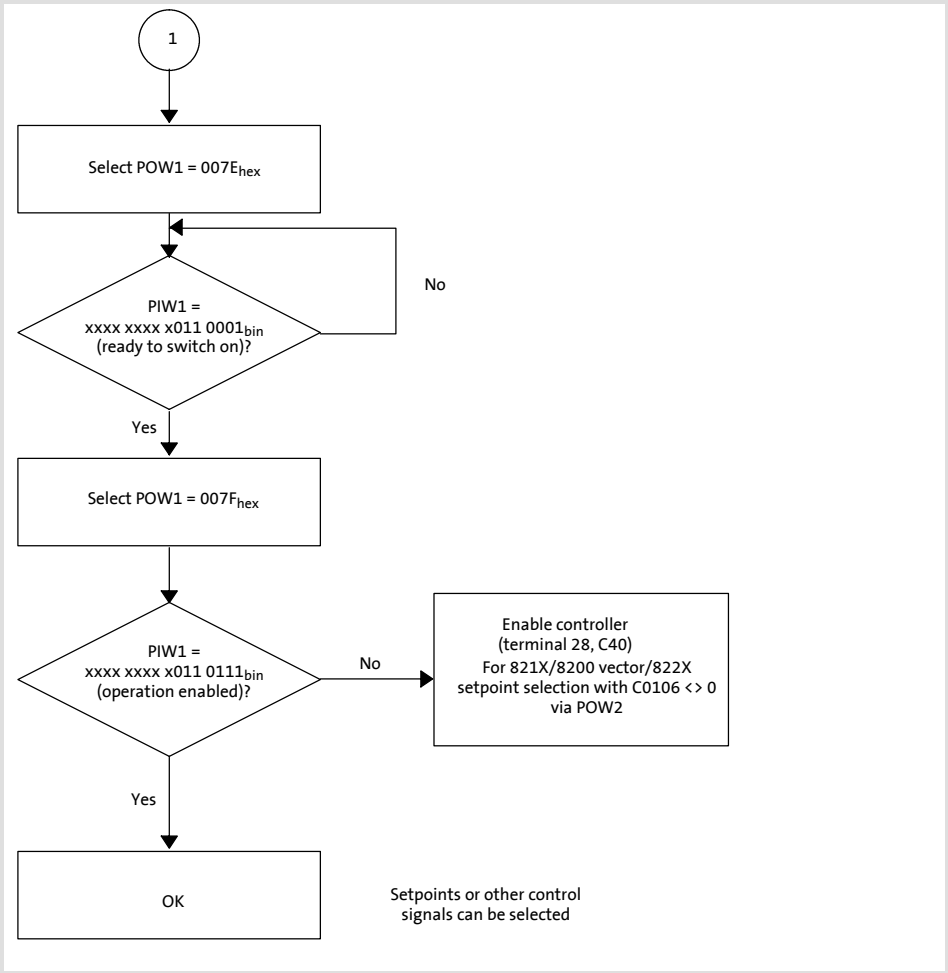
Tab. 5.6-5 Telegram exchange in PROFIDrive parameter data channel

5.7 Troubleshooting

5.7.1 Controller is inhibited

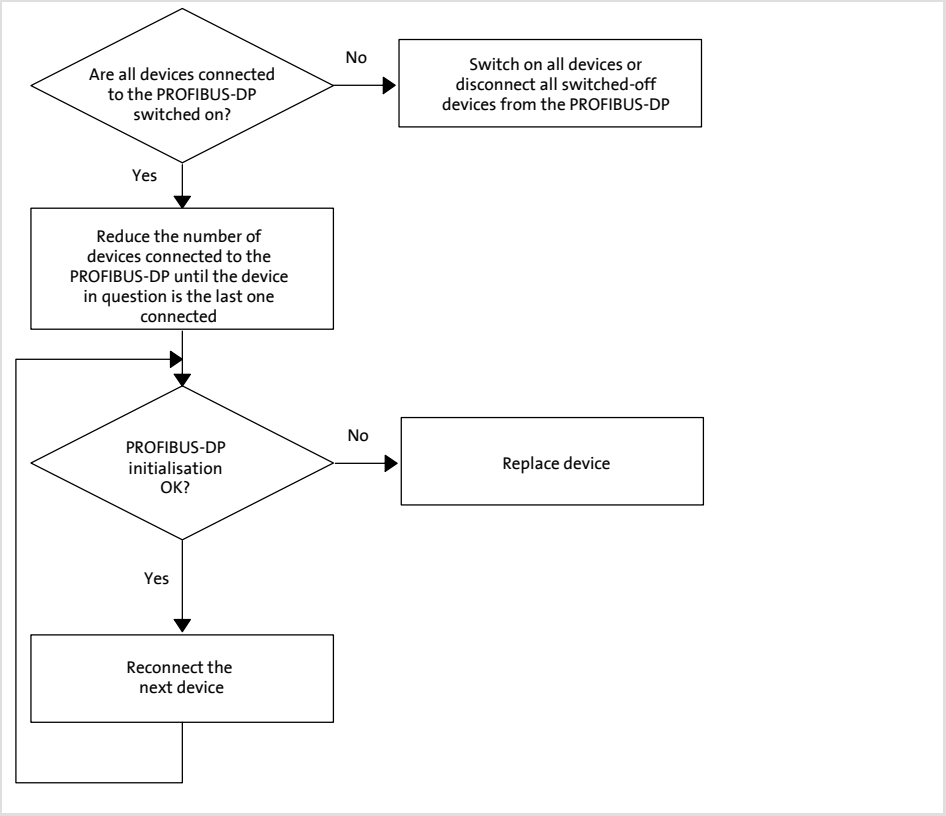
The controller cannot be enabled through PROFIBUS-DP process data, i.e. the status ”OPERATION ENABLED“ is not reached.




1
Select POW1 = 007E$_{hex}$
PIW1 =
xxxx xxxx x011 0001$_{bin}$
(ready to switch on)?
No
Yes
Select POW1 = 007F$_{hex}$
PIW1 =
xxxx xxxx x011 0111$_{bin}$
(operation enabled)?
No
Enable controller
(terminal 28, C40)
For 821X/8200 vector/822X
setpoint selection with C0106 <> 0
via POW2
Yes
OK
Setpoints or other control
signals can be selected

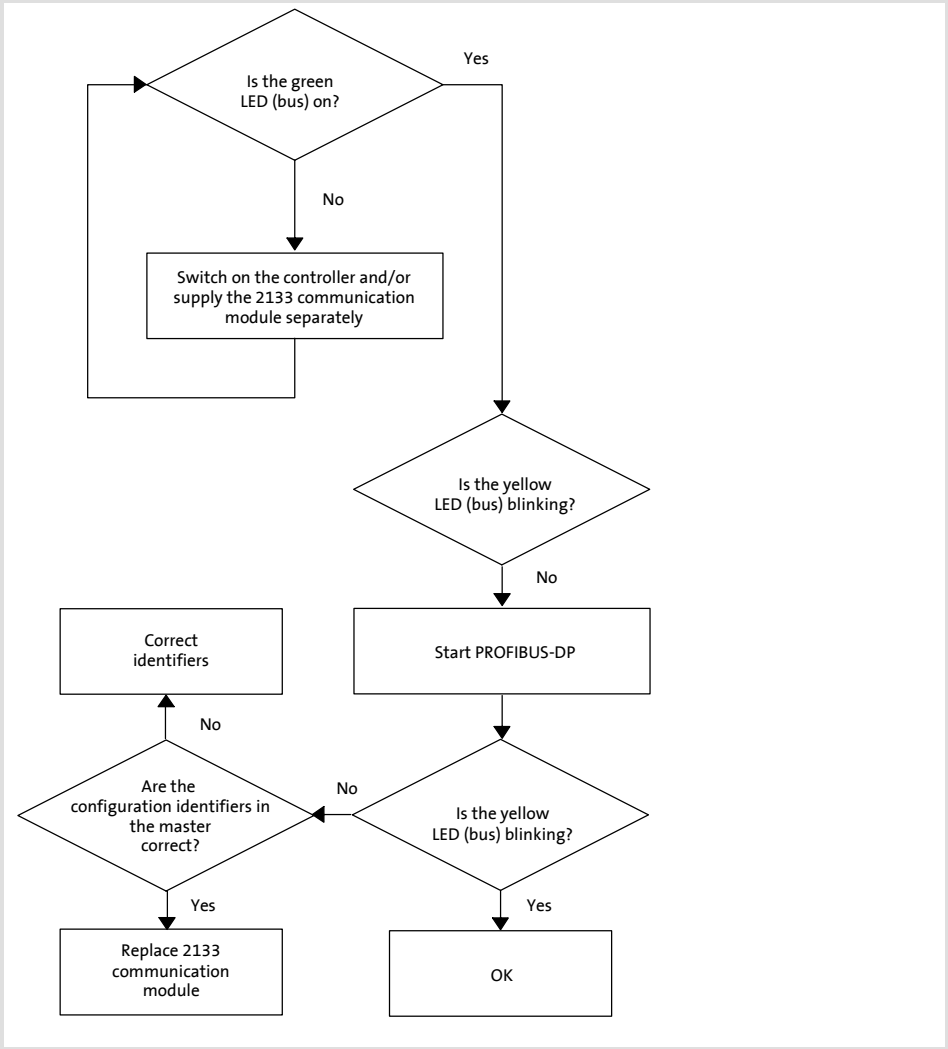
5.7.2 Check of PROFIBUS-DP

Short check for PROFIBUS-DP systems in case of faulty initialisation. The diagnostics information of the PROFIBUS-DP communication modules in the master computer must also be taken into account.
It might be useful for troubleshooting to reduce the bus to such an extent that only one device remains connected to the PROFIBUS-DP.



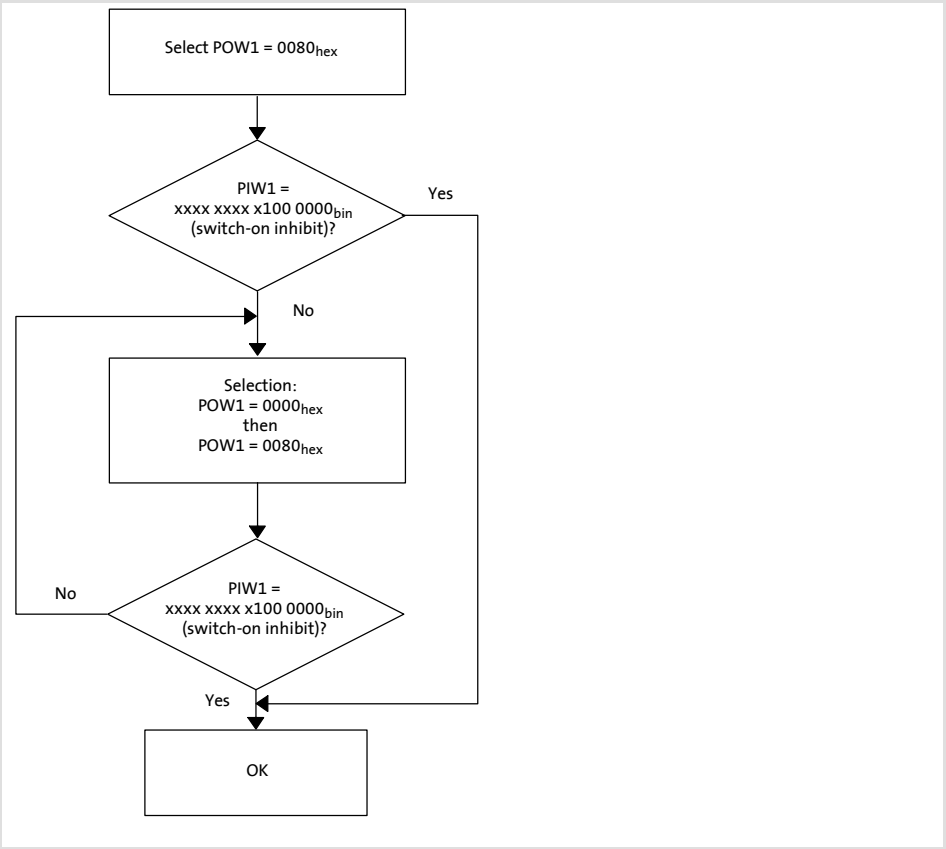
5.7.3 Activation of communication module

Activation of the communication module in conjunction with a controller.



5.7.4 Fault (TRIP) reset

Fault reset via PROFIBUS-DP process data.



5.8 Code table

5.8.1 Communication-relevant Lenze codes

How to read the table

Column	Meaning		
Code **	(Lenze) code The value of a configurable code marked by double asterisks (**) is not transmitted by parameter set transfer.		
Subcode	Subcode		
Index	Data on code addressing		
Lenze	Lenze setting of the code		
	Disp	Display code The code cannot be configured.	
Selection	Minimum value	[smallest step size / unit]	maximum value
	For a display code, the displayed values are given.		
Data type	• FIX32: 32-bit value with sign; decimal with 4 decimal positions • U16: 2 bytes, bit-coded • U32: 4 bytes, bit-coded • VS: Visible string, character string with defined length		

C0126:
Behaviour with communication error

(Extract from code table)

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C0126	-	24449_d = $5F81_h$	10	0: All monitoring is deactivated. 1: Monitoring of internal communication active	FIX32

Monitoring of internal communication between communication module and controller.

A communication abort with activated monitoring initiates TRIP (CE0).

Tip!

A description of the complete selection for this code is given in the Operating Instructions of your basic device.

C1812:
Display of software identification code

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1812	1 ... 4	22763_d = $58EB_h$	Disp	-	U32

Display of software identification code (ID) in 4 subcodes with 4 characters each.

C1813:
Display of software creation date

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1813	1 ... 4	22762_d = $58EA_h$	Disp	-	U32

Display of the software creation date in 4 subcodes with 4 characters each.

C1882:
Process data monitoring

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1882	-	$58A5_h$ = 22693_d	0	1 [1] 3 Value = [Selection] x 10000	U32

Selection	Reaction
0	No reaction
1	Fault (TRIP)
2	Controller inhibit (CINH)
3	Quick stop (QSP)

The Lenze code is used to determine the controller reaction when the process data monitoring time has expired.

This function can be used for

- Drivecom control,
- Profidrive control and
- device control

Tip!

Code C1882 performs the same function as the index 6004_{hex}.

5.9 Index table

5.9.1 DRIVECOM Pofile parameter

I-6004$_{hex}$: Process data monitoring selection code

The parameter determines the controller reaction when the process data monitoring time has expired.

Index [$_{hex}$]	Subindex	Possible settings		Data type
		Lenze	Selection	
I-6004	-	0	0: No reaction 1: CINH (controller inhibit) 2: QSP (quick stop) 4: TRIP	I16

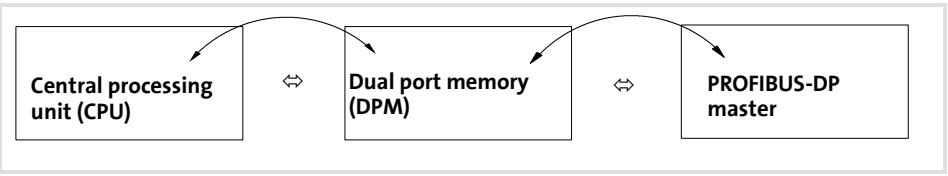
5.10 Appendix

5.10.1 Consistent parameter data

In the PROFIBUS-DP communication system data are permanently exchanged between the master computer (**CPU + PROFIBUS-DP master**) and the basic device via the slave connection module.

The PROFIBUS-DP master as well as the CPU (central processing unit) of the master computer access a joint memory - the dual port memory (DPM).

The DPM allows data exchange in both directions (write/read):



It could happen that a slower PROFIBUS-DP master writing would be overtaken by a faster CPU reading within a cycle time without any further data organisation.

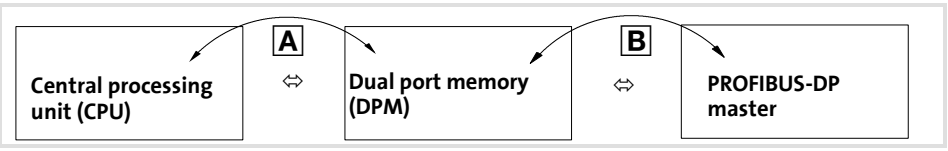
To avoid such a non-permissible status, the parameter data to be transmitted by must be marked as ”consistent”.

Data communication with existing consistency

With consistency, either ”reading” or ”writing” is possible in the memory with simultaneous access of master and CPU:

- ► PROFIBUS-DP master transfers data only as a complete data record.
- ► The CPU can only access completely updated data records.
- ► PROFIBUS-DP master cannot read or write data as long as the CPU accesses consistent data.

The result becomes clear from the example below:



A CPU wants to read!
B Master wants to write simultaneously!
1. As the master can only write if the CPU does not read, the master waits until the data are read completely by the CPU.
2. The master only writes a complete data record into DPM.

Configuring consistent data

Consistency is achieved by a suitable PROFIBUS-DP master configuration. Please use the corresponding Instructions for your configuring software for this purpose.

Tip!

Consistency configuration depends on the PROFIBUS-DP master configuring software. When using a Siemens-S5 PLC, please consider:

- ► Consistency is switched on by any word in the consistent area
- ► Consistency must be switched off by a specific switch-off word.
- ► The type of CPU, consistency and address area depends which word switches off consistency.

5.10.2 Accessories

In the following, you will find the accessory components for PROFIBUS-DP:

Note!

Please ask the manufacturer of the accessory components for the latest order information and the technical data.

Name	Note
Bus connector	Bus connector for 9-pole Sub-D plug with plug-in terminals for bus cable connection (order designation: bus connector PROFIBUS RS-485). With connectable bus terminating resistor; Order designation: Siemens: 6ES7 972-0BA00-0XA0
Bus cable	Features: ● Cable resistance: 135 - 165 Ω/km (f = 3 - 20 MHz) ● Capacitance per unit length: ≤ 30 nF/km ● Loop resistance: < 110 Ω/km ● Core diameter: > 0.64 mm ● Core cross-section: 0.34 mm^2 ● Cores: double twisted, insulated and shielded Order name: Siemens SINEC L2 2-core bus cable

5.10.3 Certificates

ZERTIFIKAT

Die PROFIBUS Nutzerorganisation e.V. erteilt der

Lenze GmbH & Co KG
Postfach 10 13 52, D-31763 Hameln
das Zertifikat Nr.: **Z00615**
für folgendes Produkt:

Name: **2133 (8200/9300)**
Modell: **Feldbusmodul für PROFIBUS-DP für Antriebsregler**
Version: **1.0**
SW: 0.5
GSD: **LENZ2133.gsd**

Das Zertifikat bestätigt, daß das oben genannte Produkt die Prüfungen auf Konformität für PROFIBUS-DP Slave-Geräte erfolgreich bestanden hat.

Die Prüfungen erfolgten gemäß „Test Specifications for PROFIBUS-DP Slaves, Version 2.0, Feb. 2000" in dem von der PNO autorisierten Prüflabor bei der Siemens AG in Fürth. Prüfumfang und Prüfergebnis sind im Prüfbericht Nr. 279-1 protokolliert.

Dieses Zertifikat wird erteilt aufgrund der PNO-Richtlinie für Prüfen und Zertifizieren (PRZ) vom 01.08.1999 und ist gültig für einen Zeitraum von 3 Jahren bis zum 13. Februar 2004.

Karlsruhe, den 21.03.2001 (Bearbeiter)

Der Vorstand der PROFIBUS Nutzerorganisation:

(E. Küster) (K.-P. Willems)

2133PFB005

5.11 Index

S

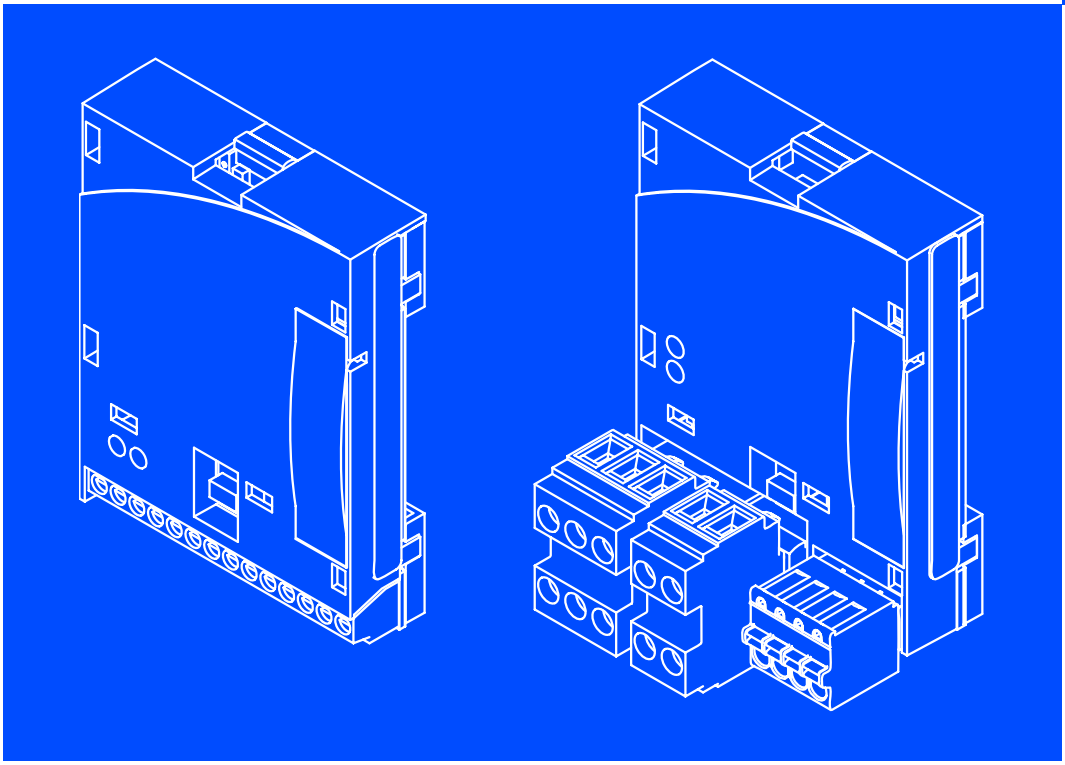
T

V

W

EDSPBS

PROFIBUS-DP



Function module E82ZAFPC00x / E82ZAFPC010

Lenze

10 E82ZAFPC0xx - PROFIBUS-DP function module

Contents

10.1 Before you start

Tip!

Current documentations and software updates for Lenze products can be found on the Internet in the ”Downloads” area under

http://www.Lenze.com

10.1.1 Your opinion is important to us

These Instructions were created to the best of our knowledge and belief to give you the best possible support for handling our product.

If you have suggestions for improvement, please e-mail us to:

feedback-docu@Lenze.de

Thank you for your support.

Your Lenze documentation team

10.1.2 What is new / what has changed in these Instructions?

Date published	Changed contents	Notes
11/2001		First edition
06/2004	All	Complete revision due to ● Layout change ● New German orthography

10.2 General information

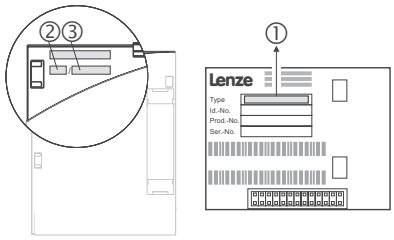
Validity

These Instructions are valid for

- E82ZAFPC function modules (PROFIBUS-DP), as of version 3A10
- E82ZAFPC001 function modules (PROFIBUS-DP), as of version 3A10
- E82ZAFPC010 function modules (PROFIBUS-DP PT), as of version 3A10

These Instructions are only valid together with the Operating Instructions for the basic devices that are permissible for the application.

Identification



E82ZAFX005

	→①			→②	→③	
Type code	**E82ZAF**	**P**	**C**	**0xx**	**3A**	**10**
Series						
PROFIBUS-DP						
Device generation						
Variant 000: Standard design 001: Coated design 010: PT design						
Hardware version						
Software version						

Application range

The E82ZAFPC00x function module can be used in conjunction with the following basic devices		as of version
Frequency inverter	8200 vector	Vx14
	8200 motec	Vx14
Motor starter	starttec	Vx1x, see notes 📖 10.9-1

The E82ZAFPC010 function module can be used in conjunction with the following basic device		as of version
Frequency inverter	8200 vector	Vx14

Features

The function module connects Lenze basic devices to the PROFIBUS-DP serial communication system.

Basic devices can be retrofitted with function modules.

10.3 Technical data

10.3.1 General data and operating conditions

Field	Values
Order designation	E82ZAFPC E82ZAFPC001 (coated) E82ZAFPC010 (PT design)
Communication profile (DIN 19245 part 1 and part 3)	PROFIBUS-DP-V0
Communication medium	RS485
Drive profile (can be switched off)	DRIVECOM Profile 20
Network topology	Without repeater: line / with repeaters: line or tree
PROFIBUS-DP device	Slave
Baud rate	9.6 kBit/s ... 12 MBit/s (automatic detection)
Process data words (16 bits)	1 word ... 10 words
DP user data length	Parameter data channel (4 words) + Process data words (1 ... 10 words)
Max. number of devices	Standard: 32 (= 1 bus segment) / with repeaters: 125
Max. cable length per bus segment	1200 m (depending on the baud rate and cable type used)
External DC voltage supply	+24 V DC ±10 %, max. 80 mA
Type of protection	IP20
Ambient temperature	Operation: -20 °C ... +60 °C Transport: -25 °C ... +70 °C Storage: -25 °C ... +60 °C
Climatic conditions	Class 3K3 according to EN 50178 (without condensation, average relative humidity 85 %)
Degree of pollution	EN 50178, pollution degree 2

E82ZAFPC00x function module

Terminal strip X3/	
VP	Level: 5 V (reference: GND3) Load capacity: I_{max} = 10 mA
28	External supply of terminal with U(ext.) = +12 V DC - 0% ... +30 V DC + 0%
20	DC voltage source for internal supply of controller inhibit (CINH) U = + 20 V (reference: GND1)
59	External supply of function module with U(ext.) = +24 V DC ± 10%

E82ZAFPC010 function module

Terminal strip X3.2/	
59	External supply of function module with U(ext.) = +24 V DC ± 10%

Terminal strip X3.3/	
28	External supply of terminal with U(ext.) = +12 V DC - 0% ... +30 V DC + 0%
20	DC voltage source for internal supply of controller inhibit (CINH) U = + 20 V (reference: GND1) Load capacity: I_{max} = 10 mA

10.3.2 Protective insulation

E82ZAFPC00x function module

Protective insulation between bus and ...	Type of insulation
● Power stage	
– 8200 vector	Double insulation
– 8200 motec	Double insulation
– starttec	Double insulation
● Ground reference plane / PE (X3/7)	Functional insulation
● External supply (X3/59)	Functional insulation
● Internal supply (X3/20)	Functional insulation
● Controller inhibit (X3/28)	Functional insulation

E82ZAFPC010 function module

Protective insulation between bus and ...	Type of insulation
● Power stage, 8200 vector	Double insulation
● Ground reference plane / PE (X3.2/7 or X3.3/7)	Functional insulation
● External supply (X3.2/59)	Functional insulation
● Internal supply (X3.3/20)	Functional insulation
● Controller inhibit (X3.3/28)	Functional insulation

10.3.3 Communication times

Tip!

The communication time is the time between the start of a request and the arrival of the corresponding response.

The PROFIBUS communication times depend on:

- Processing time in the controller
- Transmission delay time
  - Transmission rate (baud rate)
  - Telegram length

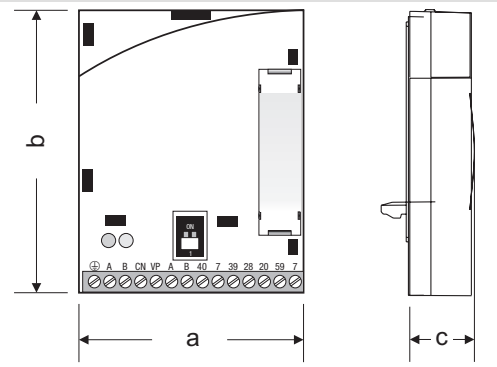
Processing time 8200 vector / 8200 motec / starttec

The parameter data and process data are independent of each other.

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

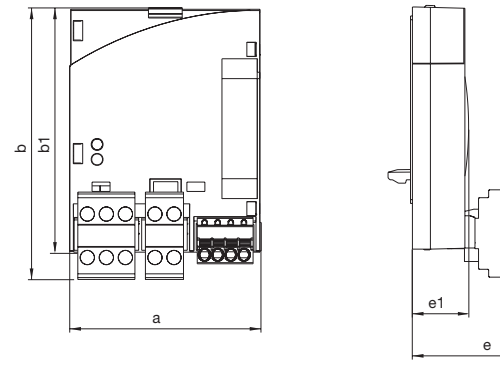
10.3.4 Dimensions

E82ZAFPC00x function module



a	51 mm
b	64 mm
c	15 mm

E82ZAFPC010 function module

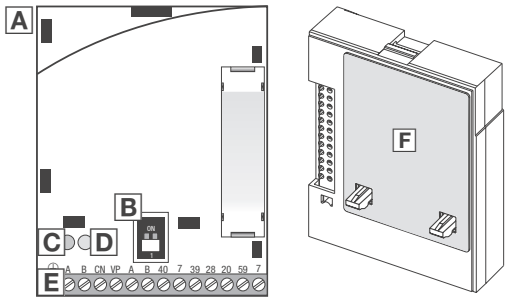


a	51 mm
b	72 mm
b1	64 mm
e	30 mm
e1	15 mm

10.4 Installation

10.4.1 Function module components

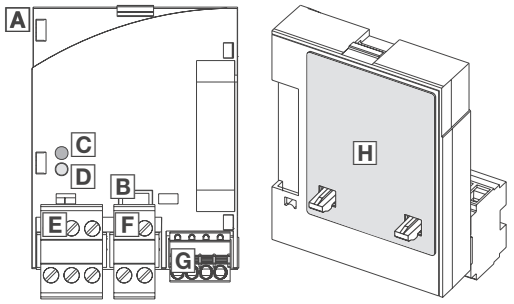
E82ZAFPC00x function module



E82ZAFP004/AFX009

Pos.	Name	Notes
A	Function module E82ZAFPC00x	
B	DIP switch for activating the bus terminating resistor	📖 10.5-8
C	Status display (yellow) for PROFIBUS-DP communication	📖 10.5-11
D	Status display (green) for drive communication	
E	Terminal strip X3, connection for ● PROFIBUS-DP ● controller inhibit (CINH) ● external voltage supply	📖 10.4-7
F	Nameplate	📖 10.2-1

E82ZAFPC010 function module



E82ZAFL007/AFX015

Pos.	Name	Notes
A	Function module E82ZAFPC010	
B	DIP switch for activating the bus terminating resistor	10.5-8
C	Status display (yellow) for PROFIBUS-DP communication	10.5-11
D	Status display (green) for drive communication	
E	Plug connector X3.1, connection for PROFIBUS-DP	10.4-8
F	Plug connector X3.2, connection for external supply of the function module	
G	Plug connector X3.3, connection for • controller inhibit (CINH) • internal supply of the controller inhibit (CINH)	
H	Nameplate	10.2-1

10.4.2 Mechanical installation

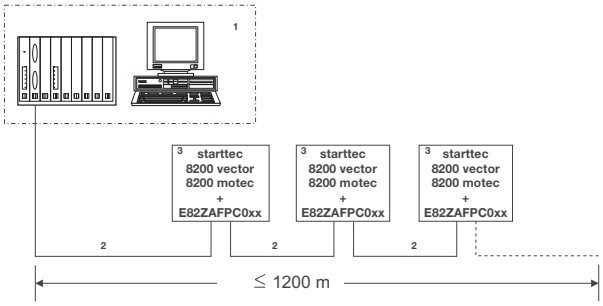
Please see the Mounting Instructions for the basic device for the mechanical installation of the function module.

The Mounting Instructions for the basic device

- ► are part of the scope of supply and are enclosed with each device.
- ► provide tips for avoiding damage through improper handling.
- ► describe the obligatory order of installation steps.

10.4.3 Electrical installation

Basic design of a PROFIBUS-DP network with RS485 cabling without repeater



No.	Element	Note
1	Master computer	E.g. PC or PLC with PROFIBUS-DP master interface module
2	Bus cable	Adapt baud rate to bus cable length.
3	PROFIBUS-DP slave	Appropriate basic device with E82ZAFPC0xx function module

Note!

When using a repeater, max. 125 devices can communicate via the PROFIBUS.

EMC-compliant wiring

For wiring according to EMC please observe the following points:

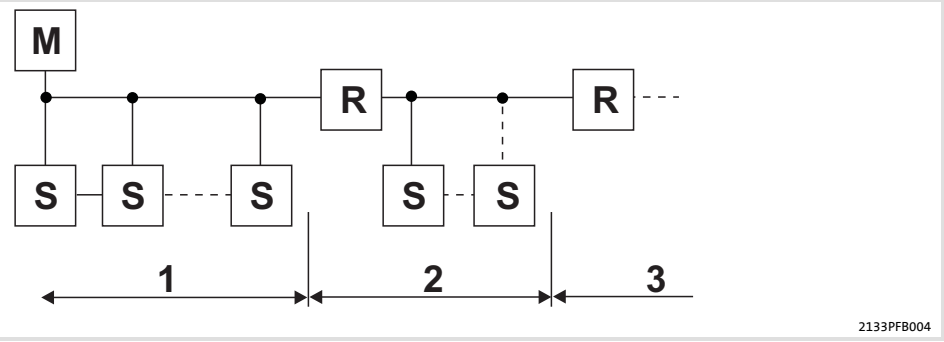
Note!

- ► Separate control cables from motor cables.
- ► Connect control and data cable shields as follows:
  – For cables with *digital signals on both sides*.
- ► Use an equalising conductor with a cross-section of at least 16 mm^2 (reference: PE) to avoid potential differences between decentralised systems (8200 motec / starttec).
- ► Please observe the other notes concerning EMC-compliant wiring given in the Instructions of the basic device.

Wiring procedure

1. Do not change the bus topology, i.e. do not use stubs.
2. Observe the wiring notes given in the documentation for the control system.
3. Only use cables which correspond to the listed specifications, see (📖 10.4-6).
4. Observe the notes on the voltage supply of the function module, see (📖 10.4-11).
5. Activate the bus terminating resistors at the first and last physical bus device, see (📖 10.5-8).

Number of bus devices



Segment	Master (M)	Slave (S)	Repeater (R)
1	1 2	31 30	- -
2	-	31	1
3	-	31	1

Tip!

Repeaters do not have their own addresses but they are taken into account when determining the max. number of slaves.

Repeaters can be used to build up line and tree topologies. In this case, the maximum total bus system expansion depends on

- ► the baud rate used
- ► the number of repeaters used

Baud rate / bus cable length

Baud rate [kBit/s]	Length [m]
9.6 - 93.75	1200
187.5	1000
500	400
1500	200
3000 - 12000	100

Tip!

For high baud rates we recommend to consider the application of optical fibres.

Advantages of optical fibres:

- External electromagnetic interferences on the transmission path remain ineffective.
- Bus lengths of several kilometres are also possible with higher baud rates. The bus length is
  - independent of the baud rate.
  - dependent on the optical fibre used.

Specification of the transmission cable

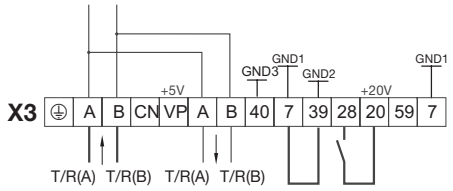
Please observe our recommendations for signal cables.

Specification bus cable	
Cable resistance	135 - 165 Ω/km, (f = 3 - 20 MHz)
Capacitance per unit length	≤ 30 nF/km
Loop resistance	< 110 Ω/km
Wire diameter	> 0.64 mm
Wire cross-section	> 0.34 mm^2
Wires	double twisted, insulated and shielded

10.4.3.1 Terminal assignment

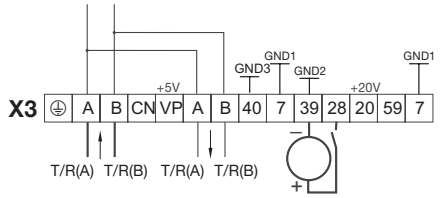
E82ZAFPC00x function module

Supply of controller inhibit (CINH) via internal voltage source (X3/20)



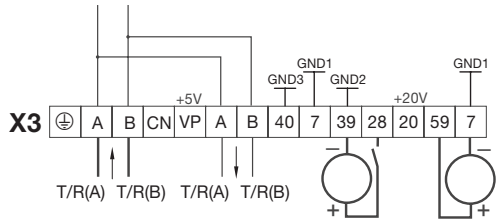
E82ZAFP001

Supply of controller inhibit (CINH) via external voltage source



E82ZAFP002

Supply of function module and controller inhibit (CINH) via external voltage source



E82ZAFP003

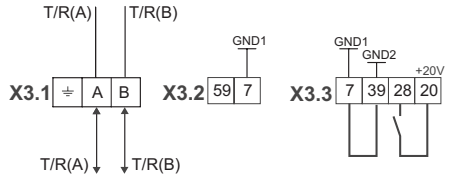
———	Minimum wiring required for operation

X3/	Name	Function	Level
⏚	PES	Additional HF shield termination	
A	T/R(A)	RS485 data cable A	
B	T/R(B)	RS485 data cable B	
CN	CNTR	See PROFIBUS-DP standard *)	Data transfer: CNTR = HIGH (+5 V, reference: GND3)
VP		See PROFIBUS-DP standard *)	+5 V (ref.: GND3)
40	GND3	Reference potential for PROFIBUS-DP network *)	
7	GND1	Reference potential for X3/20	
39	GND2	Reference potential for controller inhibit (CINH) at X3/28	
28	CINH	Controller inhibit	• Start = HIGH (+12 V ... +30 V) • Stop = LOW (0 ... +3 V)
20		DC voltage source for internal supply of controller inhibit (CINH)	+20 V (ref: GND1)
59		External DC supply for function module	U (ext.) = +24 V DC ± 10% (reference: GND1)

*) e.g. for connecting a repeater

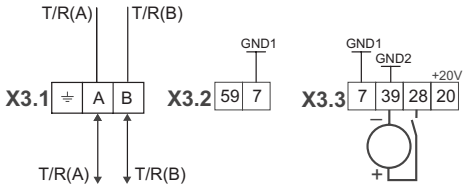
E82ZAFPC010 function module

Supply of controller inhibit (CINH) via internal voltage source (X3.3/20)



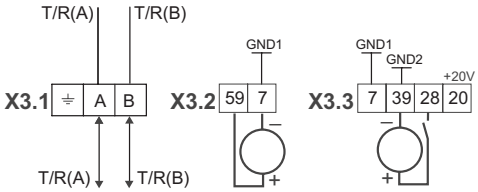
E82ZAFP011

Supply of controller inhibit (CINH) via external voltage source



E82ZAFP012

Supply of function module and controller inhibit (CINH) via external voltage source



E82ZAFP013

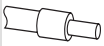
———	Minimum wiring required for operation

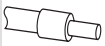
X3.1/	Name	Function	Level
⏚	PES	Additional HF shield termination	
A	T/R(A)	RS485 data cable A	
B	T/R(B)	RS485 data cable B	

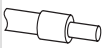
X3.2/	Name	Function	Level
7	GND1	Reference potential for X3.3/20	
59		External DC supply for function module	U (ext.) = +24 V DC ± 10% (reference: GND1)

X3.3/	Name	Function	Level
7	GND1	Reference potential for X3.3/20	
39	GND2	Reference potential for controller inhibit (CINH) at X3.3/28	
28	CINH	Controller inhibit	• Start = HIGH (+12 V ... +30 V) • Stop = LOW (0 ... +3 V)
20		DC voltage source for internal supply of controller inhibit (CINH)	+20 V (ref: GND1)

Terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	 rigid: 1.5 mm² (AWG 16)
	flexible:  without wire end ferrule 1.0 mm² (AWG 18)  with wire end ferrule, without plastic sleeve 0.5 mm² (AWG 20)  with wire end ferrule, with plastic sleeve 0.5 mm² (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

Pluggable terminal strip with spring connection	
Possible connections	 rigid: 1.5 mm² (AWG 16)
	flexible:  without wire end ferrule 1.5 mm² (AWG 16)  with wire end ferrule,without plastic sleeve 1.5 mm² (AWG 16)  with wire end ferrule, with plastic sleeve 0.5 mm² (AWG 20)
Bare end	9 mm

Pluggable terminal strip with double screw connection	
Possible connections	 rigid: 1.5 mm² (AWG 16)
	flexible:  without wire end ferrule 1.5 mm² (AWG 16)  with wire end ferrule,without plastic sleeve 1.5 mm² (AWG 16)  with wire end ferrule, with plastic sleeve 1.5 mm² (AWG 16)
Tightening torque	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)
Bare end	10 mm

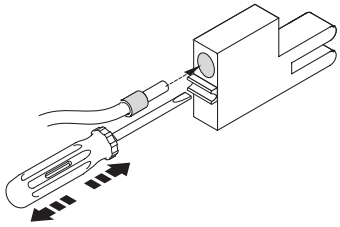
Handling of pluggable terminal strips

Stop!

Observe the following to prevent any damage to the pluggable terminal strips and contacts:

- ► Only plug on / remove if the controller is disconnected from the mains!
- ► Wire the terminal strips before plugging them on!
- ► Pluggable terminal strips that are not assigned must be plugged-on as well.

How to use the pluggable terminal strip with spring connection



E82ZAFX013

10.4.3.2 Voltage supply

Note!

With external voltage supply, always use a separate power supply unit in every control cabinet.

Internal voltage supply	External voltage supply
The internal voltage is available at terminal 20. It is used to supply the controller inhibit (CINH).	External voltage supply is necessary • for bus devices which are to be disconnected from the mains but their communication to the master is to be maintained. • for bus devices with activated bus terminating resistor which are to be disconnected from the mains although the bus system is to remain active.

10.5 Commissioning

Tip!

You will find the current GSE file for this Lenze product in the Internet in the ”Downloads” area under

http://www.Lenze.com

10.5.1 Before switching on

Stop!

Please check the following before you switch on the basic device together with the function module for the first time in the PROFIBUS-DP network:

- ► Completeness of the wiring, earth fault, and short circuit.
- ► Whether the bus system is terminated at the first and last physical bus device with an integrated active bus terminating resistor.

10.5.2 First switch-on

Note!

Keep to the switch-on sequence!

Step-by-step commissioning of the function module with the DRIVECOM device control is described below.

Step	Procedure	See
1.	Configure host system for communication with function module.	📖 10.5-5
2.	Check bus termination ● Only for the first and last bus device: Activate bus terminating resistor through DIP switch = ON **Lenze setting: OFF**	📖 10.5-8
3.	Connect mains voltage and, if necessary, separate voltage supply for the function module. ● The basic device will be ready for operation after approx. 1 second. ● Controller inhibit is active. **Reaction** ● Green LED at the front of the function module is lit (only visible in case of 8200 vector). ● Keypad: RDY IMP (if plugged on)	📖 10.5-9 📖 10.5-11
4.	Bus device addressing. ● Assign station address to bus device with C1509. ● After a parameter set transfer the address must be reassigned via the parameter data channel. Changed settings will not be effective until the voltage supply of the function module and the basic device has been switched off and on again. The address modified via keypad becomes immediately effective. **Lenze setting: 3**	📖 10.5-10
5.	Communication with the controller is now possible, i.e. all codes can be read and all changeable codes can be modified. If necessary, adapt the codes to your application (see Operating Instructions of the basic device). **Reaction** Yellow LED on the function module is blinking when PROFIBUS-DP is active.	📖 10.5-11
6.	Select function module as source for control commands and setpoints. Setting necessary to contact the controller via PROFIBUS: C0005 = 200	

Step	Procedure	See
7.	Assign process data output words (POW) of the master via C1511 to process data input words of the controller. **Lenze setting:** POW1: DRIVECOM control word (DRIVECOM-CTRL) POW2: Setpoint1 (NSET1-N1) POW3: Setpoint2 (NSET1-N2) POW4: Additional setpoint (PCTRL1-NADD) POW5: Actual process controller value (PCTRL1-ACT) POW6: Process controller setpoint (PCTRL1-SET1) POW7: Reserved (FIF-RESERVED) POW8: Torque setpoint or torque limit value (MCTRL1-MSET) POW9: PWM voltage (MCTRL1-VOLT-ADD) POW10: PWM angle (MCTRL1-PHI-ADD)	📖 10.6-3
8.	Assign process data output words of the controller via C1510 to process data input words (PIW) of the master. **Lenze setting:** PIW1: DRIVECOM status word (DRIVECOM-STAT) PIW2: Output frequency with slip (MCTRL1-NOUT+SLIP) PIW3: Output frequency without slip (MCTRL1-NOUT) PIW4: Apparent motor current (MCTRL1-IMOT) PIW5: Actual process controller value (PCTRL1-ACT) PIW6: Process controller setpoint (PCTRL1-SET1) PIW7: Process controller output (PCTRL1-OUT) PIW8: Controller load (MCTRL1-MOUT) PIW9: DC-bus voltage (MCTRL1-DCVOLT) PIW10: Ramp function generator input (NSET1-RFG1-IN)	📖 10.6-6
9.	Enable process output data: C1512 = 65535 Only necessary if C1511 has been changed.	📖 10.8-8
10.	Enable the controller via terminal. Terminal 28 = HIGH	
11.	Enter the setpoint. Master transfers setpoint via selected POW.	
12.	Change to status “READY TO SWITCH ON”. Master transfers DRIVECOM control word: $0000\ 0000\ 0111\ 1110_{bin}$ ($007E_{hex}$).	📖 10.6-9
13.	Controller is “READY TO SWITCH ON“. Master receives DRIVECOM status word: $xxxx\ xxxx\ x01x\ 0001_{bin.}$	
14.	Change to status “OPERATION ENABLED“. Master transfers DRIVECOM control word: $0000\ 0000\ 0111\ 1111_{bin}$ ($007F_{hex}$).	
15.	The drive is now running.	

10.5.3 Configuration of the host

The host must be configured before communication with the communication module is possible.

Master settings

For configuring the PROFIBUS-DP, the device data base file (*.GSE) of the communication module must be read into the master.

Device data base file

The following configurations are saved in the device data base file LENZ00DA.GSE:

Selection text in LENZ00DA.GSE	Parameter data without/with consistency		Process data without/with consistency		Occupied I/O memory
	Without	With	Without	With	
PAR (Cons.) + PZD (n Words)		•	n words		4 + n words
PAR (Cons.) + PZD (n Words Cons.)		•		n words	4 + n words
PAR + PZD (n Words)	•		n words		4 + n words
PZD (n Words)	without parameter data channel		n words		n words
PZD (n Words Cons.)	without parameter data channel			n words	n words

n = 1 ... 10

Note!

Device control via FIF status/control word

Device control is only possible if the DRIVECOM status machine (Lenze setting) is switched off.

- ► Set C1510 /1 (PIW1) to the value “1”: FIF status word 1 (FIF-STAT1).
- ► Set C1511 /1 (POW1) to the value “1”: FIF control word 1 (FIF-CTRL1).
- ► Set C1512 to “65535” to reenable process output words.

For Lenze codes see (📖 10.8-1)

Tip!

Use overall consistency

- ► We recommend to use exclusively configurations with consistency for the parameter data channel to avoid data conflicts between PROFIBUS-DP master and host CPU.
- ► Please note that the processing of consistent data varies between hosts. This must be considered in the PROFIBUS-DP application program.
- ► Detailed description of consistency: (📖 10.9-2)

Defining user data length

The user data length is defined during the DP initialisation phase (configuration). Up to 10 process data words can be configured. Optionally the parameter data channel can be activated. If the parameter channel is active, it additionally occupies 4 words of the input and output process data.

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

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

The user data lengths for process input data and process output data are identical. The selection takes place via identification bytes in the configuration software for the PROFIBUS-DP system.

Without parameter data channel	Process data channel
Identification / user data length	**Identification / user data length**
-	• Identification – without consistency: 70_{hex} ... 79_{hex} (112 ... 121) • User data length: 1 ... 10 words (POW1/PIW1 ... POW10/PIW10)

With parameter data channel	Process data channel
Identification / user data length	**Identification / user data length**
• Identification – without consistency: 73_{hex} (115) • User data length: 4 words (word 1 ... word 4)	• Identification – without consistency: 70_{hex} ... 79_{hex} (112 ... 121) • User data length: 1 ... 10 words (POW1/PIW1 ... POW10/PIW10)

General structure of the identification byte

MSB							LSB
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**

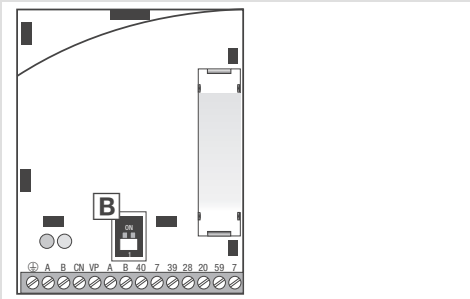
Data length
00 1 byte or 1 word
...
15 16 bytes or 16 words

Input/Output
00 Specific identification format
01 Input
10 Output
11 Input and output

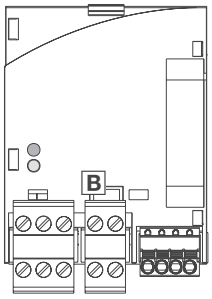
Length/Format
0 Byte
1 Word

Consistency
0 Byte or word
1 Total length

10.5.4 Activation of bus terminating resistor



E82ZAFPC004



E82ZAFPC0xx

DIP switch B	
DIP switch = ON	Integrated active bus terminating resistor is switched on
DIP switch = OFF	Integrated active bus terminating resistor is switched off

10.5.5 Switching on the controller's mains voltage

Note!

If the external voltage supply of the function module is used, the supply must be switched on as well.

The basic device will be ready for operation approx. 1 s after switching on the voltage supply.

Controller inhibit is active.

Green LED at the front of the function module is lit (only visible in case of 8200 vector frequency inverter).

If the LEDs are not lit as expected, see (📖 10.7-1).

Protection against uncontrolled restart

Note!

In some cases, the controller should not restart after a fault (e.g. after a short mains failure).

► The drive can be inhibited by setting C0142 = 0 if
- – the corresponding controller sends an LU message and
- – the fault is active for more than 0.5 seconds.

Parameter function:

► C0142 = 0
- – the controller remains inhibited even after the fault has been eliminated
- – the drive restarts in a controlled mode: LOW-HIGH edge at terminal 28 (CINH)

► C0142 = 1
- – An uncontrolled restart of the controller is possible.

10.5.6 Addressing

To address the basic devices, each device is allocated a different node address in the PROFIBUS-DP network.

Valid address range: 3 … **126**

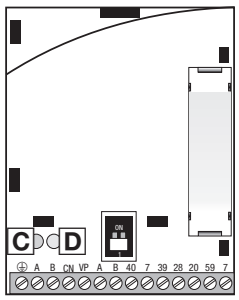
(Lenze default setting: 3)

The node address can be freely selected under code C1509.

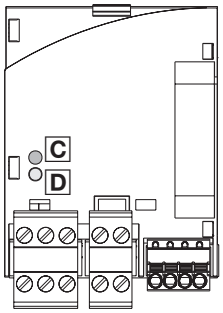
The setting is possible with

- keypad,
- PC / communication module, type 2102 LECOM, or
- class 2 master.

10.5.7 Status display



E82ZAFP004



E82ZAFP008

Pos	LED status	Explanation
C	OFF	● No communication with the PROFIBUS master. ● Function module is not supplied with voltage.
	BLINKING	Communication with the PROFIBUS master has been built up through the function module.

Pos	LED status	Explanation
D	OFF	● Function module is not supplied with voltage. ● Basic device and/or external voltage supply switched off.
	BLINKING	Function module is supplied with voltage but not connected to the basic device. Cause: ● Basic device switched off ● Basic device in initialisation phase ● Basic device not connected
	Permanently LIT	Function module is supplied with voltage and connected to the basic device.

Pos	LED status	Explanation
C + D	BLINKING	Internal function module error

10.6 Data transfer

10.6.1 General information

PROFIBUS-DP transfers two different data types between the master computer and the controllers.

► Parameter data

► Process data

As indicated in the table, these data are distributed into communication channels according to their time-critical response.

Process data
● Process data are transferred via the process data channel.
● Use process data to control the drive controller.
● The master computer has direct access to the process data. In the PLC, for instance, the data are directly assigned to the I/O area. An exchange between the master drive and the controller is required in the shortest possible time with small amounts of data being transferred cyclically.
● Process data are – not stored in the controller. – transferred between the host and the controllers in order to exchange current input and output data continuously.
● Process data are, for instance, setpoints and actual values.
An exchange between the master drive and the controller is required in the shortest possible time with small amounts of data being transferred cyclically.

Parameter data
● Parameter data are transferred via the parameter data channel.
● If the parameter data channel is active, it additionally occupies 4 words of input and output process data.
● Observe the notes on code C0003 when saving parameter changes.
● In general, the transfer of parameters is not time-critical.
● Parameter data are, for instance, operating parameters, diagnostics information and motor data.

Tab. 10.6-1 Distribution of parameter data and process data into different communication channels

10.6.2 Device control

10.6.2.1 Configuration of process data

Use the free process data configuration to assign the max. 10 PROFIBUS-DP process data words to the controller process data words. Define the assignments in codes C1511 (process output data) and C1510 (process input data).

Tip!

The ”view” is always from the master.

- ► The master sends process output data in max. 10 process data output words (POW) to the bus device.
- ► The master receives process input data in max. 10 process data input words (PIW) from the bus device.

10.6.2.2 Process data signals for 8200 vector / 8200 motec / starttec

Configuration of process output data

The assignment of the max. 10 process data output words (POW) of the master to bit control commands or setpoints of the controller can be freely configured via C1511.

Note!

The assignment of control words of different device controls is not permitted.

► To activate the DRIVECOM control, assign the DRIVECOM control word a POW (C1511/x = 17).
  – The DRIVECOM control word is mapped to the FIF control word 1.
  – The controller operates in compliance with the DRIVECOM status machine. (📖 10.6-9).

► You can set up an extended Lenze device control using the FIF control words (📖 10.6-5).

Note!

When C1511 is changed, the process output data are automatically inhibited to guarantee data consistency. Use C1512 to reenable individual or all POWs.

Configuration of process output data

Code	Subcode	Index	LENZE setting		Data type
C1511		23064_d = $5A18_h$			FIX32
	1 (POW1)		17	DRIVECOM control word (DRIVECOM-CTRL)	
	2 (POW2)		3	Setpoint 1 (NSET1-N1)	
	3 (POW3)		4	Setpoint 2 (NSET1-N2)	
	4 (POW 4)		5	Additional setpoint (PCTRL1-NADD)	
	5 (POW 5)		6	Actual process controller value (PCTRL1-ACT)	
	6 (POW 6)		7	Process controller setpoint (PCTRL1-SET1)	
	7 (POW 7)		8	Reserved	
	8 (POW 8)		9	Torque setpoint or torque limit value (MCTRL1-MSET)	
	9 (POW 9)		10	PWM voltage (MCTRL1-VOLT-ADD)	
	10 (POW 10)		11	PWM angle (MCTRL1-PHI-ADD)	

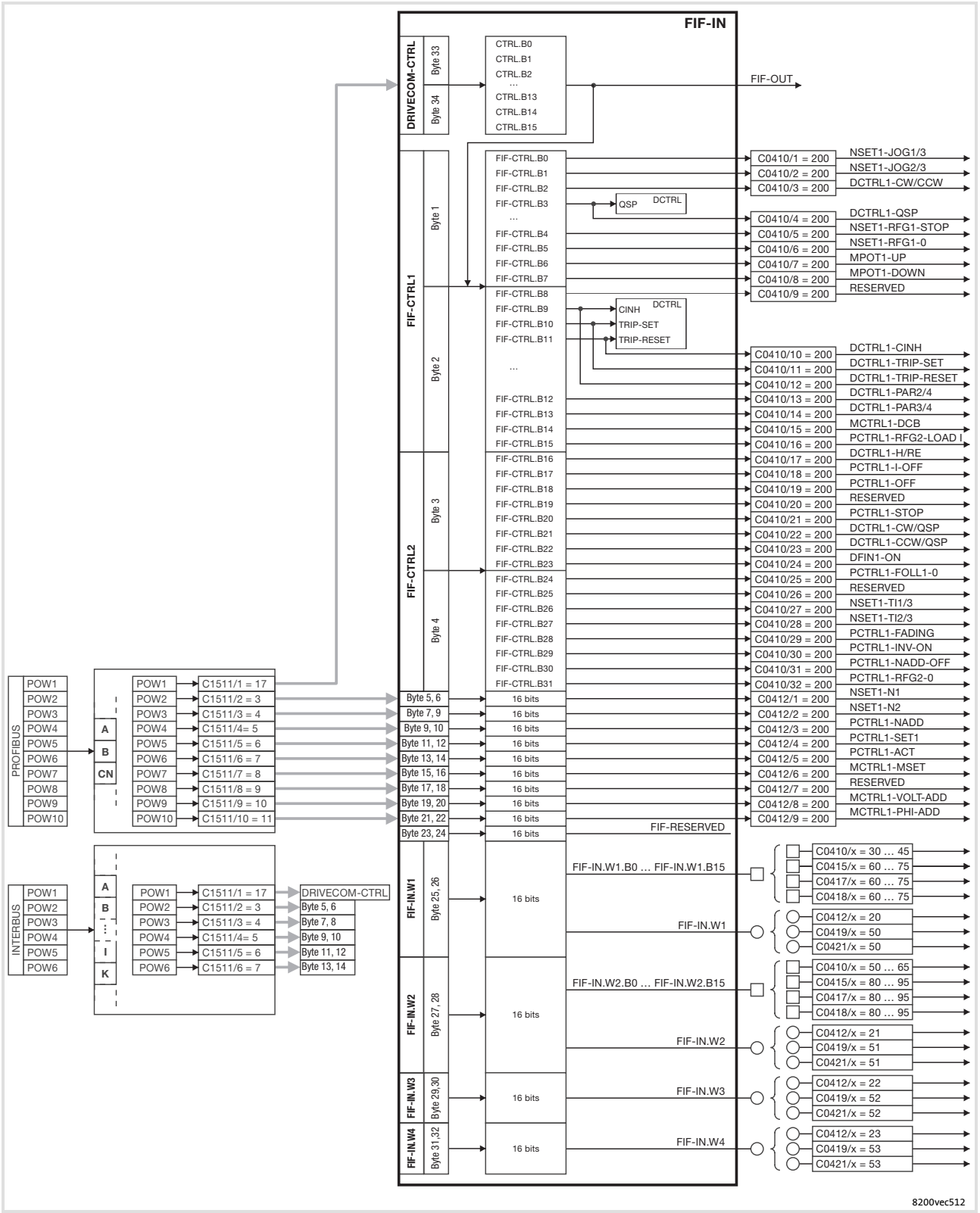


Fig. 10.6-1 Free configuration of the 10 PROFIBUS-DP process output words

FIF control word 1 (FIF-CTRL1)		FIF control word 2 (FIF-CTRL2)	
bit	**Assignment**	**bit**	**Assignment**
1 /0	**JOG values** (NSET1-JOG2/3 | NSET1-JOG1/3) bit 1 0 0 0 C0046 active 0 1 JOG1 (C0037) active 1 0 JOG2 (C0038) active 1 1 JOG3 (C0039) active	**0**	**Manual/remote changeover** (DCTRL1-H/Re) 0 not active 1 active
		1	**Switch off I-component of process controller** (PCTRL1-I-OFF) 0 not active 1 active
2	**Current direction of rotation** (DCTRL1-CW/CCW) 0 not inverted 1 inverted	**2**	**Switch off the process controller** (PCTRL1-OFF) 0 not active 1 active
3	**Quick stop** (FIF-CTRL1-QSP) 0 not active 1 active (deceleration at QSP ramp C0105)	**3**	reserved **By no means write to this bit!**
4	**Stop ramp function generator** (NSET1-RFG1-STOP) 1 0 not active 1 active	**4**	**Stop the process controller** (PCTRL1-STOP) 0 not active 1 active
5	**Ramp function generator input = 0** (NSET1-RFG1-0) 0 not active 1 active (deceleration to C0013)	**5**	**CW rotation/quick stop** (DCTRL1-CW/QSP) 0 not active 1 active
6	**UP function of motor potentiometer** (MPOT1-UP) 0 not active 1 active	**6**	**CCW rotation/quick stop** (DCTRL1-CCW/QSP) 0 not active 1 active
7	**DOWN function of motor potentiometer** (MPOT1-DOWN) 0 not active 1 active	**7**	**X3/E1 is digital frequency input** (DFIN1-ON) 0 not active 1 active
8	reserved	**8**	reserved
9	**Controller inhibit** (FIF-CTRL1-CINH) 0 Controller enabled 1 Controller inhibited	**9**	reserved
10	**External fault** (FIF-CTRL1-TRIP-SET)	**10**	reserved
11 0 ⇒ 1	**Reset fault** (FIF-CTRL1-TRIP-RESET) Bit change causes trip reset	**11**	reserved
13|12	**Change over parameter sets** (DCTRL1-PAR3/4 | DCTRL1-PAR2/4) bit 13 12 0 0 PAR1 0 1 PAR2 1 0 PAR3 1 1 PAR4	**12**	Reserved
		13	reserved
14	**DC injection brake** (MTCRL1-DCB) 0 not active 1 active	**14**	reserved
15	reserved	**15**	reserved

Tab. 10.6-2 Parameter structure of FIF control word (FIF-CTRLx)

Note!

Use of bit 5 and bit 6 in FIF control word 2:

Parameterise the codes C0410/22 (DCTRL1-CW/QSP) and C0410/23 (DCTRL1-CCW/QSP) to the value ”200”.

Configuration of process input data

Bit status information or actual values of the controller can be assigned freely to the max. 10 process data input words (PIW) of the master:

► To call status information compliant to DRIVECOM, assign the DRIVECOM status word a PIW (C1511/x = 18).
The FIF status word 1 is mapped to the DRIVECOM status word.

Configuration of process input data

Code	Subcode	Index	LENZE setting		Data type
C1510		23065_d = $5A19_h$			FIX32
	1 (PIW 1)		18	DRIVECOM status word (DRIVECOM-STAT)	
	2 (PIW 2)		3	Output frequency with slip (MCTRL1-NOUT+SLIP)	
	3 (PIW 3)		4	Output frequency without slip (MCTRL1-NOUT)	
	4 (PIW 4)		5	Apparent motor current (MCTRL1-IMOT)	
	5 (PIW 5)		6	Actual process controller value (PCTRL1-ACT)	
	6 (PIW 6)		7	Process controller setpoint (PCTRL1-SET)	
	7 (PIW 7)		8	Process controller output (PCTRL1-OUT)	
	8 (PIW 8)		9	Controller load (MCTRL1-MOUT)	
	9 (PIW 9)		10	DC-bus voltage (MCTRL1-DCVOLT)	
	10 (PIW 10)		11	Ramp function generator input (NSET1-RFG1-IN)	

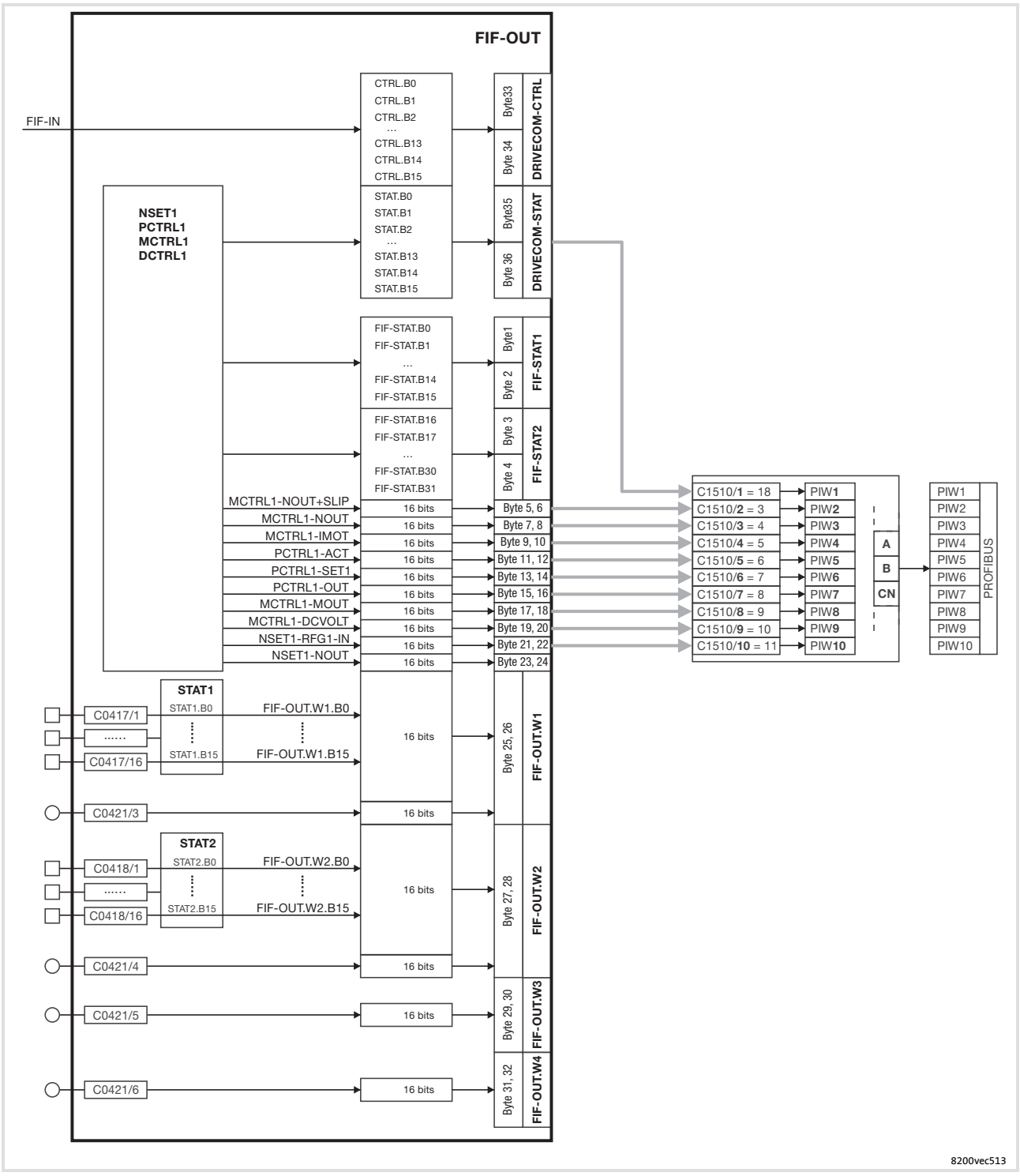


Fig. 10.6-2 Free configuration of the 10 PROFIBUS_DP process input words

FIF status word 1 (FIF-STAT1)		FIF status word 2 (FIF-STAT2)	
bit	**Assignment**	**bit**	**Assignment**
0	**Current parameter set bit 0** (DCTRL1-PAR-B0) 0 Parameter set 1 or 3 active 1 Parameter set 2 or 4 active	**0**	**Current parameter set bit 1** (DCTRL1-PAR-B1) 0 Parameter set 1 or 2 active 1 Parameter set 3 or 4 active
1	**Pulse inhibit** (DCTRL1-IMP) 0 Power outputs enabled 1 Power outputs inhibited	**1**	**TRIP, Q_{min} or pulse inhibit active** (DCTRL1-TRIP-QMIN-IMP) 0 false 1 true
2	**I_{max} limit** (MCTRL1-IMAX) (If C0014 = -5-: Torque setpoint) 0 not reached 1 reached	**2**	**PTC warning active** (DCTRL1-PTC-WARN) 0 false 1 true
3	**Output frequency = frequency setpoint** (DCTRL1-RFG1=NOUT) 0 false 1 true	**3**	reserved **Do not write to this bit!**
4	**Ramp function generator input 1 = ramp function generator output 1** (NSET1-RFG1-I=O) 0 false 1 true	**4**	**C0054 < C0156 and Q_{min} threshold reached** (DCTRL1-(IMOT<ILIM)-QMIN) 0 false 1 true
5	**Q_{min} threshold** (PCTRL1-QMIN) 0 not reached 1 reached	**5**	**C0054 < C0156 and NSET1-RFG1-I=O** (DCTRL1-(IMOT<ILIM)-RFG-I=O) 0 false 1 true
6	**Output frequency = 0** (DCTRL1-NOUT=0) 0 false 1 true	**6**	**LP1 warning (fault in motor phase) active** (DCTRL1-LP1-WARN) 0 false 1 true
7	**Controller inhibit** (DCTRL1-CINH) 0 Controller enabled 1 Controller inhibited	**7**	**f < f_{min}** (NSET1-C0010...C0011) 0 false 1 true
11...8	**Device status** (DCTRL1-STAT*1 ...-STAT*8) bit 11 10 9 8 0 0 0 0 Controller initialisation 0 0 1 0 Switch-on inhibit 0 0 1 1 Operation inhibited 0 1 0 0 Flying-restart circuit active 0 1 0 1 DC-injection brake active 0 1 1 0 Operation enabled 0 1 1 1 Message active 1 0 0 0 Active fault 1 1 1 1 No communication with basic device possible	**8**	**TRIP active** (DCTRL1-TRIP) 0 false 1 true
		9	**Motor is running** (DCTRL1-RUN) 0 false 1 true
		10	**Motor is running clockwise** (DCTRL1-RUN-CW) 0 false 1 true
		11	**Motor is running counter-clockwise** (DCTRL1-RUN-CCW) 0 false 1 true
12	**Overtemperature warning** (DCTRL1-OH-WARN) 0 No warning 1 ϑ_{max} - 10 °C reached	**12**	reserved
13	**DC-bus overvoltage** (DCTRL1-OV) 0 No overvoltage 1 Overvoltage	**13**	Reserved
14	**Direction of rotation** (DCTRL1-CCW) 0 CW rotation 1 CCW rotation	**14**	**C0054 > C0156 and NSET1-RFG1-I=0** (DCTRL1-(IMOT>ILIM)-RFG-I=O) 0 false 1 true
15	**Ready for operation** (DCTRL1-RDY) 0 not ready for operation (fault) 1 ready for operation (no fault)	**15**	reserved

Tab. 10.6-3 Parameter structure FIF status word (FIF-STATx)

10.6.3 DRIVECOM control

DRIVECOM status machine

The control information is provided by the function module via the control word.

- The controllers have standardised device states according to DRIVECOM Profile 20.
- Information on the current device status is stored in the DRIVECOM parameter “status word“.
- Commands in the DRIVECOM parameter “control word“ can change the device status. These commands are represented by arrows in the following diagram.

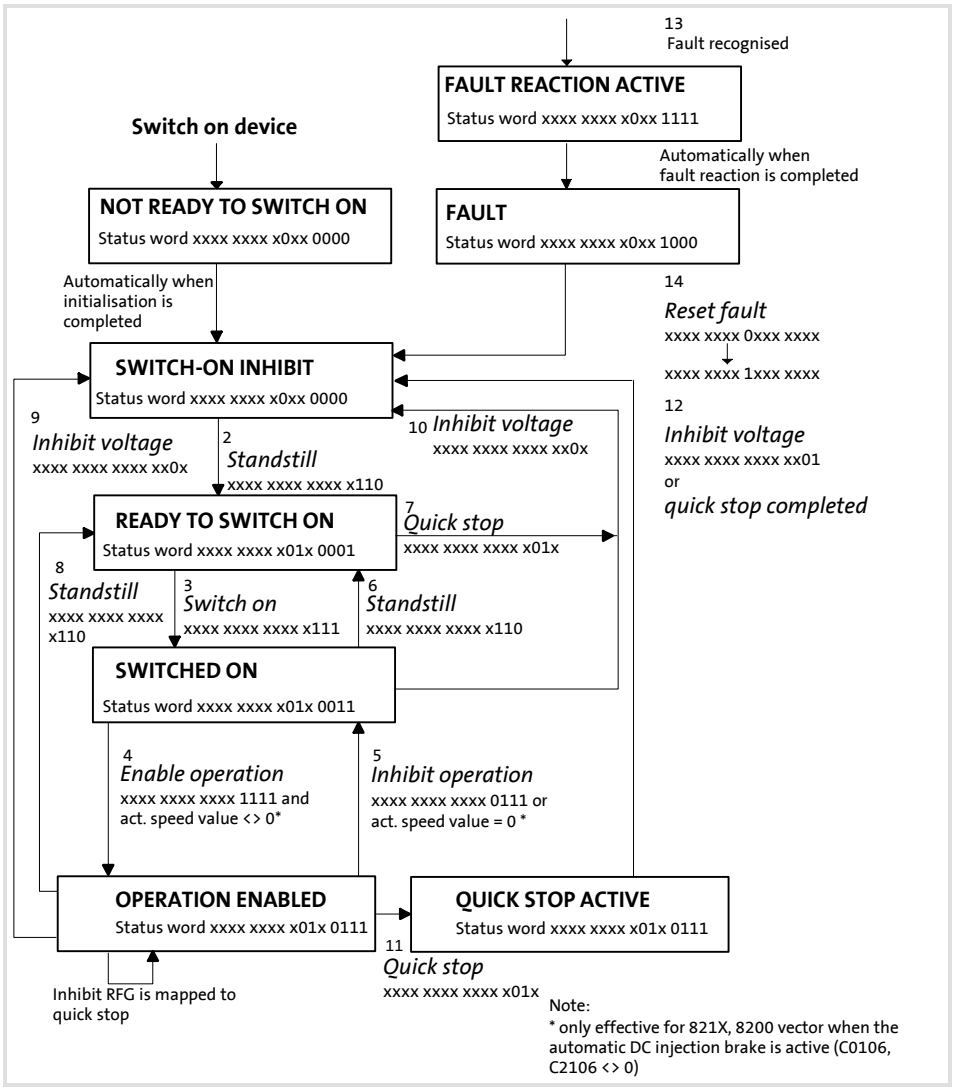


Fig. 10.6-3 Status diagram of DRIVECOM device control

DRIVECOM control word

Bit	Meaning
0	**"Switch on" command**
0	"Stop" command active
1	"Switch on" command active
1	**"Inhibit voltage" command**
0	"Inhibit voltage" command active
1	"Inhibit voltage" command not active
2	**"Quick stop" command**
0	"Quick stop" command activated
1	"Quick stop" command not active
3	**"Enable operation" command**
0	"Inhibit operation" command active
1	"Enable operation" command active
4	**"Inhibit RFG" command** Inhibit the ramp function generator (NSET1-RFG1). The quick stop function is activated, the device status of the drive does not change. Mapping to FIF control word 1 (FIF-CTRL1), bit 3 negated (FIF-CTRL1-QSP)
0	Inhibit RFG active
1	Inhibit RFG not active
5	**"RFG stop" command** Ramp function generator output (NSET1-RFG1) is "frozen"; the device status of the drive does not change. Mapping to FIF control word 1 (FIF-CTRL1), bit 4 negated (NSET1-RFG1-STOP)
0	0 = RFG stop
1	1 = RFG stop not active
6	**"RFG zero" command** Set ramp function generator input (NSET1-RFG1) to 0. ⇒ Controlled deceleration via the ramp set under C0013; the device status of the drive does not change. Mapping to FIF control word 1 (FIF-CTRL1), bit 5 negated (NSET1-RFG1-0)
0	0 = RFG zero
1	1 = RFG zero not active
7	**TRIP reset** Fault reset (TRIP)
0 ⇒ 1	Bit change causes trip reset
8	DRIVECOM reserved
9	DRIVECOM reserved
10	DRIVECOM reserved
11	Mapping to FIF control word 1 (FIF-CTRL1), bit 10 (FIF-CTRL1-TRIP-SET)
12	Mapping to FIF control word 1 (FIF-CTRL1), bit 12 (DCTRL1-PAR2/4)
13	Mapping to FIF control word 1 (FIF-CTRL1), bit 13 (DCTRL1-PAR-3/4)
14	Mapping to FIF control word 1 (FIF-CTRL1), bit 14 (MCTRL1-DCB)
15	Not assigned

Tab. 10.6-4 Parameter structure of "DRIVECOM control word" (DRIVECOM-CTRL)

DRIVECOM status word

Bit	Meaning
0	**Device status "READY TO SWITCH ON"**
0	Status less than "READY TO SWITCH ON"
1	Status at least "READY TO SWITCH ON"
1	**Device status "SWITCHED ON"**
0	Status less than "SWITCHED ON"
1	Status at least "SWITCHED ON"
2	**Device status "OPERATION ENABLED"**
0	Status less than "OPERATION ENABLED"
1	Status "OPERATION ENABLED"
3	**Device status "FAULT"**
0	No fault (TRIP)
1	Fault (TRIP) occurred
4	**Status "Inhibit voltage" command**
0	Command applied
1	Command not applied
5	**Status "Quick stop" command**
0	Command applied
1	Command not applied
6	**Device status "SWITCH ON INHIBIT"**
0	Status not "SWITCH ON INHIBIT"
1	Status "SWITCH ON INHIBIT"
7	**Collective warning**
0	No warning
1	Warning (overheat)
8	**Collective message** Automatic setting and resetting of pulse inhibit in the device status "OPERATION ENABLED". Possible causes: Undervoltage, overvoltage or overcurrent
0	No message
1	Message IMP active
9	Bus access right
1	Always
10	**Status speed/frequency deviation**
0	$RFG_{on} <> RFG_{off}$
1	$RFG_{on} = RFG_{off}$
11	**Status DRIVECOM speed limitation**
0	Always
12	Mapping of FIF status word 1 (FIF-STAT1), bit 0 (DCTRL1-PAR-B0)
13	Mapping of FIF status word 2 (FIFSTAT2), bit 0 (DCTRL1-PAR-B1)
14	Mapping of FIF status word 1 (FIFSTAT1), bit 2 (MCTRL1-IMAX)
15	Mapping of FIF status word 1 (FIF-STAT1), bit 5 (PCTRL1-QMIN)

Tab. 10.6-5 Parameter structure of "DRIVECOM status word" (DRIVECOM-STAT)

Bit control commands		The bit control commands of the control word depend on other bit positions. The command is executed only for the following bit patterns:								
		Control word bits								Note
Command	Meaning	7	6	5	4	3	2	1	0	
Standstill	From different device states ⇨ “READY TO SWITCH ON“.	x	x	x	x	x	1	1	**0**	1 Bit set
Switch on	Transition ⇨ “SWITCHED ON“.	x	x	x	x	x	1	1	**1**	
Enable operation	Transition ⇨“OPERATION ENABLED“. The controller inhibit is deactivated.	x	x	x	x	**1**	1	1	1	0 Bit not set
Inhibit operation	Transition ⇨ “SWITCHED ON“. The controller inhibit is activated.	x	x	x	x	**0**	1	1	1	
Voltage inhibit	Transition ⇨ “SWITCH-ON INHIBIT“. The controller inhibit is activated.	x	x	x	x	x	x	**0**	x	x Any bit
Quick stop	Transition ⇨ “SWITCH-ON INHIBIT“. If the drive was enabled ⇨controlled deceleration along the Lenze quick stop ramp.	x	x	x	x	x	**0**	1	x	
Error reset	Acknowledge fault If the fault has been removed, automatically ⇨ “SWITCH-ON INHIBIT“.	0 ⇨1	x	x	x	x	x	x	x	

Error reset
RFG-zero
RFG-stop
RFG-inhibit
Enable operation
Quick stop
Voltage inhibit
Switch on

Status bits		The current device status is clearly coded in bits 0 to 6 of the status word:							
		Bits of the status word							Note
Device status	Meaning	6	5	4	3	2	1	0	
NOT READY TO SWITCH ON	Controller is being initialised and is not yet ready to operate. After initialisation automatically ⇨“READY TO SWITCH ON“.	0	x	x	0	0	0	0	1 Bit set
SWITCH-ON INHIBIT	Controller inhibited (CINH). Waiting for ”Stop” command	1	x	x	0	0	0	0	
READY TO SWITCH ON	Controller inhibited (CINH). Waiting for ”Switch-on” command	0	1	x	0	0	0	1	0 Bit not set
SWITCHED ON	Controller inhibited (CINH). Waiting for ”Enable operation” command	0	1	x	0	0	1	1	
OPERATION ENABLED	Controller enabled ($\overline{\text{CINH}}$). Pulse inhibit can be set automatically	0	1	x	0	1	1	1	x Any bit
FAULT REACTION ACTIVE	Fault (TRIP) recognised, a time-based fault response initiated. Then automatically ⇨”TRIP”	0	x	x	1	1	1	1	
FAULT	Controller is in the ”FAULT“ status.	0	x	x	1	0	0	0	
QUICK STOP ACTIVE	“Quick stop” command was sent in the “OPERATION ENABLED“ device status ⇨ controlled deceleration along the quick stop ramp. After deceleration automatically ⇨“SWITCH-ON INHIBIT“.	0	0	x	0	1	1	1	

Switch-on inhibit
Quick stop
Voltage inhibit
Fault
Operation enabled
Switched on
Ready to switch on

10.6.4 Parameter data channel

The DRIVECOM parameter data channel

- ► enables parameter setting and diagnostics of the controller.
- ► allows access to all Lenze parameters (codes).
- ► additionally occupies 4 words of the input and output data words in the master.
- ► has an identical structure for both directions of transmission.

Parameter data (valid for both parameter data channels)

Parameter data are addressed through codes listed in the code table of the corresponding Operating Instructions for your controller.

Lenze parameter sets

8200 vector / 8200 motec
The 8200 vector / 8200 motec controllers have 2 or 4 parameter sets, the parameters of which can be addressed directly via the PROFIBUS-DP. They are addressed by means of a code offset:
• Offset 0 addresses parameter set 1 with the Lenze codes C0000 to C1999 • Offset 2000 addresses parameter set 2 with the Lenze codes C2000 to C3999
• Offset 4000 addresses parameter set 3 with the Lenze codes C4000 to C5999 • Offset 6000 addresses parameter set 4 with the Lenze codes C6000 to C7999
If a parameter is only available once (see Instructions 8200 vector / 8200 motec), use the code offset 0.
Example for C0011 (maximum field frequency): C0011 in parameter set 1: Lenze code number = 11 C0011 in parameter set 2: Lenze code number = 2011
C0011 in parameter set 3: Lenze code number = 4011 C0011 in parameter set 4: Lenze code number = 6011
Parameter changes: Automatic storage (can be switched off under C0003) Process data changes: No automatic storage

10.6.4.1 DRIVECOM parameter data channel

Addressing of Lenze parameters

In the case of the DRIVECOM parameter data channel, the parameters of a device are not addressed directly via Lenze code numbers, but via indices (byte 3 / byte 4) and subindices (byte 2).

The Lenze code numbers are converted into indices via an offset (24575_{dez} or $5FFF_{hex}$):

Addressing of Lenze codes	Example of C0001 (operating mode)
– PROFIBUS-DP index = 24575 - Lenze code number	– PROFIBUS-DP index = 24575 - 1 = 24574
– PROFIBUS-DP $index_{hex}$ = $5FFF_{hex}$ - Lenze code $number_{hex}$	– PROFIBUS-DP $index_{hex}$ = $5FFF_{hex}$ - 1_{hex} = $5FFE_{hex}$

Lenze parameters are mainly represented in the fixed point format, data type integer32 with four decimal digits. For this reason, the value of the parameter or the value of the code must be multiplied by 10000 in order to obtain integer values.

This parameter value is entered into the user data (byte 5 - byte 8) of the telegram.

► Example

1. Set C0039 (JOG) = 150.4 Hz
2. Multiply parameter value by 10000.
3. 150.4 x 10000 = 1504000_{dez} ($0016F300_{hex}$)
4. Enter parameter value into user data.

Telegram structure (overview)

The telegram of the DRIVECOM parameter data channel consists of a total of 8 bytes. The individual bytes are described in detail on the following pages.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index High byte	Index Low byte	Data 4 / Error 4	Data 3 / Error 3	Data 2 / Error 2	Data 1 / Error 1

Byte 1: Service
Job and response control for the parameter data channel

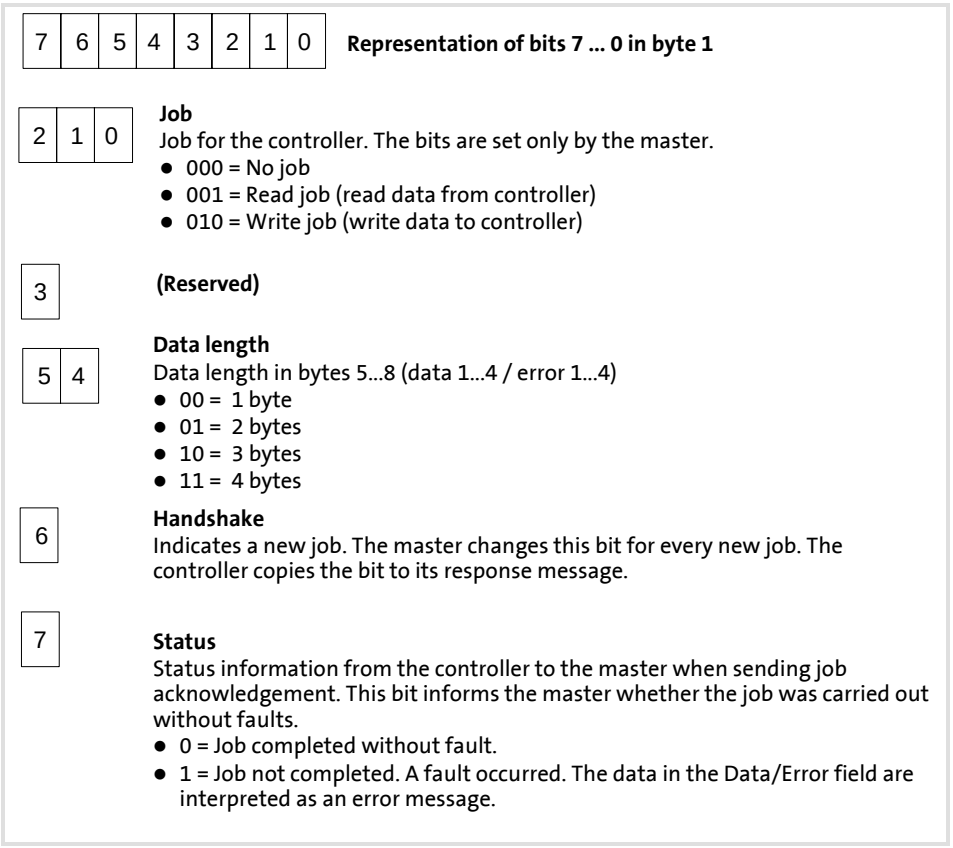


Fig. 10.6-4 Byte 1: Job and response control

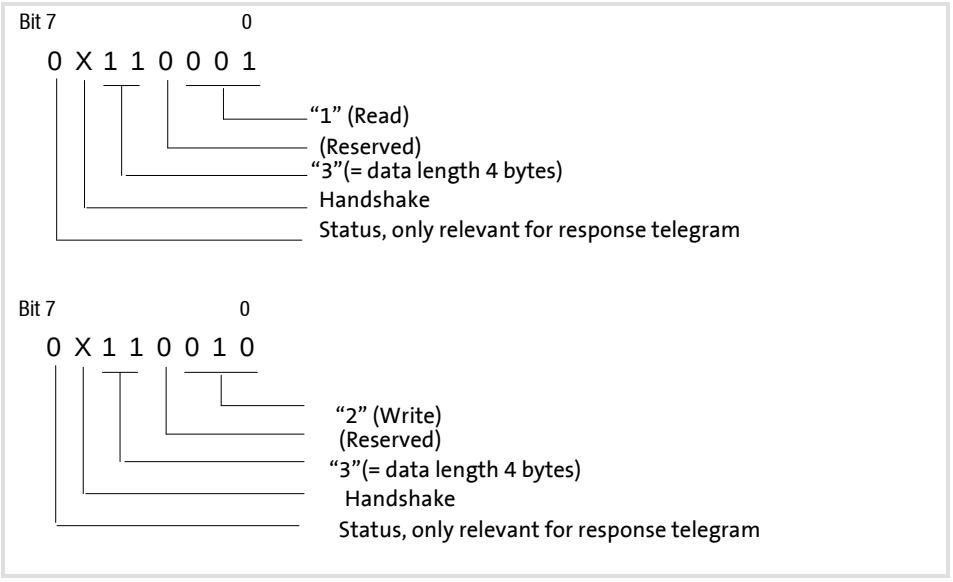


Fig. 10.6-5 Example of byte 1

Byte 2: Subindex

Additional addressing via the subindex is required for those codes that have a subcode (see code table).

Example:

Code C0039 / subcode 3 addresses "NSET JOG" (50% = Lenze setting)

Byte 3 / 4: Index

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	**Index High byte**	**Index Low byte**	Data 4 / Error 4	Data 3 / Error 3	Data 2 / Error 2	Data 1 / Error 1

The parameters or the Lenze codes are selected with these two bytes according to the formula:

Index = 24575 - Lenze code number

Example:
The parameter C0012 (acceleration time) is to be addressed:

24575 - 12 = 24563 = $5FF3_{hex}$

The entries for this example would be:

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

► Byte 4: Index low byte = $F3_{hex}$

Byte 5 - 8: Parameter value (data) or fault information (error)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index High byte	Index Low byte	**Data 4 / Error 4**	**Data 3 / Error 3**	**Data 2 / Error 2**	**Data 1 / Error 1**

The status of the (”status”) bit 7 in byte 1 (”job”) determines the meaning of this data field:

Meaning of bytes 5 - 8 if	
bit 7 = 0	**bit 7 = 1**
Parameter value (data 1 -4)	Fault information (error 1 - 4) for an invalid access.

Parameter value (data)

Depending on the data format, the length of the parameter value is between 1 to 4 bytes. Data are saved in the Motorola format, i.e. first the high byte or high word, then the low byte or low word.

Byte 5	Byte 6	Byte 7	Byte 8
High byte	Low byte	High byte	Low byte
High word		Low word	
Double word			

Assignment of bytes 5 .. 8 with parameter values of different lengths

Byte 5	Byte 6	Byte 7	Byte 8
Parameter value (length 1)	00	00	00
Parameter value (length 2)		00	00
Parameter value (length 4)			

Note: Strings or data blocks cannot be transmitted.

Error messages

The following error messages may appear:

Data 1	Data 2	Data 4	Meaning
6	3	00_{hex}	No right to access
6	5	10_{hex}	Impermissible job parameter
6	5	11_{hex}	Invalid subindex
6	5	12_{hex}	Data length too large
6	5	13_{hex}	Data length too small
6	6	00_{hex}	Object is no parameter
6	7	00_{hex}	Object does not exist
6	8	00_{hex}	Data types do not correspond
8	0	00_{hex}	Job cannot be executed
8	0	20_{hex}	Job cannot be executed at the moment
8	0	21_{hex}	Not executable because of local control
8	0	22_{hex}	Not executable because of device status
8	0	30_{hex}	Out of value range/parameter can only be changed with inhibited controller
8	0	31_{hex}	Parameter value too large
8	0	32_{hex}	Parameter value too small
8	0	33_{hex}	Sub-parameter out of value range
8	0	34_{hex}	Sub-parameter value too large
8	0	35_{hex}	Sub-parameter value too small
8	0	36_{hex}	Maximum value smaller than minimum value
8	0	41_{hex}	Communication object cannot be mapped on process data
8	0	42_{hex}	Process data length exceeded
8	0	43_{hex}	General collision with other values

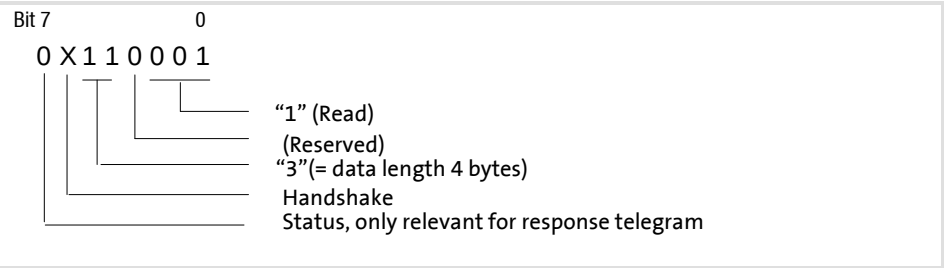
10.6.4.2 Programming of read jobs

Step	Read job
1.	Define user data range of the controller, i.e. define the location of the DP user data in the host (observe manufacturer-specific information).
2.	Enter the address of the desired parameter in the field "Index and subindex" (DP output data).
3.	Job = Read job. The bit "Job / handshake" must be changed (DP output data).
4.	Check whether the bit "Job / handshake" is the same for the DP input data and the DP output data. If the bit "Job / handshake" is the same, the response has been received. You should implement a time monitoring.
5.	Check whether the bit "Job / status" is set. ● If the bit "Job / status" is not set: Field "Data / error" contains the desired parameter value. ● If the bit "Job / status" is set: Read job was not executed correctly. Field "Data / error" contains the error information.

Example: Read parameter

The controller heatsink temperature (assumption: ϑ = 43° C) is to be read (C0061).

► Byte 1: Job



► Byte 2: Subindex

Subindex = 0, as there is no subindex under code C0061.

► Byte 3/4: Index (calculation)

Index (of read request) = 24575 - code number
Index = 24575 - 61 = 24514 = 5F $C2_{hex}$ ($5F_{hex}$ = high byte, $C2_{hex}$ = low byte)

► Byte 5 ...8: Data (contained in the response telegram)

Data 1 to data 4 = 43° C x 10000 = 430000 = 00 06 8F $B0_{hex}$

Result:

► Request telegram from master to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
01_{hex} 00000001_{bin}	**00_{hex}** 00000000_{bin}	**$5F_{hex}$** 01011111_{bin}	**$C2_{hex}$** 11000010_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}
Wait for change of handshake bit (bit 6 here: 0 → 1) in the response							

► Response telegram from drive to master (for faultless execution)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
30_{hex} $0011\ 0000_{bin}$	00_{hex} $0000\ 0000_{bin}$	$5F_{hex}$ $0101\ 1111_{bin}$	$C2_{hex}$ $1100\ 0010_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**06_{hex}** $0000\ 0110_{bin}$	**$8F_{hex}$** $1000\ 1111_{bin}$	**$B0_{hex}$** $1011\ 0000_{bin}$

Tab. 10.6-6 Telegram exchange in DRIVECOM parameter data channel

10.6.4.3 Programming of write jobs

Step	Write job
1.	Define user data range of the controller, i.e. define the location of the DP user data in the host (observe manufacturer-specific information).
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Enter parameter value in field ”Data/Error“.
4.	Job / service = Write job and the bit ”Job / handshake“ must be changed (DP output data).
5.	Check whether the bit ”Job / handshake“ is the same for the DP input data and the DP output data. If the bit ”Job / handshake“ is the same, the response has been received. You should implement a time monitoring.
6.	Check whether the bit ”Job / status“ is set: ● If the bit ”Job / status“ is not set: The job was executed faultlessly ● If the bit ”Job / status“ is set: The job was not executed faultlessly if the bit ”Job / status“ is set. Field ”Data / error“ contains the error information.

Example: Write parameter

The controller acceleration time (C0012) is to be set to T_{ir} = 20 s.

► Byte 1: Job

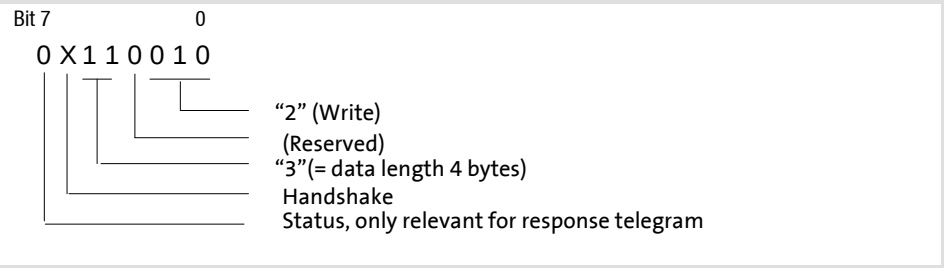


Fig. 10.6-6 Example

► Byte 2: Subindex

Subindex = 0, as there is no subindex under code C0012.

► Byte 3/4: Index (calculation)

Index = 24575 - code number

Index = 24575 - 12 = 24563 = 5F F3$_{hex}$ (5F$_{hex}$ = high byte, F3$_{hex}$ = low byte)

► Byte 5 - 8: Data

Calculation of the acceleration time: 20 s x 10,000 = 200,000 = 00 03 0D 40$_{hex}$

Result:

► Request telegram from master to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
72$_{hex}$ 0111 0010$_{bin}$	**00$_{hex}$** 0000 0000$_{bin}$	**5F$_{hex}$** 0101 1111 $_{bin}$	**F3$_{hex}$** 1111 0011$_{bin}$	**00$_{hex}$** 0000 0000$_{bin}$	**03$_{hex}$** 0000 0011$_{bin}$	**0D$_{hex}$** 0000 1101$_{bin}$	**40$_{hex}$** 0100 0000$_{bin}$
Wait for change of handshake bit (bit 6 here: 0 → 1)							

► Response telegram from drive to master (for faultless execution)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
70$_{hex}$ 0100 0110$_{bin}$	00$_{hex}$ 0000 0000$_{bin}$	5F$_{hex}$ 0101 1111 $_{bin}$	F3$_{hex}$ 1111 0011$_{bin}$	00$_{hex}$ 0000 0000$_{bin}$	00$_{hex}$ 0000 0000$_{bin}$	00$_{hex}$ 00000000$_{bin}$	00$_{hex}$ 0000 0000$_{bin}$
Wait for change of handshake bit (bit 6 here: 1 → 0)							

Tab. 10.6-7 Telegram exchange in DRIVECOM parameter data channel

10.6.5 Parameter set transfer

Note!

Always switch the mains after you have transferred the parameter sets with keypad!

Observe the options for parameter set transfer with keypad marked with “Keypad⇨“ under code C0002.

10.7 Troubleshooting

Two LEDs at the function module display the status:

LED status	LED green	LED yellow
Blinking	The initialisation between function module and controller is not yet completed	Telegram receipt
On	Function module is connected to voltage supply, no fault.	-
OFF	Function module has no voltage supply	No telegram receipt

Fault	Possible cause	Remedy
PROFIBUS-DP master indicates bus error and yellow LED on the function module is off	Short circuit/open circuit	Check PROFIBUS-DP wiring
	Bus termination not connected	Connect bus terminating resistor of the last bus device.
	Incorrect station address	Set correct station address.
PROFIBUS-DP master indicates bus error and yellow LED on the function module is blinking	Incorrect PROFIBUS-DP configuration data	Check the configuration data sent by the master under C1526. Permitted configuration data: 📖 10.5-7
Controller cannot be enabled	Not enabled via control word	Transmit $007F_{hex}$
	Controller inhibit via terminal active	X3/28 = HIGH (+12 ... +30 V)
	No setpoint selected	C0412/1 =200 (PROFIBUS-DP setpoint source) must be set
		Assign setpoint to process output data in C1511

10.8 Code table

How to read the table

Column	Meaning		
Code **	(Lenze) code The value of a configurable code marked by double asterisks (**) is not transmitted by parameter set transfer.		
Subcode	Subcode		
Index	Data on code addressing		
Lenze	Lenze setting of the code		
	Disp	Display code The code cannot be configured.	
Selection	Minimum value	[smallest step size / unit]	maximum value
	For a display code, the displayed values are given.		
Data type	• FIX32: 32-bit value with sign; decimal with 4 decimal positions • U16: 2 bytes, bit-coded • U32: 4 bytes, bit-coded • VS: Visible string, character string with defined length		

C0002: Parameter set management

(Extract from code table)

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C0002	0	24573_d = $5FFD_h$	0		FIX32

Parameter set management (selection 0):

Selection	Important
0 Ready	**PAR1 ... PAR4:** ● Parameter sets of controller ● PAR1 ... PAR4 **FPAR1:** ● Module-specific parameter set of function module ● FPAR1 is stored in the function module

Restore delivery condition:

Selection	Important
1 Lenze setting ⇨PAR1	Restore delivery condition in the selected parameter set
2 Lenze setting ⇨PAR2	
3 Lenze setting ⇨PAR3	
4 Lenze setting ⇨PAR4	
31 Lenze setting ⇨FPAR1	Restore delivery condition in the function module
61 Lenze setting ⇨PAR1 + FPAR1	Restore delivery condition in the selected parameter set of the controller and in the function module
62 Lenze setting ⇨PAR2 + FPAR1	
63 Lenze setting ⇨PAR3 + FPAR1	
64 Lenze setting ⇨PAR4 + FPAR1	

Transfer parameter sets using the keypad:

Selection		Important
You can use the keypad to transfer parameter sets to other controllers. During transfer, access to the parameters via other channels is inhibited!		
	Keypad ⇨ Controller	Overwrite all available parameter sets (PAR1 ... PAR4, FPAR1 if available) with the corresponding keypad data
70	With function module	
10	(other)	
	Keypad ⇨ PAR1 (+ FPAR1)	Overwrite selected parameter set and FPAR1 (if available) with the corresponding keypad data
71	With function module	
11	(other)	
	Keypad ⇨ PAR2 (+ FPAR1)	
72	With function module	
12	(other)	
	Keypad ⇨ PAR3 (+ FPAR1)	
73	With function module	
13	(other)	
	Keypad ⇨ PAR4 (+ FPAR1)	
74	With function module	
14	(other)	
	Controller ⇨ Keypad	Copy all available parameter sets (PAR1 ... PAR4, FPAR1 if available) into the keypad
80	With function module	
20	(other)	
	Keypad ⇨ Function module	Overwrite only the module-specific parameter set FPAR1 with the keypad data
40	Only with function module	
	Function module ⇨ Keypad	Copy only the module-specific parameter set FPAR1 into the keypad
50	Only with function module	

Save your own setting:

Selection		Important
9	PAR1 ⇨ Own setting	You can store your own setting for the parameters of the controller (e.g. delivery condition of your machine): 1. Check that parameter set 1 is active 2. Inhibit controller 3. Set C0003 = 3, confirm with ENTER 4. Set C0002 = 9, confirm with ENTER, your own setting is stored 5. Set C0003 = 1, confirm with ENTER 6. Enable controller
		You can use this function to simply copy PAR1 to the parameter sets PAR2 ... PAR4
5	Own setting ⇨PAR1	Restore your own setting in the selected parameter set
6	Own setting ⇨PAR2	
7	Own setting ⇨PAR3	
8	Own setting ⇨PAR4	

C0126:
Behaviour with communication error

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C0126	-	24449_d = $5F81_h$	10	0: All monitoring is deactivated. 2: Monitoring of internal communication active	FIX32

Monitoring of internal communication between function module and controller.

A communication abort with activated monitoring initiates TRIP (CE5).

Tip!

A description of the complete selection for this code is given in the Operating Instructions of your basic device.

C1500: Software identification code

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1500	-	23075_d = $5A23_h$	Disp	-	VS

The code contains a string with a length of 14 bytes. The identification code is displayed, e.g. 82ZAFU0C_1XXXX.

C1501: Software creation date

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1501	-	23074_d = $5A22_h$	Disp	-	VS

The code contains a string with a length of 17 bytes. The software creation date and time are displayed, e.g. Jun 21 2000 12:31.

C1502: Display of software identification code

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1502	1 ... 4	23073_d = $5A21_h$	Disp	-	U32

Display of code C1500 in 4 subcodes, 4 characters each.

C1503: Display of software creation date

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1503	1 ... 4	23072_d = $5A20_h$	Disp	-	U32

Display of code C1501 in 4 subcodes, 4 characters each.

C1509: Bus device addressing

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1509		23066_d = $5A1A_h$	1	1	[1]	126	FIX32

This code can be used for bus device addressing. The code is only effective if the address switches S1-S7 were set to OFF prior to mains switching.

Note!

The change of the bus device address will only be effective after mains switching of the module/drive.

C1510: Configuration of process input data

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1510		23065_d = $5A19_h$			FIX32
	1 (PIW1)		18	see table below	
	2 (PIW2)		3		
	3 (PIW3)		4		
	4 (PIW 4)		5		
	5 (PIW 5)		6		
	6 (PIW 6)		7		
	7 (PIW 7)		8		
	8 (PIW 8)		9		
	9 (PIW 9)		10		
	10 (PIW 10)		11		

The bit status information or the actual values of the controller can be freely assigned to the max. 10 process data input words (PIW) of the master.

Selection		Scaling
1	FIF status word 1 (FIF-STAT1)	16 bits
2	FIF status word 2 (FIF-STAT2)	16 bits
3	Output frequency with slip (MCTRL1-NOUT+SLIP)	±24000 ≡ ±480 Hz
4	Output frequency without slip (MCTRL1-NOUT)	±24000 ≡ ±480 Hz
5	Apparent motor current (MCTRL1-IMOT)	2^{14} ≡ 100 % rated device current
6	Actual process controller value (PCTRL1-ACT)	±24000 ≡ ±480 Hz
7	Process controller setpoint (PCTRL1-SET)	±24000 ≡ ±480 Hz
8	Process controller output (PCTRL1-OUT)	±24000 ≡ ±480 Hz
9	Controller load (MCTRL1-MOUT)	$\pm 2^{14}$ ≡±100 % rated motor torque
10	DC-bus voltage (MCTRL1-DCVOLT)	1ph: 960 ≡ DC 400 V 3ph: 975 ≡ DC 800 V
11	Ramp function generator input (NSET1-RFG1-IN)	±24000 ≡ ±480 Hz
12	Ramp function generator output (NSET1-NOUT)	±24000 ≡ ±480 Hz
13	FIF-OUT.W1	16 bits or 0 ... 65535
14	FIF-OUT.W2	16 bits or 0 ... 65535
15	FIF-OUT.W3	0...65535
16	FIF-OUT.W4	0...65535
17	DRIVECOM control word (DRIVECOM-CTRL)	16 bits
18	DRIVECOM status word (DRIVECOM-STAT)	16 bits

C1511: Configuration of process output data

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1511		23064_d = $5A18_h$			FIX32
	1 (POW1)		17	see table below	
	2 (POW2)		3		
	3 (POW3)		4		
	4 (POW 4)		5		
	5 (POW 5)		6		
	6 (POW 6)		7		
	7 (POW 7)		8		
	8 (POW 8)		9		
	9 (POW 9)		10		
	10 (POW 10)		11		

The process data output words (POW) of the master can be freely assigned to bit control commands or setpoints of the controller via C1511.

Selection		Scaling
1	FIF control word 1 (FIF-CTRL1)	16 bits
2	FIF control word 2 (FIF-CTRL2)	16 bits
3	Setpoint 1 (NSET1-N1)	±24000 ≡ ±480 Hz
4	Setpoint 2 (NSET1-N2)	±24000 ≡ ±480 Hz
5	Additional setpoint (PCTRL1-NADD)	±24000 ≡ ±480 Hz
6	Actual process controller value (PCTRL1-ACT)	±24000 ≡ ±480 Hz
7	Process controller setpoint (PCTRL1-SET1)	±24000 ≡ ±480 Hz
8	Reserved	
9	Torque setpoint or torque limit value (MCTRL1-MSET)	2^{14} ≡ 100 % rated motor torque
10	PWM voltage (MCTRL1-VOLT-ADD)	STOP Only for special applications. Modify only after having contacted Lenze!
11	PWM angle (MCTRL1-PHI-ADD)	
12	Reserved	
13	FIF-IN.W1	16 bits or 0 ... 65535
14	FIF-IN.W2	16 bits or 0 ... 65535
15	FIF-IN.W3	0...65535
16	FIF-IN.W4	0...65535
17	DRIVECOM control word (DRIVECOM-CTRL)	16 bits

C1512:
Enable process output data

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1512**		23063_d = $5A17_h$	1	1	[1]	65535	FIX32

When C1511 is modified, the process output data are automatically inhibited in order to ensure data consistency.

Use C1512 to reenable individual or all POWs.

Due to the different decimal values of the bit positions, any combinations of process data output words can be enabled.

► 0 = Inhibit output word

► 1 = Enable output word

Valency of bit positions				
POW 10	POW 9	...	POW 2	POW 1
2^9	2^8		2^1	2^0

The value 65535 ($FFFF_{hex}$) in code C1512 enables all process output data.

C1513:
Monitoring response time of PZD communication

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1513	-	23062_d = $5A16_h$	3000	0	[1 ms]	65535	FIX32

The value of the monitoring response time is provided by the master.

Note!
A change in monitoring is immediately effective.
Monitoring starts with the receipt of the first telegram.

Tip!
The value = 0 in C1513 deactivates monitoring.

C1514:
Monitoring reaction in case of PZD communication fault

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1514	-	23061_d = $5A15_h$	0	0 0: No action; 1: TRIP (fault) 2: CINH (controller inhibit) 3: QSP (quick stop)	[1]	3	FIX32

If the master does not send a message within the monitoring response time (configurable under C1513), the action set under this code is executed.

Note!
A change in the monitoring reaction is immediately effective.

C1516:
Display baud rate

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1516		23059_d = $5A13_h$	Disp	0	[1]	9	FIX32

Selection	Baud rate
0	12 MBit/s
1	6 MBit/s
2	3 MBit/s
3	1.5 MBit/s
4	500 kBit/s
5	187.5 kBit/s
6	93.75 kBit/s
7	45.45 kBit/s
8	19.2 kBit/s
9	9.6 kBit/s

C1517:
Display bus device address

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1517		23058_d = $5A12_h$	Disp	3	[1]	126	FIX32

Display of the bus device address set under C1509.

C1520:
Display of all words to master

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1520	1...10	23055_d = $5A0F_h$	Disp	0	[1]	65535	U16

Display of process data input words PIW1 to PIW10 under the individual subcodes. All words are displayed but only the ones configured are valid.

C1521:
Display of all words from master

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1521	1 (POW1) 2 (POW2) ... 10 (POW10)	23054_d = $5A0E_h$	Disp	0	[1]	65535	U16

Display of the process data output words POW1 ... POW10 of the master under the individual subcodes.

C1522:
Display of all process data words to basic device

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1522	1...16	23053_d = $5A0D_h$	Disp	0	[1]	65535	U16

Display of process data words 1 ... 16 that are transferred from the function module to the basic device:

Subcode	Process data word
1	FIF control word 1 (FIF-CTRL1)
2	FIF control word 2 (FIF-CTRL2)
3	Setpoint 1 (NSET1-N1)
4	Setpoint 2 (NSET1-N2)
5	Additional setpoint (PCTRL1-NADD)
6	Actual process controller value (PCTRL1-ACT)
7	Process controller setpoint (PCTRL1-SET1)
8	Reserved
9	Torque setpoint or torque limit value (MCTRL1-MSET)
10	PWM voltage (MCTRL1-VOLT-ADD)
11	PWM angle (MCTRL1-PHI-ADD)
12	Reserved
13	FIF-IN.W1
14	FIF-IN.W2
15	FIF-IN.W3
16	FIF-IN.W4

C1523:
Display of all process data words from basic device

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1523	1...16	23052_d = $5A0C_h$	Disp	0	[1]	65535	U16

Display of process data words 1 ... 16 that are transferred from the basic device to the function module:

Subcode	Process data word
1	FIF status word 1 (FIF-STAT1)
2	FIF status word 2 (FIF-STAT2)
3	Output frequency with slip (MCTRL1-NOUT+SLIP)
4	Output frequency without slip (MCTRL1-NOUT)
5	Apparent motor current (MCTRL1-IMOT)
6	Actual process controller value (PCTRL1-ACT)
7	Process controller setpoint (PCTRL1-SET)
8	Process controller output (PCTRL1-OUT)
9	Controller load (MCTRL1-MOUT)
10	DC-bus voltage (MCTRL1-DCVOLT)
11	Ramp function generator input (NSET1-RFG1-IN)
12	Ramp function generator output (NSET1-NOUT)
13	FIF-OUT.W1
14	FIF-OUT.W2
15	FIF-OUT.W3
16	FIF-OUT.W4

C1526:
Display of last configuration data

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1526	1: 1st byte 2: 2nd byte 3: 3rd byte	23050_d = $5A0A_h$	Disp	0	[1]	65535	FIX32

This code displays the current configuration data.

Configuration data indicate:

- ► The type of the set parameter channel
- ► The length of the process data
- ► The existence/non-existence of consistency

Observe the description for the user data length (📖 10.5-7)

C1530:
PROFIBUS-DP diagnostics

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1530		23045_d = $5A05_h$	Disp	see below	FIX32

Code C1530 gives information on the current status of the Profibus.

Selection		
Bit	**Meaning**	**Explanation**
0	Reserved	
1	Reserved	
2	Reserved	
3	Reserved	
5|4	Status of DP state machine (DP-STATE)	
00	"WAIT_PRM"	The slave waits for a parameter telegram after acceleration. Other types of telegrams will be rejected or will not be processed. Data exchange is not yet possible.
01	"WAIT_CFG"	The slave waits for the configuration telegram that determines the number of input and output bytes. The master informs the slave about the number of I/O bytes that will be transferred.
10	"DATA_EX"	If the parameter setting as well as the configuration of the firmware and the application have been accepted, the slave status changes to Data_Exchange (exchange user data with the master)
11	Not possible	
7|6	Status of watchdog state machine (WD-STATE)	
00	"BAUD_SEARCH"	The Profibus slave is able to recognise the transmission rate automatically.
01	"BAUD_CONTROL"	After recognising the correct baud rate, the slave status changes to "Baud_Control" and the transmission rate is monitored.
10	"DP_CONTROL"	The status 'DP_Control' is used for threshold monitoring of the Profibus-DP master.
11	Not possible	
11...8	PROFIBUS-DP transmission rate recognised by SPC3	

Bit	11	10	9	8	
	0	0	0	0	12 MBit/s
	0	0	0	1	6 MBit/s
	0	0	1	0	3 MBit/s
	0	0	1	1	1.5 MBit/s
	0	1	0	0	500 kBit/s
	0	1	0	1	187.5 kBit/s
	0	1	1	0	93.75 kBit/s
	0	1	1	1	45.45 kBit/s
	1	0	0	0	19.2 kBit/s
	1	0	0	1	9.6 kBit/s

12	Reserved
13	Reserved
14	Reserved
15	Reserved

C1531:
Bus status

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1531	1 ... 4	23044_d = $5A04_h$	Disp	0	[1]	65535	FIX32

Depending on the subcode, the following bus states are displayed:

- ► Subcode 1: Data cycles per second
- ► Subcode 2: Total data cycles
- ► Subcode 3: Total parameterisation events
- ► Subcode 4: Total configuration events

Tip!

When the maximum count value of 65535 is reached, the counter starts again with 0.

10.9 Appendix

10.9.1 Special characteristics when using with Lenze basic devices

Use of function module in conjunction with starttec motor starter

Note!

If the function module is used in conjunction with the starttec motor starter, solely the Lenze device control is effective.

In the following table, the bit assignments for the applicable control word 1 (FIF-CTRL1) and status word 1 (FIF-STAT1) are given:

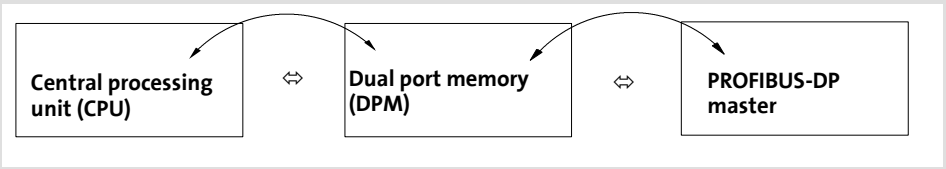
Control word 1 (FIF-CTRL1)		Status word 1 (FIF-STAT1)	
Bit	**Assignment**	**Bit**	**Assignment**
0	**S1**	**0**	Reserved
1	**S2**	**1**	Reserved
2	**Brake**	**2**	Reserved
3	Reserved	**3**	Reserved
4	Reserved	**4**	Reserved
5	Reserved	**5**	Reserved
6	Reserved	**6**	**Fixed 1**
7	Reserved	**7**	**Controller inhibit** 0 Controller enabled 1 Controller inhibited
8	Reserved	**11...8**	**Device status** Bit 11 10 9 8 0 0 1 1 Operation inhibited 0 1 1 0 Operation enabled 1 0 0 0 Fault active 1 1 1 1 Communication with basic device not possible
9	**Controller inhibit** (FIF-CTRL1-CINH) 0 Controller enabled 1 Controller inhibited		
10	**External fault** (FIF-CTRL1-TRIP-SET)		
11	**Fault reset** 0=>1 (FIF-CRTL1-TRIP-RESET) Bit change causes trip reset		
12	Reserved	**12**	Reserved
13	Reserved	**13**	Reserved
14	Reserved	**14**	Reserved
15	Reserved	**15**	**Ready for operation** 0 Not ready for operation (fault) 1 Ready for operation (no fault)

10.9.2 Consistent parameter data

In the PROFIBUS-DP communication system data are permanently exchanged between the master computer (**CPU + PROFIBUS-DP master**) and the basic device via the slave connection module.

The PROFIBUS-DP master as well as the CPU (central processing unit) of the master computer access a joint memory - the dual port memory (DPM).

The DPM allows data exchange in both directions (write/read):



It could happen that a slower PROFIBUS-DP master writing would be overtaken by a faster CPU reading within a cycle time without any further data organisation.

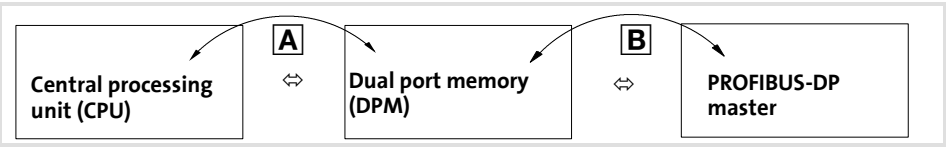
To avoid such a non-permissible status, the parameter data to be transmitted by must be marked as ”consistent”.

Data communication with existing consistency

With consistency, either ”reading” or ”writing” is possible in the memory with simultaneous access of master and CPU:

- ► PROFIBUS-DP master transfers data only as a complete data record.
- ► The CPU can only access completely updated data records.
- ► PROFIBUS-DP master cannot read or write data as long as the CPU accesses consistent data.

The result becomes clear from the example below:



A CPU wants to read!
B Master wants to write simultaneously!
1. As the master can only write if the CPU does not read, the master waits until the data are read completely by the CPU.
2. The master only writes a complete data record into DPM.

Configuring consistent data

Consistency is achieved by a suitable PROFIBUS-DP master configuration. Please use the corresponding Instructions for your configuring software for this purpose.

Tip!

Consistency configuration depends on the PROFIBUS-DP master configuring software. When using a Siemens-S5 PLC, please consider:

- ► Consistency is switched on by any word in the consistent area
- ► Consistency must be switched off by a specific switch-off word.
- ► The type of CPU, consistency and address area depends which word switches off consistency.

10.9.3 Certificates

ZERTIFIKAT

Die PROFIBUS Nutzerorganisation e.V. erteilt der

Lenze GmbH & Co KG
Postfach 10 13 52; 31763 Hameln
das Zertifikat Nr.: **Z00547**
für folgendes Produkt:

Name: **8200 neu-PROFIBUS DP**
Modell: **Feldbus-Funktionsmodul für Frequenzumrichter**
Version: **V0.3; SW: 1.0**
GSD: **LENZ00DA.gsd**

Das Zertifikat bestätigt, daß das oben genannte Produkt die Prüfungen auf Konformität für PROFIBUS DP Slave-Geräte erfolgreich bestanden hat.

Die Prüfungen erfolgten gemäß „Test Specifications for PROFIBUS DP Slaves, Version 2.0, Feb. 2000" in dem von der PNO autorisierten Prüflabor bei der Siemens AG in Fürth. Prüfumfang und Prüfergebnis sind im Prüfbericht Nr. 221-2 protokolliert.

Dieses Zertifikat wird erteilt aufgrund der PNO-Richtlinie für Prüfen und Zertifizieren (PRZ) vom 01. August 1999 und ist gültig für einen Zeitraum von 3 Jahren bis zum 18. Dezember 2005.

Karlsruhe, den 19.03.2003 ..... (Bearbeiter)

Der Vorstand der PROFIBUS Nutzerorganisation:

..... (K.-P. Lindner) ..... (Prof. K. Bender)

E82ZAFP014

10.10 Index

R

S

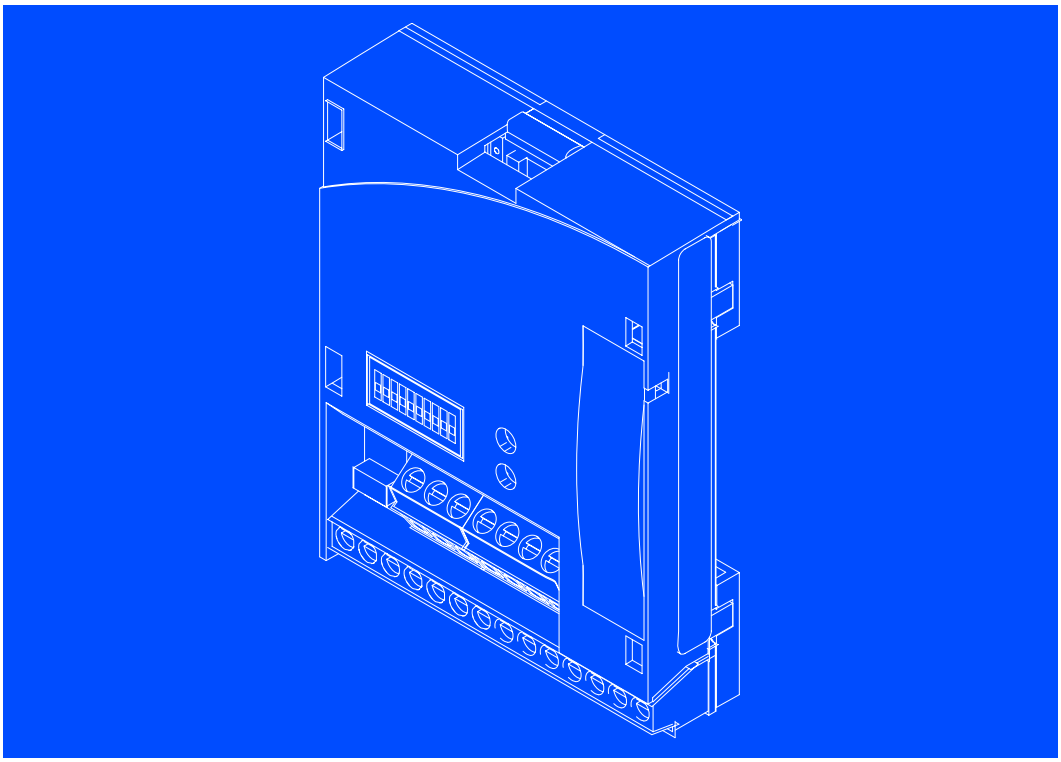
T

V

W

EDSPBS

PROFIBUS-DP I/O



Function module E82ZAFPC201

Lenze

11 E82ZAFPC201 function module (PROFIBUS-DP I/O)

Contents

11.1 Before you start

Tip!

Current documentations and software updates for Lenze products can be found on the Internet in the ”Downloads” area under

http://www.Lenze.com

11.1.1 Your opinion is important to us

These Instructions were created to the best of our knowledge and belief to give you the best possible support for handling our product.

If you have suggestions for improvement, please e-mail us to:

feedback-docu@Lenze.de

Thank you for your support.

Your Lenze documentation team

11.1.2 What is new / what has changed in these Instructions?

Date published	Changed contents	Notes
06/2004		First edition

11.2 General information

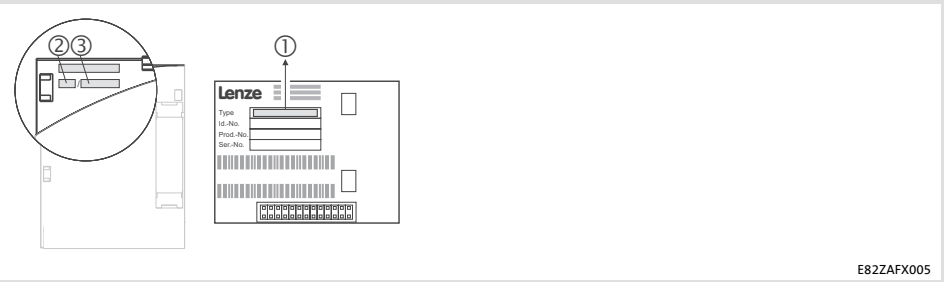
Validity

These Instructions are valid for

► E82ZAFPC201 function modules (PROFIBUS-DP I/O), as of version 1x1x

These Instructions are only valid together with the Operating Instructions for the basic devices that are permissible for the application.

Identification



	→①			→②	→③	
Type code	**E82ZAF**	**P**	**C**	**201**	**1x**	**1x**
Series						
PROFIBUS-DP						
Device generation						
Variant: V201 (PROFIBUS-DP I/O)						
Hardware version						
Software version						

Application range

The E82ZAFPC201 function module can be used in conjunction with the following basic devices		as of version
Frequency inverter	8200 vector	Vx14
	8200 motec	Vx14
Motor starter	starttec	Vx1x, see notes 📖 11.9-1

Features

The function module connects Lenze basic devices to the PROFIBUS-DP serial communication system.

Basic devices can be retrofitted with function modules.

11.3 Technical data

11.3.1 General data and operating conditions

Field	Values
Order designation	E82ZAFPC201
PUO ID number	$081B_{hex}$
Communication profile (DIN 19245 Part 1 and Part 3)	• PROFIBUS-DP-V0 • PROFIBUS-DP-V1 (not in case of compatibility with E82ZAFPC0xx)
Communication medium	RS485
Drive profile	• DRIVECOM Profile 20, can be switched off, • PROFIDrive version 2, can be switched off, (status machine and PKW interface)
Network topology	Without repeater: line / with repeaters: line or tree
PROFIBUS-DP device	Slave
Baud rate [kBit/s]	9.6 ... 12000 (automatic detection)
Process data words (PZD) (16 bits)	1 word ... 10 words
DP user data length	Parameter data channel (4 words) + process data words (1 ... 10 words)
Max. number of devices	Standard: 32 (= 1 bus segment) / with repeaters: 125
Max. cable length per bus segment	1200 m (depending on the baud rate and cable type used)
External DC voltage supply	+24 V DC ±10 %, max. 100 mA
Type of protection	IP20
Ambient temperature	Operation: -20 °C ... +60 °C Transport: -25 °C ... +70 °C Storage: -25 °C ... +60 °C
Climatic conditions	Class 3K3 according to EN 50178 (without condensation, average relative humidity 85 %)
Degree of pollution	EN 50178, pollution degree 2

Plug-in connections

Field	Values
Plug connector X3.1	
/E1* /E2	Input resistance 3.3 kΩ 0 = LOW (0 ... +3 V) PLC level, HTL 1 = HIGH (+12 V ... +30 V) PLC level, HTL Reference: GND2 *) Alternatively frequency input 0 ... 10 kHz, one-track, or 0 ... 1 kHz, two-track, configuration via C0425
/20	I_{max} = 10 mA
Plug connector X3.2	
/VP	Max. load: 10 mA, reference: GND3
/28	External supply of the terminal with U (ext.) = +12 V DC - 0% ... +30 V DC + 0%, Reference: GND2
/20	I_{max} = 10 mA, reference: GND1

11.3.2 Protective insulation

Insulation voltages between bus and ...	Type of insulation
● Power stage	
– 8200 vector	Double insulation
– 8200 motec	Double insulation
– starttec	Double insulation
● Ground reference plane / PE (X3/7)	Functional insulation
● External supply (X3/59)	Functional insulation
● Terminal X3.1/E1 or X3.1/E2	Functional insulation
● Terminal X3.1/20 or X3.2/20	Functional insulation
● Terminal X3.2/28	Functional insulation

11.3.3 Communication times

Tip!

The communication time is the time between the start of a request and the arrival of the corresponding response.

The PROFIBUS communication times depend on:

► Processing time in the controller

► Transmission delay time
- Transmission rate (baud rate)
- Telegram length

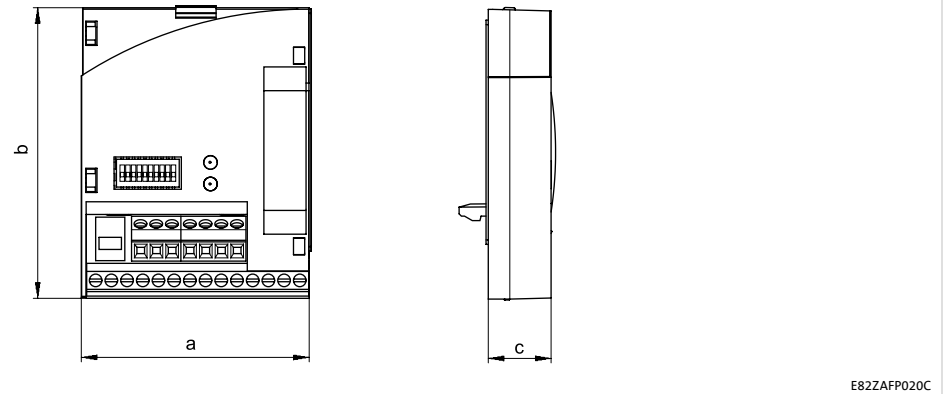
Processing time 8200 vector / 8200 motec / starttec

The parameter data and process data are independent of each other.

► Parameter data: approx. 30 ms + 20 ms tolerance

► Process data: approx. 3 ms + 2 ms tolerance

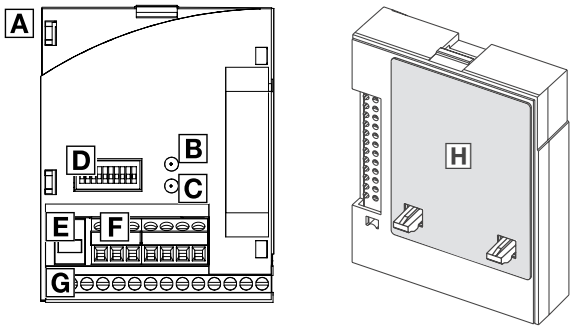
11.3.4 Dimensions



a	51 mm
b	64 mm
c	15 mm

11.4 Installation

11.4.1 Function module components



E82ZAFPC020B, E82ZAFX009

Pos.	Name	Notes
A	E82ZAFPC201 function module	
B	Status display (yellow) for communication with PROFIBUS-DP	11.5-14
C	Status display (green) for communication with drive	
D	DIP switch to set • the compatibility to E82ZAFPC0xx function module • the device address	11.5-5 11.5-13
E	DIP switch for activating the bus terminating resistor	11.5-10
F	Terminal strip X3.1, connections for • digital inputs E1 and E2 • external voltage supply	11.4-8
G	Terminal strip X3.2, connections for • PROFIBUS-DP • controller inhibit (CINH) • external voltage supply	
H	Nameplate	11.2-1

11.4.2 Mechanical installation

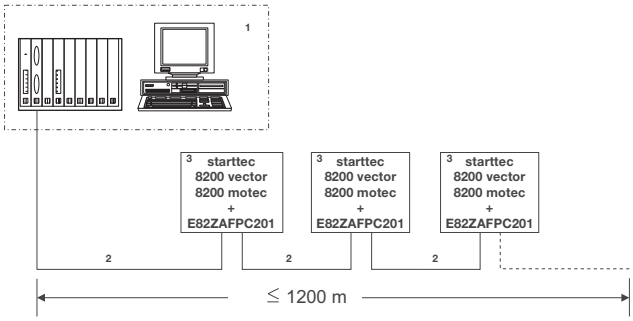
Please see the Mounting Instructions for the basic device for the mechanical installation of the function module.

The Mounting Instructions for the basic device

- ► are part of the scope of supply and are enclosed with each device.
- ► provide tips for avoiding damage through improper handling.
- ► describe the obligatory order of installation steps.

11.4.3 Electrical installation

Basic design of a PROFIBUS-DP network with RS485 cabling without repeater



No.	Element	Note
1	Master computer	E.g. PC or PLC with PROFIBUS-DP master interface module
2	Bus cable	Adapt baud rate to bus cable length.
3	PROFIBUS-DP slave	Appropriate basic device with E82ZAFPCxxx function module

Note!

When using a repeater, max. 125 devices can communicate via the PROFIBUS.

EMC-compliant wiring

For wiring according to EMC please observe the following points:

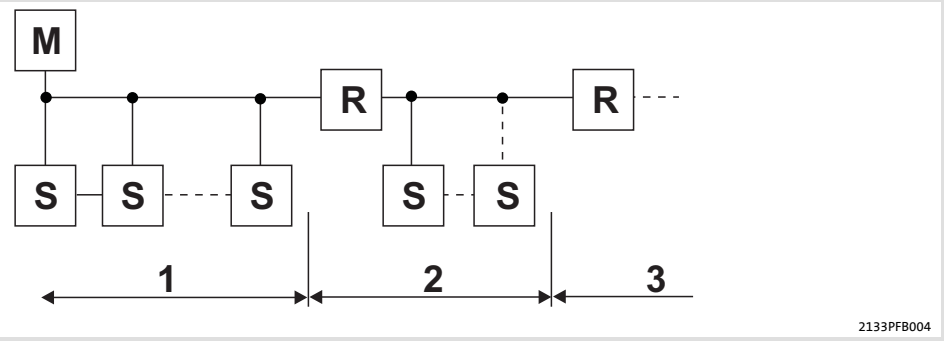
Note!

- ► Separate control cables from motor cables.
- ► Connect control and data cable shields as follows:
  – For cables with *digital signals on both sides*.
- ► Use an equalising conductor with a cross-section of at least 16 mm^2 (reference: PE) to avoid potential differences between decentralised systems (8200 motec / starttec).
- ► Please observe the other notes concerning EMC-compliant wiring given in the Instructions of the basic device.

Wiring procedure

1. Do not change the bus topology, i.e. do not use stubs.
2. Observe the wiring notes given in the documentation for the control system.
3. Only use cables which correspond to the listed specifications, see (📖 11.4-7).
4. Observe the notes on the voltage supply of the function module, see (📖 11.4-9).
5. Activate the bus terminating resistors at the first and last physical bus device, see (📖 11.5-10).

Number of bus devices



Segment	Master (M)	Slave (S)	Repeater (R)
1	1 2	31 30	- -
2	-	31	1
3	-	31	1

Tip!

Repeaters do not have their own addresses but they are taken into account when determining the max. number of slaves.

Repeaters can be used to build up line and tree topologies. In this case, the maximum total bus system expansion depends on

- ► the baud rate used
- ► the number of repeaters used

Baud rate / bus cable length

Baud rate [kBit/s]	Length [m]
9.6 - 93.75	1200
187.5	1000
500	400
1500	200
3000 - 12000	100

Tip!

For high baud rates we recommend to consider the application of optical fibres.

Advantages of optical fibres:

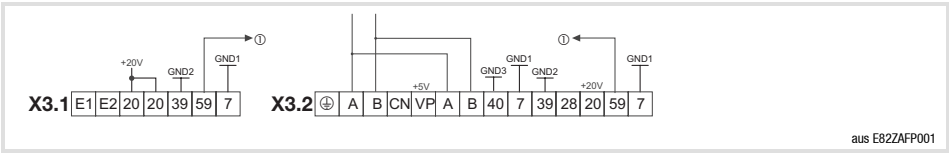
- External electromagnetic interferences on the transmission path remain ineffective.
- Bus lengths of several kilometres are also possible with higher baud rates. The bus length is
  - independent of the baud rate.
  - dependent on the optical fibre used.

Specification of the transmission cable

Please observe our recommendations for signal cables.

Specification bus cable	
Cable resistance	135 - 165 Ω/km, (f = 3 - 20 MHz)
Capacitance per unit length	≤ 30 nF/km
Loop resistance	< 110 Ω/km
Wire diameter	> 0.64 mm
Wire cross-section	> 0.34 mm^2
Wires	double twisted, insulated and shielded

11.4.3.1 Terminal assignment

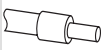


X3.1/	Name	Function	Level
E1	Digital inputs	Individual setting: Adapt the digital inputs via C0007 or C0410.	See "Technical data"
E2			
20		DC voltage source for internal supply of controller inhibit (CINH)	+20 V (ref: GND1)
39	GND2	Reference potential of ● controller inhibit (CINH) at X3.2/28 ● digital inputs at X3.1/E1 and X3.1/E2	
59		External DC supply for the function module	U (ext.) = +24 V DC ± 10% (reference: GND1)
7	GND1	Reference potential for X3.1/20 or X3.2/20	

X3.2/	Name	Function	Level
⏚	PES	Additional HF shield termination	
A	T/R(A)	RS485 data cable A	
B	T/R(B)	RS485 data cable B	
CN	CNTR	See PROFIBUS-DP standard *)	Data transfer: CNTR = HIGH (+5 V, reference: GND3)
VP		See PROFIBUS-DP standard *)	+5 V (ref.: GND3)
40	GND3	Reference potential for PROFIBUS-DP network *)	
7	GND1	Reference potential for X3.1/20 or X3.2/20	
39	GND2	Reference potential of ● controller inhibit (CINH) at X3.2/28 ● digital inputs at X3.1/E1 and X3.1/E2	
28	CINH	Controller inhibit	● Start = HIGH (+12 V ... +30 V) ● Stop = LOW (0 ... +3 V)
20		DC voltage source for internal supply of controller inhibit (CINH)	+20 V (ref: GND1)
59		External DC supply for the function module	U (ext.) = +24 V DC ± 10% (reference: GND1)

*) e. g. when connecting a repeater

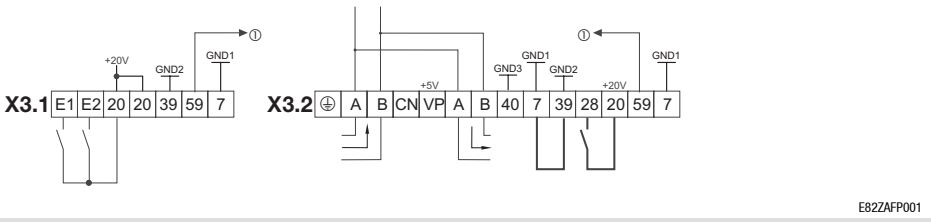
Terminal data

Electrical connection	Terminal strip with screw connection
Possible connections	 rigid: 1.5 mm² (AWG 16)
	flexible:  without wire end ferrule 1.0 mm² (AWG 18)  with wire end ferrule, without plastic sleeve 0.5 mm² (AWG 20)  with wire end ferrule, with plastic sleeve 0.5 mm² (AWG 20)
Tightening torque	0.22 ... 0.25 Nm (1.9 ... 2.2 lb-in)
Bare end	5 mm

11.4.3.2 Voltage supply

Internal DC voltage supply

The internal voltage is available at terminal X3.1/20 or X3.2/20. It supplies the controller inhibit (CINH) and the digital inputs E1/E2.



———	Minimum wiring required for operation

External voltage supply

Note!

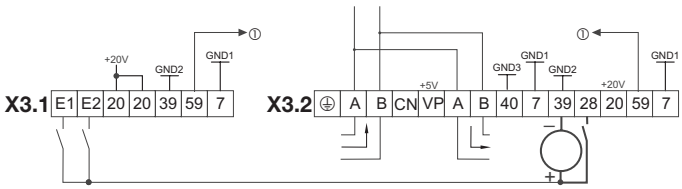
With external voltage supply, always use a separate power supply in every control cabinet (technical data: see (📖 11.3-1), external DC voltage supply).

External voltage supply is necessary

- ► if the communication with the master is to be maintained even if one or several devices are disconnected from the mains.
- ► if the bus system is to stay active even if the device with the activated bus terminating resistor is disconnected from the mains.

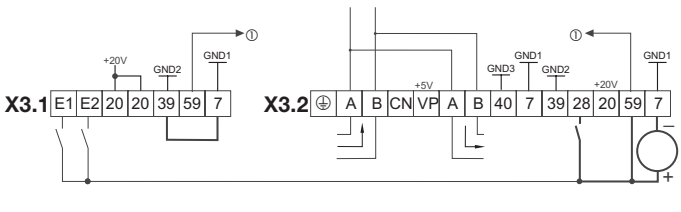
External voltage supply of

- ► X3.1/E1 and X3.1/E2, digital inputs
- ► X3.2/28, controller inhibit (CINH)



External voltage supply of

- ► X3.1/E1 and X3.1/E2, digital inputs
- ► X3.2/28, controller inhibit (CINH)
- ► X3.2/59, E82ZAFPC201 function module



———	Minimum wiring required for operation

11.5 Commissioning

Tip!

You will find the current GSE file for this Lenze product in the Internet in the ”Downloads” area under

http://www.Lenze.com

11.5.1 Before switching on

Stop!

Please check the following before you switch on the basic device together with the function module for the first time in the PROFIBUS-DP network:

- Completeness of the wiring, earth fault, and short circuit.
- Whether the bus system is terminated at the first and last physical bus device with an integrated active bus terminating resistor.

11.5.2 First switch-on

Note!

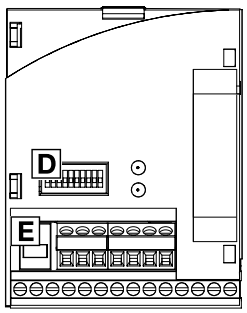
Keep to the switch-on sequence!

Step-by-step commissioning of the function module with DRIVECOM device control is described below.

Step	Procedure	See
1.	Provide software compatibility to the function module ● E82ZAFPC201 (switch S8 = OFF) ● E82ZAFPC0xx (switch S8 = ON). For this setting, continue with commissioning of function module E82ZAFPC0xx in the corresponding part of the PROFIBUS-DP Communication Manual. **Lenze setting: S8 = OFF**	📖 11.5-5
2.	Configure host system for communication with function module.	📖 11.5-6
3.	Check bus termination ● Only for the first and last bus device: Activate bus terminating resistor through DIP switch = ON **Lenze setting: OFF**	📖 11.5-10
4.	Connect mains voltage and, if necessary, external voltage supply of the function module ● The basic device will be ready for operation after approx. 1 second. ● Controller inhibit is active. **Reaction** ● Green LED at the front of the function module is lit (only visible in case of 8200 vector). ● Keypad: RDY IMP (if attached)	📖 11.5-14
5.	Assign address. ● Assign a definite station address via C1509 or ● set address via switch **Lenze setting: 3** Changed settings will not be effective until the voltage supply of the function module and the basic device has been switched off and on again.	📖 11.5-12
6.	Communication with the controller is now possible, i.e. all codes can be read and all changeable codes can be modified. If necessary, adapt the codes to your application (see Operating Instructions of the basic device). Yellow LED on the function module is blinking when PROFIBUS-DP is active.	📖 11.5-14
7.	Select function module as source for control commands and setpoints ● Setting necessary to contact the controller via the fieldbus: C0005 = 200	

Step	Procedure	See
8.	Assign process output words (POW) of the master via C1511 to the process input words of the controller. **Lenze setting:** POW1: DRIVECOM control word (DRIVECOM-CTRL) POW2: Setpoint1 (NSET1-N1) POW3: Setpoint2 (NSET1-N2) POW4: Additional setpoint (PCTRL1-NADD) POW5: Actual process controller value (PCTRL1-ACT) POW6: Process controller setpoint (PCTRL1-SET1) POW7: Reserved (FIF-RESERVED) POW8: Torque setpoint or torque limit value (MCTRL1-MSET) POW9: PWM voltage (MCTRL1-VOLT-ADD) POW10: PWM angle (MCTRL1-PHI-ADD)	📖 11.6-3
9.	Assign process output words of the controller via C1510 to the process input words (PIW) of the master. **Lenze setting:** PIW1: DRIVECOM status word (DRIVECOM-STAT) PIW2: Output frequency with slip (MCTRL1-NOUT+SLIP) PIW3: Output frequency without slip (MCTRL1-NOUT) PIW4: Apparent motor current (MCTRL1-IMOT) PIW5: Actual process controller value (PCTRL1-ACT) PIW6: Process controller setpoint (PCTRL1-SET1) PIW7: Process controller output (PCTRL1-OUT) PIW8: Controller load (MCTRL1-MOUT) PIW9: DC-bus voltage (MCTRL1-DCVOLT) PIW10: Ramp function generator input (NSET1-RFG1-IN)	📖 11.6-7
10.	Enable process output data via C1512 = 65535 Only necessary if C1511 has been changed.	
11.	Enable the controller via terminal. Terminal 28 = HIGH	
12.	Enter the setpoint. Master transfers setpoint via selected POW.	
13.	Change to status “READY TO SWITCH ON“: Master transfers DRIVECOM control word: 0000 0000 0111 1110_{bin} ($007E_{hex}$).	📖 11.6-10
14.	Controller is “READY TO SWITCH ON“. Master receives DRIVECOM status word: xxxx xxxx x01x $0001_{bin.}$	
15.	Change to “OPERATION ENABLED“. Master transfers DRIVECOM control word: 0000 0000 0111 1111_{bin} ($007F_{hex}$).	
16.	The drive is now running.	

11.5.3 Software compatibility setting



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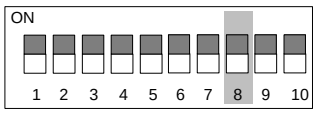

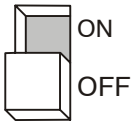

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Fig. 11.5-1 Software compatibility setting

DIP switch D	
Compatibility	**S8**
E82ZAFPC201	OFF
E82ZAFPC0xx	ON

11.5.4 Configuration of the host

The host must be configured before communication with the communication module is possible.

Master settings

For configuring the PROFIBUS-DP, the device data base file (*.GSE) of the communication module must be read into the master.

Device data base file

The following configurations are saved in the device data base file LENZ08IB.GSE:

Selection text in LENZ08IB.GSE		Parameter data with consistency	Process data with/without consistency	Occupied I/O memory
Drivecom-PAR (Cons)	+ PZD (n Words)	DRIVECOM	n words without consistency	4 + n words
Drivecom-PAR (Cons)	+ PZD (n Words Cons)		n words with consistency	4 + n words
PKW (Cons)	+ PZD (n Words)	PKW	n words without consistency	4 + n words
PKW (Cons)	+ PZD (n Words Cons)		n words with consistency	4 + n words
PZD (n Words)		without parameter data channel	n words without consistency	n words
PZD (n Words Cons)		without parameter data channel	n words with consistency	n words

n = 1 ... 10

Setting compatibility to PPO types 1 ... 5

Process data assignment of PPO types:

Type	Selection text in LENZ08IB.GSE		
PPO1	PKW (Cons)	+	PZD (2 Words)
	PKW (Cons)	+	PZD (2 Words Cons)
PPO2	PKW (Cons)	+	PZD (6 Words)
	PKW (Cons)	+	PZD (6 Words Cons)
PPO3			PZD (2 Words)
			PZD (2 Words Cons)
PPO4			PZD (6 Words)
			PZD (6 Words Cons)
PPO5	PKW (Cons)	+	PZD (10 Words)
	PKW (Cons)	+	PZD (10 Words Cons)

Note!

In order to achieve compatibility to the PPO types 1 ... 5 (PROFIDrive device control), the following codes must be configured in addition:

- ► C1510/1 = 20 (PROFIDrive status word)
- ► C1511/1 = 19 (PROFIDrive control word)

Example 1

The slave is to operate with PPO2 and consistent process data.

The following entry must be selected in the GSE file:

”PKW(Cons)+PZD(6W Cons)”

In addition the following codes must be set via the parameter data channel:

- ► C1510/1 = 20
- ► C1511/1 = 19

Example 2

The slave is to operate with PPO4 and inconsistent process data.

Start with setting the following codes via the parameter data channel:

► C1510/1 = 20

► C1511/1 = 19

Then select the following entry in the GSE file:

”PZD(6W)”

Adaptation of the device controls

Note!

After selecting the configuration in the device data base file, the codes C1510 and C1510 must be adapted to the corresponding device control.

Then C1512 must be set to the value “65535” in order to reenable the process data output words.

► Lenze device control
  – Set C1510 /1 (PIW1) to the value “1”: FIF status word 1 (FIF-STAT1).
  – Set C1511 /1 (POW1) to the value “1”: FIF control word 1 (FIF-CTRL1).

► Device control via DRIVECOM (Lenze setting)
  – Set C1510 /1 (PIW1) to the value “18”: DRIVECOM status word (DRIVECOM-STAT).
  – Set C1511 /1 (POW1) to the value “17”: DRIVECOM control word (DRIVECOM-CTRL).

► Device control via PROFIDrive
  – Set C1510 /1 (PIW1) to the value “20”: PROFIDrive status word (PROFIDrive-STAT).
  – Set C1511 /1 (POW1) to the value “19”: PROFIDrive control word (PROFIDrive-CTRL).

For Lenze codes see (📖 11.8-1)

Tip!

Use overall consistency

► Please note that the processing of consistent data varies between hosts. This must be considered in the PROFIBUS-DP application program.

► Detailed description of consistency: See Appendix

Defining user data length

The user data length is defined during the DP initialisation phase (configuration). You can configure up to 10 process data words.

Optionally you can activate a parameter data channel. If the parameter data channel is active, it additionally occupies 4 words of input and output process data.

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

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

The user data lengths for process input data and process output data are identical. The selection takes place via identification bytes in the configuration software for the PROFIBUS-DP system.

Parameter data channel		Process data channel
Without / with	**Identification / user data length**	**Identification / user data length**
Without	-	• Identification – without consistency: 70_{hex} ... 79_{hex} (112 ... 121) – with consistency: $F0_{hex}$ ... $F9_{hex}$ (240 ... 249) • User data length: 1 ... 10 words (POW1/PIW1 ... POW10/PIW10)
With	• Identification: $F3_{hex}$ (243) • User data length: 4 words (word 1 ... word 4)	• Identification – without consistency: 70_{hex} ... 79_{hex} (112 ... 121) – with consistency: $F0_{hex}$ ... $F9_{hex}$ (240 ... 249) • User data length: 1 ... 10 words (POW1/PIW1 ... POW10/PIW10)

General structure of the identification byte

MSB							LSB
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**

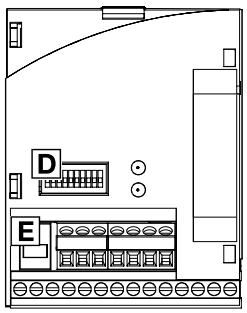
Data length
00 1 byte or 1 word
...
15 16 bytes or 16 words

Input/Output
00 Specific identification format
01 Input
10 Output
11 Input and output

Length/Format
0 Byte
1 Word

Consistency
0 Byte or word
1 Total length

11.5.5 Activation of bus terminating resistor



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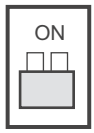

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Fig. 11.5-2 Activation of bus terminating resistor

DIP switch E	
DIP switch = ON	Integrated active bus terminating resistor is switched on
DIP switch = OFF	Integrated active bus terminating resistor is switched off

11.5.6 Switching on the controller's mains voltage

Note!

If the external voltage supply of the function module is used, the supply must be switched on as well.

The basic device will be ready for operation approx. 1 s after switching on the voltage supply.

Controller inhibit is active.

Green LED at the front of the function module is lit (only visible in case of 8200 vector frequency inverter).

If the LEDs are not lit as expected, see (📖 11.7-1).

Protection against uncontrolled restart

Note!

In some cases, the controller should not restart after a fault (e.g. after a short mains failure).

► The drive can be inhibited by setting C0142 = 0 if
  – the corresponding controller sends an LU message and
  – the fault is active for more than 0.5 seconds.

Parameter function:

► C0142 = 0
  – the controller remains inhibited even after the fault has been eliminated
  – the drive restarts in a controlled mode: LOW-HIGH edge at terminal 28 (CINH)

► C0142 = 1
  – An uncontrolled restart of the controller is possible.

11.5.7 Addressing

To address the controllers, each bus device must be allocated a definite address.

Note!

- If S1 - S7 = OFF, the device address from *code C1509* becomes active with switching on.
- As soon as one of the switches S1 ... S7 = ON, the address from the *switch settings* becomes active with switching on.

The Lenze setting of the switches (S1 - S8) is **OFF**.

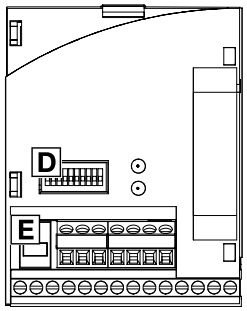
Switch off the voltage supply of the communication module and the controller and switch it on again in order to activate the changed settings.

Valid address range

Input by	Valid address range	Notes
• Keypad or PC	3...126	-
• DIP switch	3...125	When entering the address 0, 1, 2, 126 or 127, the settings from code C1509 become active.

The address settings can be freely selected via the front DIP switch, the keypad and the PC or by the master (class 2).

Address settings through the front DIP switch



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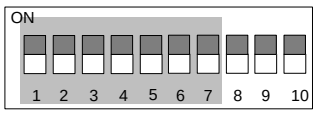

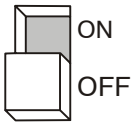

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Fig. 11.5-3 Set bus device address

DIP switch D	
Address	**S1 ... S7**

The address (decimal number) is calculated by inserting the switch status of switches S1 ... S7 ('0' = OFF and '1' = ON) into the equation:

$$Address_{dec} = S_1 \cdot 2^0 + S_2 \cdot 2^1 + S_3 \cdot 2^2 + S_4 \cdot 2^3 + S_5 \cdot 2^4 + S_6 \cdot 2^5 + S_7 \cdot 2^6$$

The equation also indicates the valency of an activated switch (see front labelling). The sum of valencies makes the device address to be set:

Switch	S1	S2	S3	S4	S5	S6	S7
Valency	1	2	4	8	16	32	64

Example 1:

Switch	S1	S2	S3	S4	S5	S6	S7
Switch position	1	1	1	0	0	0	0
Address (= 7)	1	2	4	0	0	0	0

Example 2:

Switch	S1	S2	S3	S4	S5	S6	S7
Switch position	1	0	0	1	1	0	0
Address (= 25)	1	0	0	8	16	0	0

Address settings through the keypad or the PC

The address is set under code C1509 (see code table for the controller).

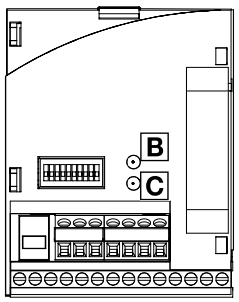
DIP switches S1 - S7 must be in OFF position (= delivery state).

Address settings through the master class 2

In this case, only one PROFIBUS-DP device must be connected to the bus. This can be achieved by a special switch-on sequence.

Master settings (only master class 2) have an effect on the setting in code C1509.

11.5.8 Status display



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Pos	LED status	Explanation
B	OFF	• No communication with the PROFIBUS master. • Function module not supplied with voltage.
	BLINKING	Communication with the PROFIBUS master has been built up through the function module.
C	OFF	• Function module not supplied with voltage. • Basic device and/or external voltage supply switched off.
	BLINKING	Function module is supplied with voltage but not connected to the basic device. Cause: • Basic device switched off • Basic device in initialisation phase • Basic device not connected
	Constantly ON	Function module is supplied with voltage and connected to the basic device.
B +C	BLINKING	Internal function module error

11.6 Data transfer

11.6.1 General information

PROFIBUS-DP transfers two different data types between the master computer and the controllers.

► Parameter data

► Process data

As indicated in the table, these data are distributed into communication channels according to their time-critical response.

Process data
● Process data are transferred via the process data channel.
● Use process data to control the drive controller.
● The master computer has direct access to the process data. In the PLC, for instance, the data are directly assigned to the I/O area. An exchange between the master drive and the controller is required in the shortest possible time with small amounts of data being transferred cyclically.
● Process data are – not stored in the controller. – transferred between the host and the controllers in order to exchange current input and output data continuously.
● Process data are, for instance, setpoints and actual values.
An exchange between the master drive and the controller is required in the shortest possible time with small amounts of data being transferred cyclically.

Parameter data
● Parameter data are transferred via the parameter data channel.
● If the parameter data channel is active, it additionally occupies 4 words of input and output process data.
● Observe the notes on code C0003 when saving parameter changes.
● In general, the transfer of parameters is not time-critical.
● Parameter data are, for instance, operating parameters, diagnostics information and motor data.

Tab. 11.6-1 Distribution of parameter data and process data into different communication channels

11.6.2 Device control

11.6.2.1 Configuration of process data

Use the free process data configuration to assign the max. 10 PROFIBUS-DP process data words to the controller process data words. Define the assignments in codes C1511 (process output data) and C1510 (process input data).

Tip!

The ”view” is always from the master.

- ► The master sends process output data in max. 10 process data output words (POW) to the bus device.
- ► The master receives process input data in max. 10 process data input words (PIW) from the bus device.

11.6.2.2 Process data signals for 8200 vector / 8200 motec / starttec

Configuration of process output data

The assignment of the max. 10 process data output words (POW) of the master to bit control commands or setpoints of the controller can be freely configured via C1511.

Note!

The assignment of control words of different device controls is not permitted.

► To activate the DRIVECOM control, assign the DRIVECOM control word a POW (C1511/x = 17).
  – The DRIVECOM control word is mapped to the FIF control word 1.
  – The controller operates in compliance with the DRIVECOM status machine. (📖 11.6-10).

► To activate the PROFIDrive device control, assign the PROFIDrive control word a POW (C1511/x = 19).
  – The PROFIDrive control word is mapped to the FIF control word 1.
  – The controller operates in compliance with the PROFIDrive status machine (📖 11.6-14).

► You can set up an extended Lenze device control using the FIF control words (📖 11.6-6).

Note!

When C1511 is changed, the process output data are automatically inhibited to guarantee data consistency. Use C1512 to reenable individual or all POWs.

Configuration of process output data

Code	Subcode	Index	LENZE setting		Data type
C1511		23064_d = $5A18_h$			FIX32
	1 (POW1)		17	DRIVECOM control word (DRIVECOM-CTRL)	
	2 (POW2)		3	Setpoint 1 (NSET1-N1)	
	3 (POW3)		4	Setpoint 2 (NSET1-N2)	
	4 (POW 4)		5	Additional setpoint (PCTRL1-NADD)	
	5 (POW 5)		6	Actual process controller value (PCTRL1-ACT)	
	6 (POW 6)		7	Process controller setpoint (PCTRL1-SET1)	
	7 (POW 7)		8	Reserved	
	8 (POW 8)		9	Torque setpoint / torque limit value (MCTRL1-MSET)	
	9 (POW 9)		10	PWM voltage (MCTRL1-VOLT-ADD)	
	10 (POW 10)		11	PWM angle (MCTRL1-PHI-ADD)	

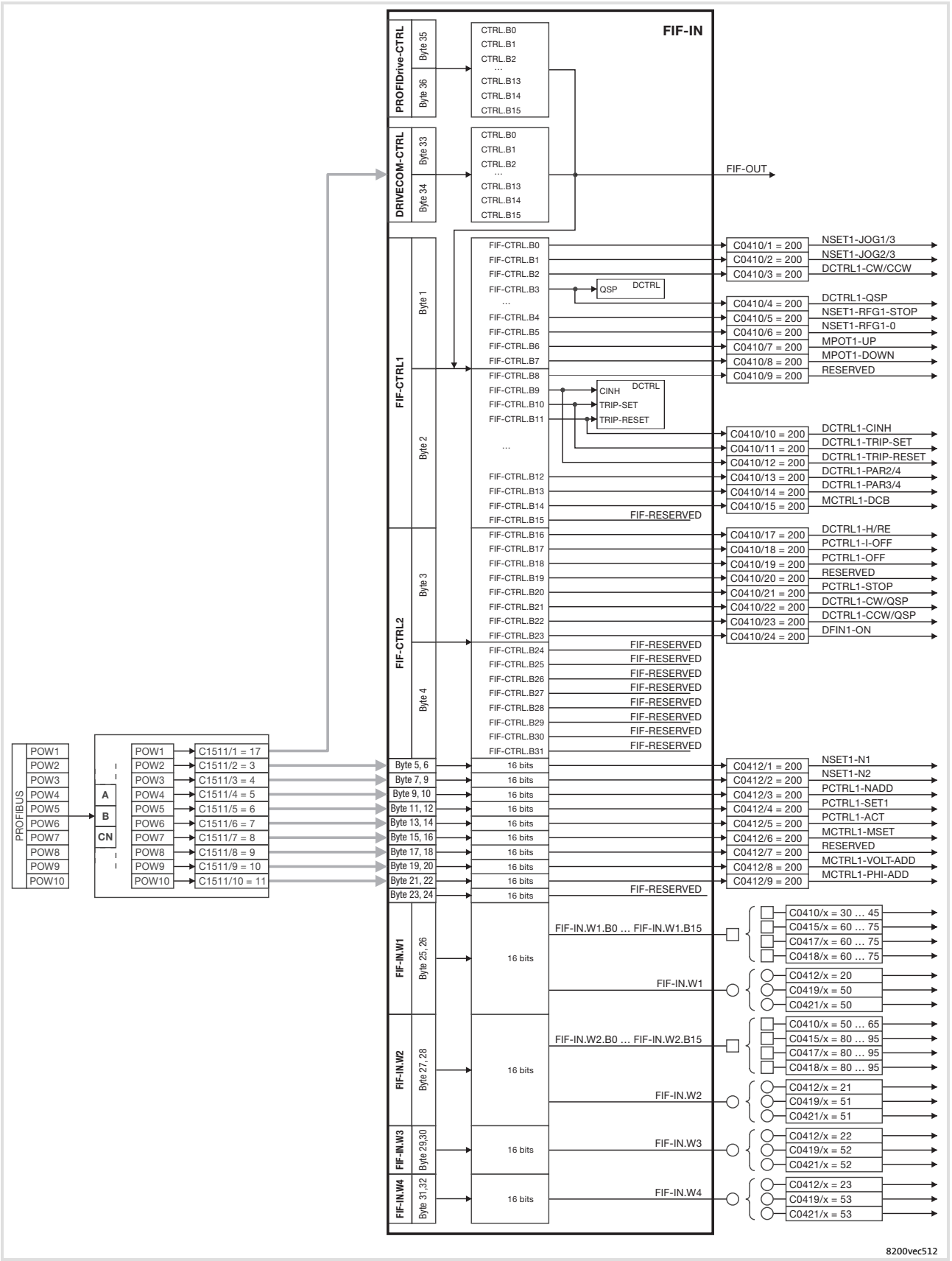


Fig. 11.6-1 Free configuration of the 10 PROFIBUS-DP process output words

FIF control word 1 (FIF-CTRL1)		FIF control word 2 (FIF-CTRL2)	
bit	**Assignment**	**bit**	**Assignment**
1 /0	**JOG values** (NSET1-JOG2/3 | NSET1-JOG1/3) bit 1 0 0 0 C0046 active 0 1 JOG1 (C0037) active 1 0 JOG2 (C0038) active 1 1 JOG3 (C0039) active	**0**	**Manual/remote changeover** (DCTRL1-H/Re) 0 not active 1 active
		1	**Switch off I-component of process controller** (PCTRL1-I-OFF) 0 not active 1 active
2 0 1	**Current direction of rotation** (DCTRL1-CW/CCW) not inverted inverted	**2** 0 1	**Switch off the process controller** (PCTRL1-OFF) not active active
3 0 1	**Quick stop** (FIF-CTRL1-QSP) not active active (deceleration at QSP ramp C0105)	**3**	reserved **By no means write to this bit!**
4 1 0 1	**Stop ramp function generator** (NSET1-RFG1-STOP) not active active	**4** 0 1	**Stop the process controller** (PCTRL1-STOP) not active active
5 0 1	**Ramp function generator input = 0** (NSET1-RFG1-0) not active active (deceleration to C0013)	**5** 0 1	**CW rotation/quick stop** (DCTRL1-CW/QSP) not active active
6 0 1	**UP function of motor potentiometer** (MPOT1-UP) not active active	**6** 0 1	**CCW rotation/quick stop** (DCTRL1-CCW/QSP) not active active
7 0 1	**DOWN function of motor potentiometer** (MPOT1-DOWN) not active active	**7** 0 1	**X3/E1 is digital frequency input** (DFIN1-ON) not active active
8	reserved	**8**	reserved
9 0 1	**Controller inhibit** (FIF-CTRL1-CINH) Controller enabled Controller inhibited	**9**	reserved
10	**External fault** (FIF-CTRL1-TRIP-SET)	**10**	reserved
11 0 ⇒ 1	**Reset fault** (FIF-CTRL1-TRIP-RESET) Bit change causes trip reset	**11**	reserved
13|12	**Change over parameter sets** (DCTRL1-PAR3/4 | DCTRL1-PAR2/4) bit 13 12 0 0 PAR1 0 1 PAR2 1 0 PAR3 1 1 PAR4	**12**	Reserved
		13	reserved
14 0 1	**DC injection brake** (MTCRL1-DCB) not active active	**14**	reserved
15	reserved	**15**	reserved

Tab. 11.6-2 Parameter structure of FIF control word (FIF-CTRLx)

Note!

Use of bit 5 and bit 6 in FIF control word 2:

Parameterise the codes C0410/22 (DCTRL1-CW/QSP) and C0410/23 (DCTRL1-CCW/QSP) to the value ”200”.

Configuration of process input data

Bit status information or actual values of the controller can be assigned freely to the max. 10 process data input words (PIW) of the master:

- To call status information compliant to DRIVECOM, assign the DRIVECOM status word a PIW (C1511/x = 18).
  The FIF status word 1 is mapped to the DRIVECOM status word.
- To call status information compliant to PROFIDrive, assign the PROFIDrive status word a PIW (C1511/x = 20).
  The FIF status word 1 is mapped to the PROFIDrive status word.

Configuration of process input data

Code	Subcode	Index	LENZE setting		Data type
C1510		23065_d = $5A19_h$			FIX32
	1 (PIW 1)		18	DRIVECOM status word (DRIVECOM-STAT)	
	2 (PIW 2)		3	Output frequency with slip (MCTRL1-NOUT+SLIP)	
	3 (PIW 3)		4	Output frequency without slip (MCTRL1-NOUT)	
	4 (PIW 4)		5	Apparent motor current (MCTRL1-IMOT)	
	5 (PIW 5)		6	Actual process controller value (PCTRL1-ACT)	
	6 (PIW 6)		7	Process controller setpoint (PCTRL1-SET)	
	7 (PIW 7)		8	Process controller output (PCTRL1-OUT)	
	8 (PIW 8)		9	Controller load (MCTRL1-MOUT)	
	9 (PIW 9)		10	DC-bus voltage (MCTRL1-DCVOLT)	
	10 (PIW 10)		11	Ramp function generator input (NSET1-RFG1-IN)	

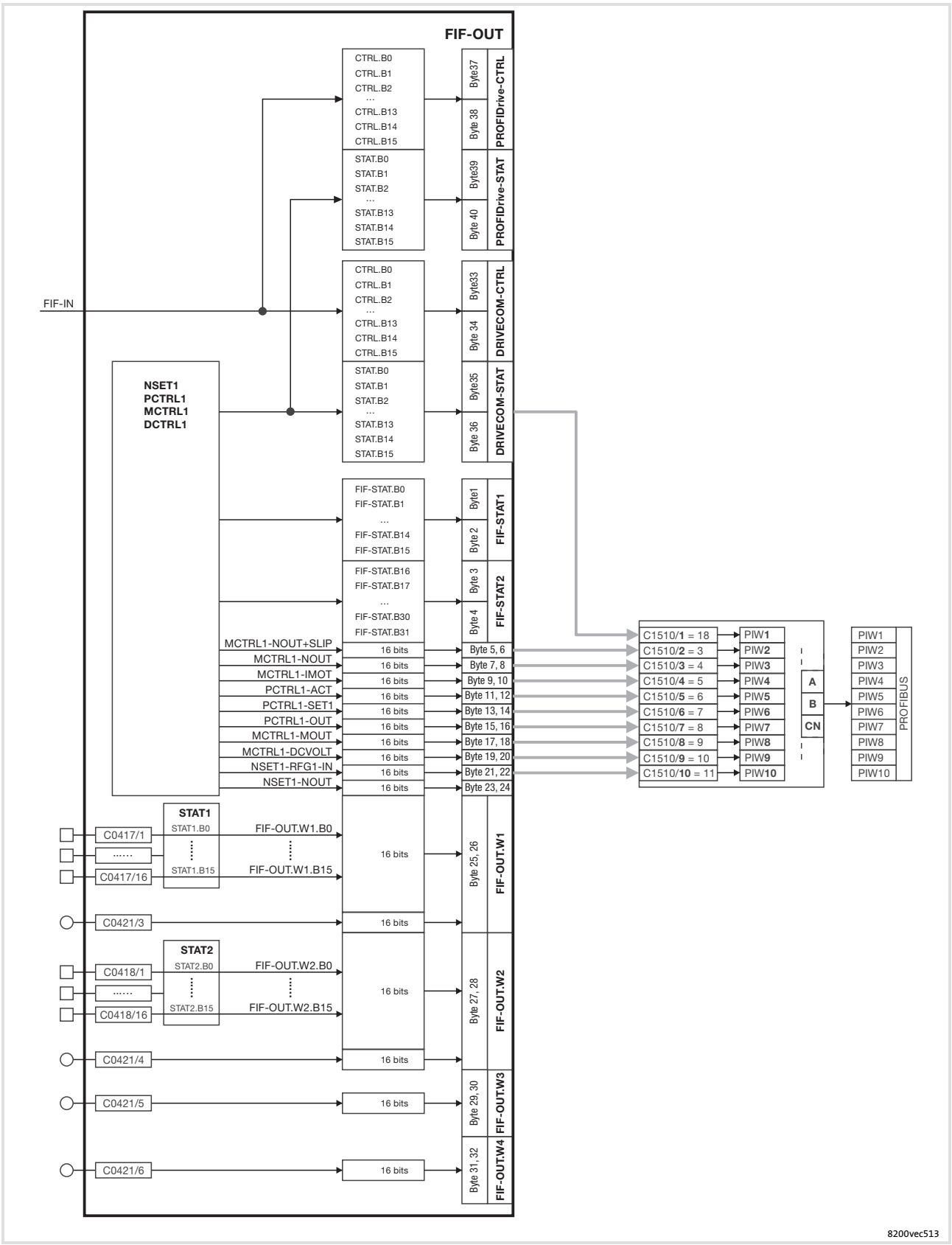


Fig. 11.6-2 Free configuration of the 10 PROFIBUS_DP process input words

FIF status word 1 (FIF-STAT1)		FIF status word 2 (FIF-STAT2)	
bit	**Assignment**	**bit**	**Assignment**
0	**Current parameter set bit 0** (DCTRL1-PAR-B0) 0 Parameter set 1 or 3 active 1 Parameter set 2 or 4 active	**0**	**Current parameter set bit 1** (DCTRL1-PAR-B1) 0 Parameter set 1 or 2 active 1 Parameter set 3 or 4 active
1	**Pulse inhibit** (DCTRL1-IMP) 0 Power outputs enabled 1 Power outputs inhibited	**1**	**TRIP, Q_{min} or pulse inhibit active** (DCTRL1-TRIP-QMIN-IMP) 0 false 1 true
2	**I_{max} limit** (MCTRL1-IMAX) (If C0014 = -5-: Torque setpoint) 0 not reached 1 reached	**2**	**PTC warning active** (DCTRL1-PTC-WARN) 0 false 1 true
3	**Output frequency = frequency setpoint** (DCTRL1-RFG1=NOUT) 0 false 1 true	**3**	reserved **Do not write to this bit!**
4	**Ramp function generator input 1 = ramp function generator output 1** (NSET1-RFG1-I=O) 0 false 1 true	**4**	**C0054 < C0156 and Q_{min} threshold reached** (DCTRL1-(IMOT<ILIM)-QMIN) 0 false 1 true
5	**Q_{min} threshold** (PCTRL1-QMIN) 0 not reached 1 reached	**5**	**C0054 < C0156 and NSET1-RFG1-I=O** (DCTRL1-(IMOT<ILIM)-RFG-I=O) 0 false 1 true
6	**Output frequency = 0** (DCTRL1-NOUT=0) 0 false 1 true	**6**	**LP1 warning (fault in motor phase) active** (DCTRL1-LP1-WARN) 0 false 1 true
7	**Controller inhibit** (DCTRL1-CINH) 0 Controller enabled 1 Controller inhibited	**7**	**f < f_{min}** (NSET1-C0010...C0011) 0 false 1 true
11...8	**Device status** (DCTRL1-STAT*1 ...-STAT*8) bit 11 10 9 8 0 0 0 0 Controller initialisation 0 0 1 0 Switch-on inhibit 0 0 1 1 Operation inhibited 0 1 0 0 Flying-restart circuit active 0 1 0 1 DC-injection brake active 0 1 1 0 Operation enabled 0 1 1 1 Message active 1 0 0 0 Active fault 1 1 1 1 No communication with basic device possible	**8**	**TRIP active** (DCTRL1-TRIP) 0 false 1 true
		9	**Motor is running** (DCTRL1-RUN) 0 false 1 true
		10	**Motor is running clockwise** (DCTRL1-RUN-CW) 0 false 1 true
		11	**Motor is running counter-clockwise** (DCTRL1-RUN-CCW) 0 false 1 true
12	**Overtemperature warning** (DCTRL1-OH-WARN) 0 No warning 1 ϑ_{max} - 10 °C reached	**12**	reserved
13	**DC-bus overvoltage** (DCTRL1-OV) 0 No overvoltage 1 Overvoltage	**13**	Reserved
14	**Direction of rotation** (DCTRL1-CCW) 0 CW rotation 1 CCW rotation	**14**	**C0054 > C0156 and NSET1-RFG1-I=0** (DCTRL1-(IMOT>ILIM)-RFG-I=O) 0 false 1 true
15	**Ready for operation** (DCTRL1-RDY) 0 not ready for operation (fault) 1 ready for operation (no fault)	**15**	reserved

Tab. 11.6-3 Parameter structure FIF status word (FIF-STATx)

11.6.3 DRIVECOM control

DRIVECOM status machine

The control information is provided by the function module via the control word.

- The controllers have standardised device states according to DRIVECOM Profile 20.
- Information on the current device status is stored in the DRIVECOM parameter “status word“.
- Commands in the DRIVECOM parameter “control word“ can change the device status. These commands are represented by arrows in the following diagram.

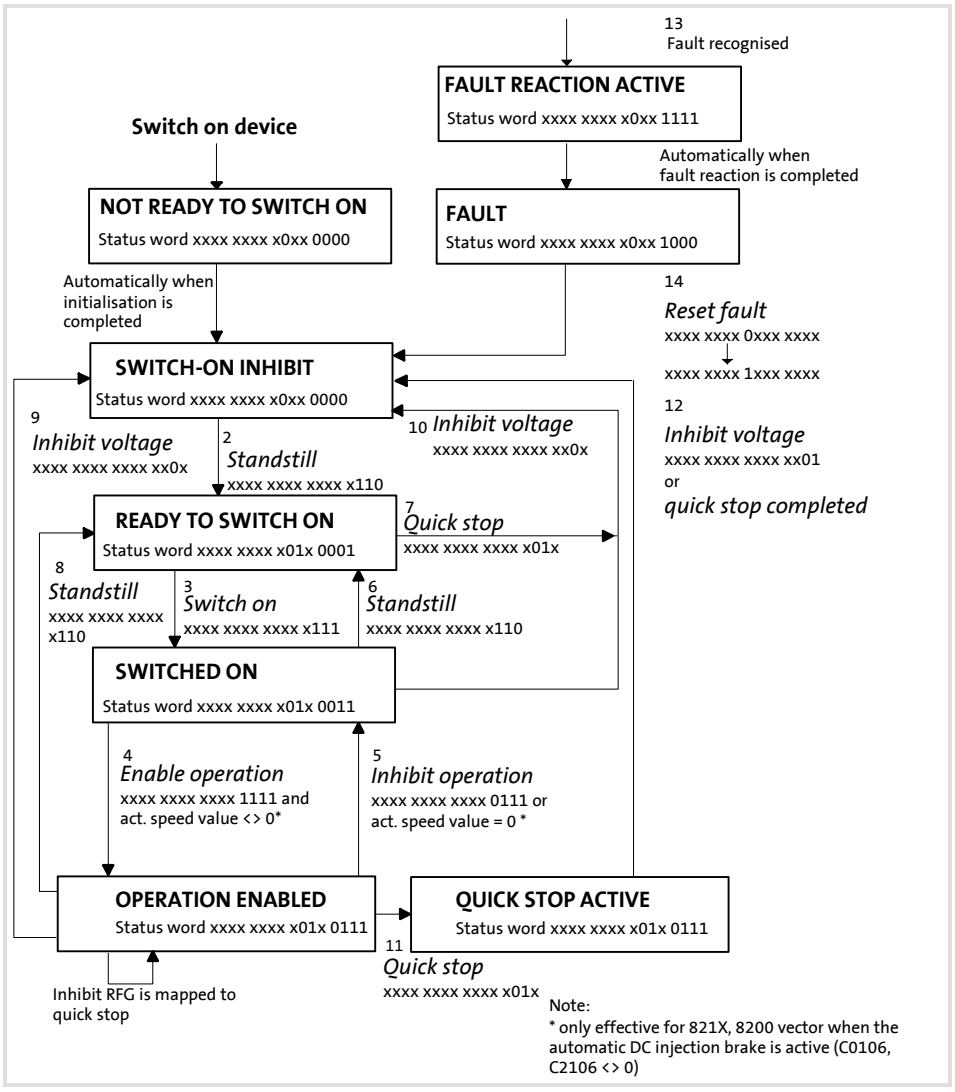


Fig. 11.6-3 Status diagram of DRIVECOM device control

DRIVECOM control word

Bit	Meaning
0	**"Switch on" command**
0	"Stop" command active
1	"Switch on" command active
1	**"Inhibit voltage" command**
0	"Inhibit voltage" command active
1	"Inhibit voltage" command not active
2	**"Quick stop" command**
0	"Quick stop" command activated
1	"Quick stop" command not active
3	**"Enable operation" command**
0	"Inhibit operation" command active
1	"Enable operation" command active
4	**"Inhibit RFG" command** Inhibit the ramp function generator (NSET1-RFG1). The quick stop function is activated, the device status of the drive does not change. Mapping to FIF control word 1 (FIF-CTRL1), bit 3 negated (FIF-CTRL1-QSP)
0	Inhibit RFG active
1	Inhibit RFG not active
5	**"RFG stop" command** Ramp function generator output (NSET1-RFG1) is "frozen"; the device status of the drive does not change. Mapping to FIF control word 1 (FIF-CTRL1), bit 4 negated (NSET1-RFG1-STOP)
0	0 = RFG stop
1	1 = RFG stop not active
6	**"RFG zero" command** Set ramp function generator input (NSET1-RFG1) to 0. ⇒ Controlled deceleration via the ramp set under C0013; the device status of the drive does not change. Mapping to FIF control word 1 (FIF-CTRL1), bit 5 negated (NSET1-RFG1-0)
0	0 = RFG zero
1	1 = RFG zero not active
7	**TRIP reset** Fault reset (TRIP)
0 ⇒ 1	Bit change causes trip reset
8	DRIVECOM reserved
9	DRIVECOM reserved
10	DRIVECOM reserved
11	Mapping to FIF control word 1 (FIF-CTRL1), bit 10 (FIF-CTRL1-TRIP-SET)
12	Mapping to FIF control word 1 (FIF-CTRL1), bit 12 (DCTRL1-PAR2/4)
13	Mapping to FIF control word 1 (FIF-CTRL1), bit 13 (DCTRL1-PAR-3/4)
14	Mapping to FIF control word 1 (FIF-CTRL1), bit 14 (MCTRL1-DCB)
15	Not assigned

Tab. 11.6-4 Parameter structure of "DRIVECOM control word" (DRIVECOM-CTRL)

DRIVECOM status word

Bit	Meaning
0	**Device status "READY TO SWITCH ON"**
0	Status less than "READY TO SWITCH ON"
1	Status at least "READY TO SWITCH ON"
1	**Device status "SWITCHED ON"**
0	Status less than "SWITCHED ON"
1	Status at least "SWITCHED ON"
2	**Device status "OPERATION ENABLED"**
0	Status less than "OPERATION ENABLED"
1	Status "OPERATION ENABLED"
3	**Device status "FAULT"**
0	No fault (TRIP)
1	Fault (TRIP) occurred
4	**Status "Inhibit voltage" command**
0	Command applied
1	Command not applied
5	**Status "Quick stop" command**
0	Command applied
1	Command not applied
6	**Device status "SWITCH ON INHIBIT"**
0	Status not "SWITCH ON INHIBIT"
1	Status "SWITCH ON INHIBIT"
7	**Collective warning**
0	No warning
1	Warning (overheat)
8	**Collective message** Automatic setting and resetting of pulse inhibit in the device status "OPERATION ENABLED". Possible causes: Undervoltage, overvoltage or overcurrent
0	No message
1	Message IMP active
9	Bus access right
1	Always
10	**Status speed/frequency deviation**
0	$RFG_{on} <> RFG_{off}$
1	$RFG_{on} = RFG_{off}$
11	**Status DRIVECOM speed limitation**
0	Always
12	Mapping of FIF status word 1 (FIF-STAT1), bit 0 (DCTRL1-PAR-B0)
13	Mapping of FIF status word 2 (FIFSTAT2), bit 0 (DCTRL1-PAR-B1)
14	Mapping of FIF status word 1 (FIFSTAT1), bit 2 (MCTRL1-IMAX)
15	Mapping of FIF status word 1 (FIF-STAT1), bit 5 (PCTRL1-QMIN)

Tab. 11.6-5 Parameter structure of "DRIVECOM status word" (DRIVECOM-STAT)

Bit control commands

The bit control commands of the control word depend on other bit positions. The command is executed only for the following bit patterns:

Command	Meaning	Control word bits 7	6	5	4	3	2	1	0	Note
Standstill	From different device states ⇨ "READY TO SWITCH ON".	x	x	x	x	x	1	1	**0**	1 Bit set
Switch on	Transition ⇨ "SWITCHED ON".	x	x	x	x	x	1	1	**1**	
Enable operation	Transition ⇨"OPERATION ENABLED". The controller inhibit is deactivated.	x	x	x	x	**1**	1	1	1	0 Bit not set
Inhibit operation	Transition ⇨ "SWITCHED ON". The controller inhibit is activated.	x	x	x	x	**0**	1	1	1	
Voltage inhibit	Transition ⇨ "SWITCH-ON INHIBIT". The controller inhibit is activated.	x	x	x	x	x	x	**0**	x	x Any bit
Quick stop	Transition ⇨ "SWITCH-ON INHIBIT". If the drive was enabled ⇨controlled deceleration along the Lenze quick stop ramp.	x	x	x	x	x	**0**	1	x	
Error reset	Acknowledge fault If the fault has been removed, automatically ⇨ "SWITCH-ON INHIBIT".	0 ⇨1	x	x	x	x	x	x	x	

Error reset
RFG-zero
RFG-stop
RFG-inhibit
Enable operation
Quick stop
Voltage inhibit
Switch on

Status bits

The current device status is clearly coded in bits 0 to 6 of the status word:

Device status	Meaning	Bits of the status word 6	5	4	3	2	1	0	Note
NOT READY TO SWITCH ON	Controller is being initialised and is not yet ready to operate. After initialisation automatically ⇨"READY TO SWITCH ON".	0	x	x	0	0	0	0	1 Bit set
SWITCH-ON INHIBIT	Controller inhibited (CINH). Waiting for "Stop" command	1	x	x	0	0	0	0	
READY TO SWITCH ON	Controller inhibited (CINH). Waiting for "Switch-on" command	0	1	x	0	0	0	1	0 Bit not set
SWITCHED ON	Controller inhibited (CINH). Waiting for "Enable operation" command	0	1	x	0	0	1	1	
OPERATION ENABLED	Controller enabled ($\overline{\text{CINH}}$). Pulse inhibit can be set automatically	0	1	x	0	1	1	1	x Any bit
FAULT REACTION ACTIVE	Fault (TRIP) recognised, a time-based fault response initiated. Then automatically ⇨"TRIP"	0	x	x	1	1	1	1	
FAULT	Controller is in the "FAULT" status.	0	x	x	1	0	0	0	
QUICK STOP ACTIVE	"Quick stop" command was sent in the "OPERATION ENABLED" device status ⇨ controlled deceleration along the quick stop ramp. After deceleration automatically ⇨"SWITCH-ON INHIBIT".	0	0	x	0	1	1	1	

Switch-on inhibit
Quick stop
Voltage inhibit
Fault
Operation enabled
Switched on
Ready to switch on

11.6.4 PROFIDrive control

11.6.4.1 PROFIDrive status machine

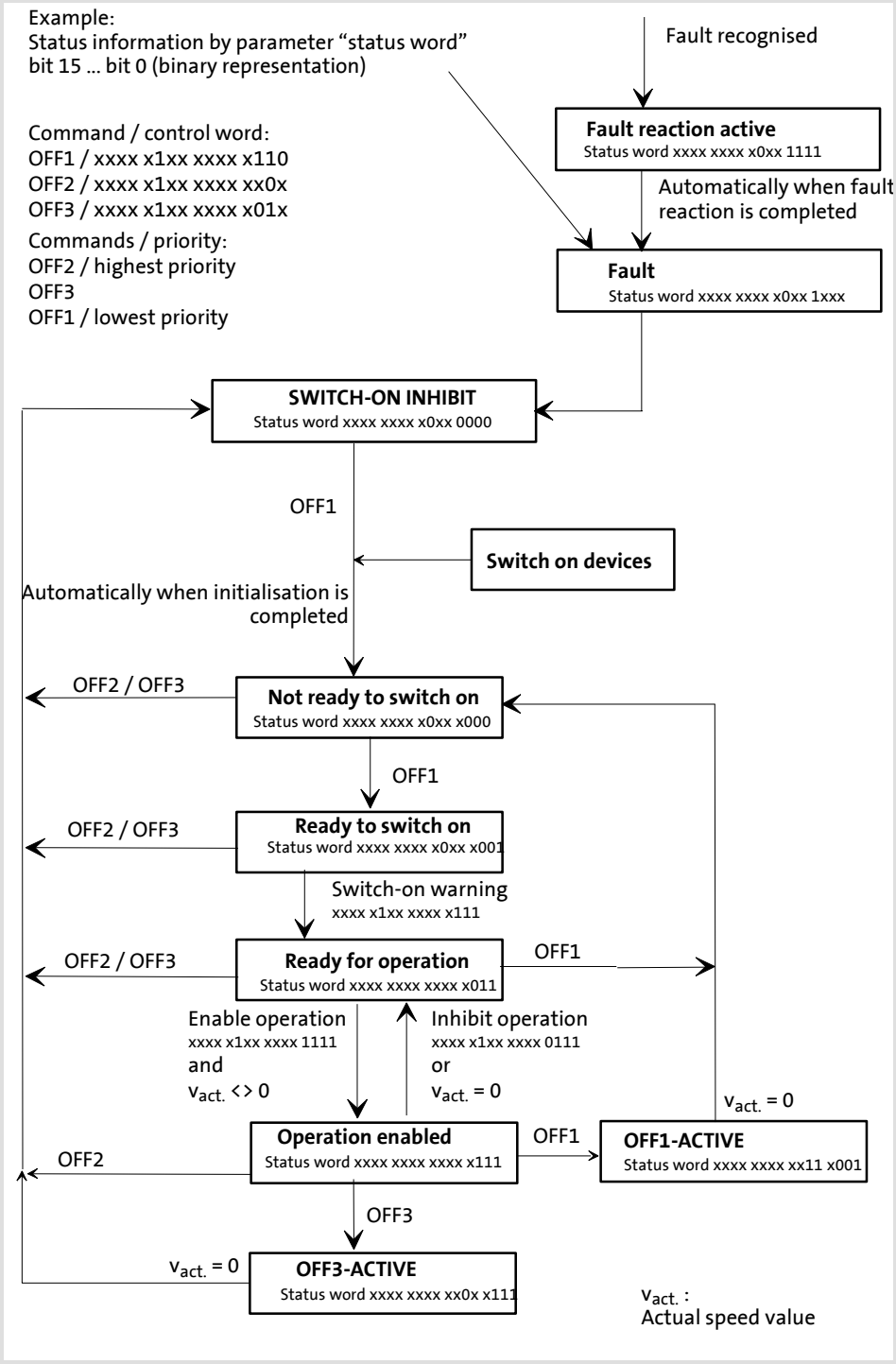


Fig. 11.6-4 Status diagram of PROFIDrive device control

PROFIDrive control word

Bit	Name	Meaning
0	OFF1	0 = OFF1 active; RFG zero, controller inhibit at zero speed 1 = OFF1 inactive
1	OFF2	0 = OFF2 active 1 = OFF2 inactive
2	OFF3	0 = OFF3 active 1 =OFF3 inactive
3	Enable operation	0 = Inhibit operation 1 = Enable operation
4	RFG inhibit	Inhibit the ramp function generator. The quick stop function is activated, the device status of the drive does not change. 0 = RFG inhibit (quick stop) 1 = RFG inhibit not active
5	RFG stop	Free. Mapping to bit FIF-CTRL.B4 negated.
6	Inhibit setpoint	Free. Mapping to bit FIF-CTRL.B5 negated.
7	Error reset	Reset of a fault (TRIP). A bit change from 0 to 1 is required.
8	Jogging 1	Not used
9	Jogging 2	Not used
10	Master function from automation device	0 = No master function by automation device 1 = Master function by automation device
11	Manufacturer	Mapping to FIF control word 1 (FIF-CTRL1), bit 7 (MPOT1-DOWN)
12	Manufacturer	Mapping to FIF control word 1 (FIF-CTRL1), bit 12 (DCTRL1-PAR2/4)
13	Manufacturer	Mapping to FIF control word 1 (FIF-CTRL1), bit 13 (DCTRL1-PAR3/4)
14	Manufacturer	Mapping to FIF control word 1 (FIF-CTRL1), bit 14 (MCTRL1-DCB)
15	Manufacturer	Mapping to FIF control word 1 (FIF-CTRL1), bit 15 (reserved)

PROFIDrive status word

Bit	Name	Meaning
0	Ready to switch on	Device status information 0 = Status lower than “READY TO SWITCH ON“ 1 = Status at least “SWITCHED ON“
1	Ready for operation	Device status information 0 = Status lower than “READY FOR OPERATION“ 1 = Status at least “READY FOR OPERATION“
2	Operation enabled	Device status information 0 = Status lower than “OPERATION ENABLED“ 1 = Status “OPERATION ENABLED“
3	Fault	Device status information 0 = No fault (TRIP) 1 = Fault (TRIP) occurred
4	OFF2	Information on command “OFF2“ 0 = Command active 1 = Command not active
5	OFF3	Information on command “OFF3“ 0 = Command active 1 = Command not active
6	Switch-on inhibit	Device status information 0 = Status not “SWITCH-ON INHIBIT“ 1 = Status “SWITCH-ON INHIBIT“
7	Warning	Collective warning 0 = No warning 1 = Warning
8	Reserved	Always 1
9	Master function requested	1
10	Setpoint reached	Status of speed / frequency deviation 0 = RFGon <> RFGoff 1 = RFGon = RFGoff
11	Reserved	0
12	Manufacturer	Mapping of FIF status word 1 (FIF-STAT1), bit 14 (DCTRL1-CCW)
13	Manufacturer	Mapping of FIF status word 1 (FIF-STAT1), bit 15 (DCTRL1-RDY)
14	Manufacturer	Mapping of FIF status word 1 (FIF-STAT1), bit 2 (MCTRL1-IMAX)
15	Manufacturer	Mapping of FIF status word 1 (FIF-STAT1), bit 5 (PCTRL1-QMIN)

11.6.5 Parameter data channel

The DRIVECOM parameter data channel and the PKW interface

- ► enable parameter setting and diagnostics of the controller.
- ► allow access to Lenze parameters (codes).
- ► assign additionally the first 4 words of the input and output data words in the master.
- ► have an identical structure for both directions of transmission.

Parameter data are addressed through codes. You find a code table in the Operating Instructions for your controller.

Lenze parameter sets

The 8200 vector controllers have 4 parameter sets. The parameters of these sets can be addressed directly through the PROFIBUS-DP.

Note!

- ► Parameter set 1 can be accessed via the DRIVECOM parameter data channel or the PKW interface.
- ► Parameter sets 2 - 4 can be accessed via the DRIVECOM parameter data channel.

Addressing of Lenze parameter sets

The parameter sets are addressed by means of a code offset:

- ► Offset 0 addresses parameter set 1 (C0000 to C1999).
- ► Offset 2000 addresses parameter set 2 (C2000 to C3999).
- ► Offset 4000 addresses parameter set 3 (C4000 to C5999).
- ► Offset 6000 addresses parameter set 4 (C6000 to C7999).

If a parameter is only available once (see Operating Instructions for 8200 vector), use the code offset 0.

Example for C0011 (maximum rotating-field frequency):

C0011 in parameter set 1: Lenze code number = 11

C0011 in parameter set 2: Lenze code number = 2011

C0011 in parameter set 3: Lenze code number = 4011

C0011 in parameter set 4: Lenze code number = 6011

Note!

Parameter changes:

Cyclic writing to codes via Profibus is only permissible if the automatic parameter set storage of the controller C0003 is deactivated (value 0).

Process data changes:

No automatic storage

11.6.5.1 DRIVECOM parameter data channel

Addressing of Lenze parameters

In the case of the DRIVECOM parameter data channel, the parameters of a device are not addressed directly via Lenze code numbers, but via indices (byte 3 / byte 4) and subindices (byte 2).

The Lenze code numbers are converted into indices via an offset (24575_{dez} or $5FFF_{hex}$):

Addressing of Lenze codes	Example of C0001 (operating mode)
– PROFIBUS-DP index = 24575 - Lenze code number	– PROFIBUS-DP index = 24575 - 1 = 24574
– PROFIBUS-DP $index_{hex}$ = $5FFF_{hex}$ - Lenze code $number_{hex}$	– PROFIBUS-DP $index_{hex}$ = $5FFF_{hex}$ - 1_{hex} = $5FFE_{hex}$

Lenze parameters are mainly represented in the fixed point format, data type integer32 with four decimal digits. For this reason, the value of the parameter or the value of the code must be multiplied by 10000 in order to obtain integer values.

This parameter value is entered into the user data (byte 5 - byte 8) of the telegram.

► Example

1. Set C0039 (JOG) = 150.4 Hz
2. Multiply parameter value by 10000.
3. 150.4 x 10000 = 1504000_{dez} ($0016F300_{hex}$)
4. Enter parameter value into user data.

Telegram structure (overview)

The telegram of the DRIVECOM parameter data channel consists of a total of 8 bytes. The individual bytes are described in detail on the following pages.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index High byte	Index Low byte	Data 4 / Error 4	Data 3 / Error 3	Data 2 / Error 2	Data 1 / Error 1

Byte 1: Service
Job and response control for the parameter data channel

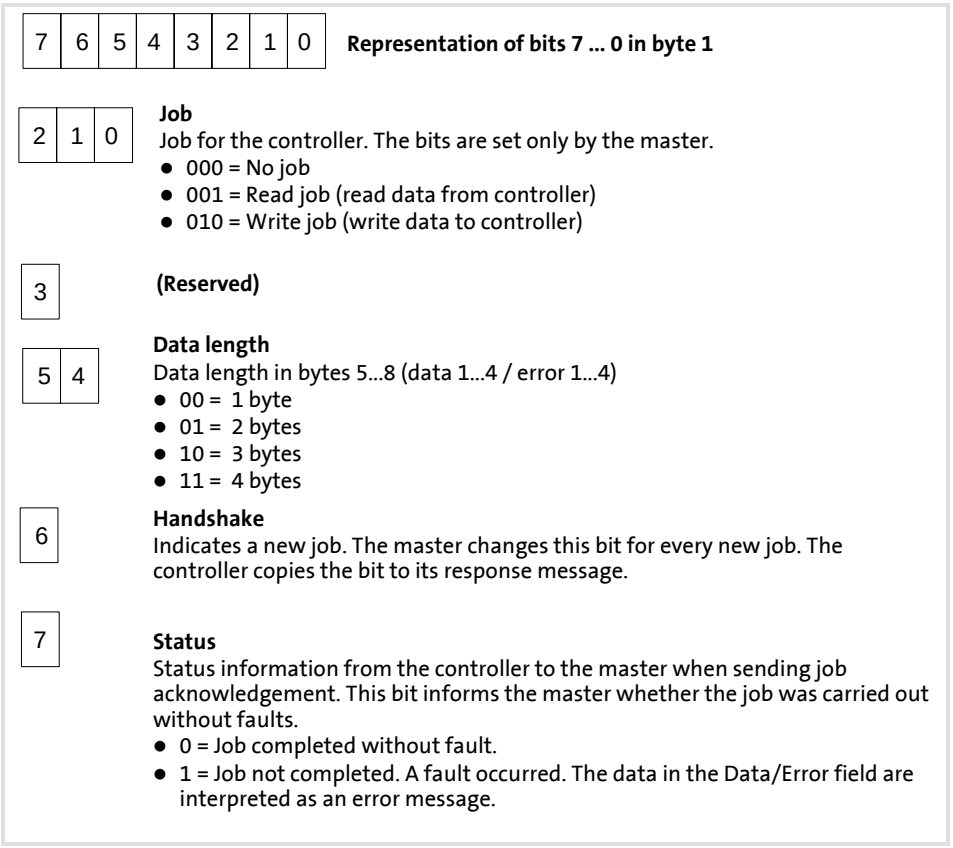


Fig. 11.6-5 Byte 1: Job and response control

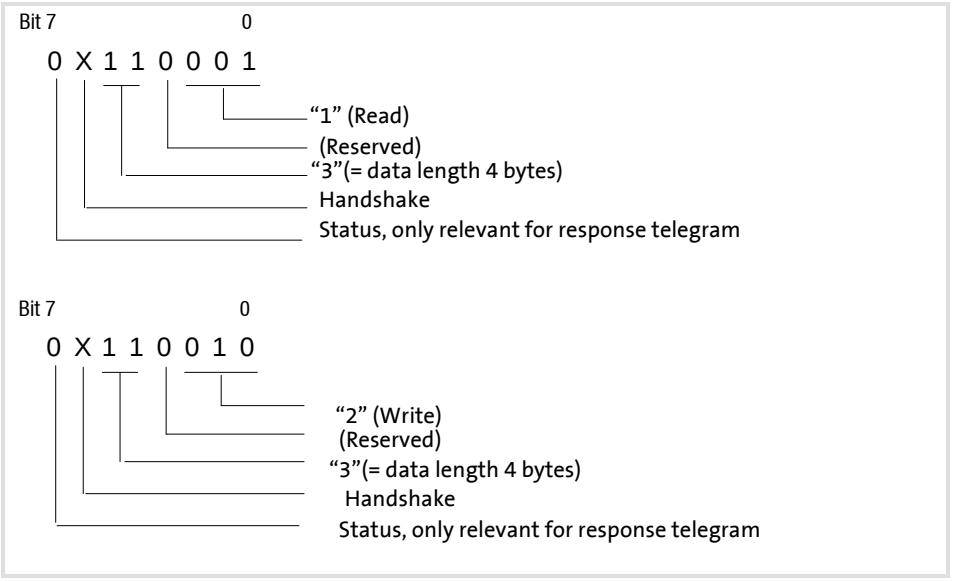


Fig. 11.6-6 Example of byte 1

Byte 2: Subindex

Additional addressing via the subindex is required for those codes that have a subcode (see code table).

Example:

Code C0039 / subcode 3 addresses "NSET JOG" (50% = Lenze setting)

Byte 3 / 4: Index

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	**Index High byte**	**Index Low byte**	Data 4 / Error 4	Data 3 / Error 3	Data 2 / Error 2	Data 1 / Error 1

The parameters or the Lenze codes are selected with these two bytes according to the formula:

Index = 24575 - Lenze code number

Example:
The parameter C0012 (acceleration time) is to be addressed:

24575 - 12 = 24563 = $5FF3_{hex}$

The entries for this example would be:

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

► Byte 4: Index low byte = $F3_{hex}$

Byte 5 - 8: Parameter value (data) or fault information (error)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index High byte	Index Low byte	**Data 4 / Error 4**	**Data 3 / Error 3**	**Data 2 / Error 2**	**Data 1 / Error 1**

The status of the (”status”) bit 7 in byte 1 (”job”) determines the meaning of this data field:

Meaning of bytes 5 - 8 if	
bit 7 = 0	**bit 7 = 1**
Parameter value (data 1 -4)	Fault information (error 1 - 4) for an invalid access.

Parameter value (data)

Depending on the data format, the length of the parameter value is between 1 to 4 bytes. Data are saved in the Motorola format, i.e. first the high byte or high word, then the low byte or low word.

Byte 5	Byte 6	Byte 7	Byte 8
High byte	Low byte	High byte	Low byte
High word		Low word	
Double word			

Assignment of bytes 5 .. 8 with parameter values of different lengths

Byte 5	Byte 6	Byte 7	Byte 8
Parameter value (length 1)	00	00	00
Parameter value (length 2)		00	00
Parameter value (length 4)			

Note: Strings or data blocks cannot be transmitted.

Error messages

The following error messages may appear:

Data 1	Data 2	Data 4	Meaning
6	3	00_{hex}	No right to access
6	5	10_{hex}	Impermissible job parameter
6	5	11_{hex}	Invalid subindex
6	5	12_{hex}	Data length too large
6	5	13_{hex}	Data length too small
6	6	00_{hex}	Object is no parameter
6	7	00_{hex}	Object does not exist
6	8	00_{hex}	Data types do not correspond
8	0	00_{hex}	Job cannot be executed
8	0	20_{hex}	Job cannot be executed at the moment
8	0	21_{hex}	Not executable because of local control
8	0	22_{hex}	Not executable because of device status
8	0	30_{hex}	Out of value range/parameter can only be changed with inhibited controller
8	0	31_{hex}	Parameter value too large
8	0	32_{hex}	Parameter value too small
8	0	33_{hex}	Sub-parameter out of value range
8	0	34_{hex}	Sub-parameter value too large
8	0	35_{hex}	Sub-parameter value too small
8	0	36_{hex}	Maximum value smaller than minimum value
8	0	41_{hex}	Communication object cannot be mapped on process data
8	0	42_{hex}	Process data length exceeded
8	0	43_{hex}	General collision with other values

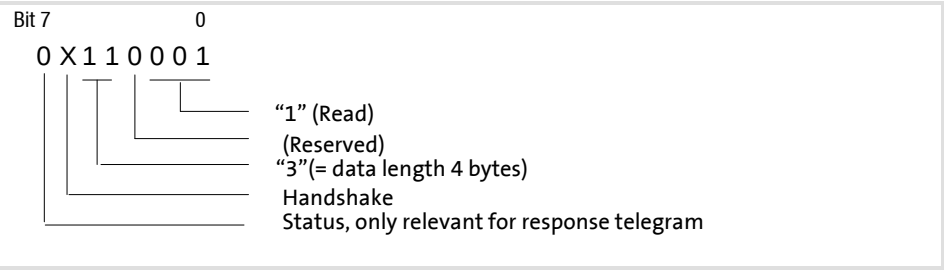
11.6.5.2 Programming of read jobs

Step	Read job
1.	Define user data range of the controller, i.e. define the location of the DP user data in the host (observe manufacturer-specific information).
2.	Enter the address of the desired parameter in the field "Index and subindex" (DP output data).
3.	Job = Read job. The bit "Job / handshake" must be changed (DP output data).
4.	Check whether the bit "Job / handshake" is the same for the DP input data and the DP output data. If the bit "Job / handshake" is the same, the response has been received. You should implement a time monitoring.
5.	Check whether the bit "Job / status" is set. ● If the bit "Job / status" is not set: Field "Data / error" contains the desired parameter value. ● If the bit "Job / status" is set: Read job was not executed correctly. Field "Data / error" contains the error information.

Example: Read parameter

The controller heatsink temperature (assumption: ϑ = 43° C) is to be read (C0061).

► Byte 1: Job



► Byte 2: Subindex

Subindex = 0, as there is no subindex under code C0061.

► Byte 3/4: Index (calculation)

Index (of read request) = 24575 - code number
Index = 24575 - 61 = 24514 = 5F $C2_{hex}$ ($5F_{hex}$ = high byte, $C2_{hex}$ = low byte)

► Byte 5 ...8: Data (contained in the response telegram)

Data 1 to data 4 = 43° C x 10000 = 430000 = 00 06 8F $B0_{hex}$

Result:

► Request telegram from master to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
01_{hex} 00000001_{bin}	**00_{hex}** 00000000_{bin}	**$5F_{hex}$** 01011111_{bin}	**$C2_{hex}$** 11000010_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}
Wait for change of handshake bit (bit 6 here: 0 → 1) in the response							

► Response telegram from drive to master (for faultless execution)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
30_{hex} $0011\ 0000_{bin}$	00_{hex} $0000\ 0000_{bin}$	$5F_{hex}$ $0101\ 1111_{bin}$	$C2_{hex}$ $1100\ 0010_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**06_{hex}** $0000\ 0110_{bin}$	**$8F_{hex}$** $1000\ 1111_{bin}$	**$B0_{hex}$** $1011\ 0000_{bin}$

Tab. 11.6-6 Telegram exchange in DRIVECOM parameter data channel

11.6.5.3 Programming of write jobs

Step	Write job
1.	Define user data range of the controller, i.e. define the location of the DP user data in the host (observe manufacturer-specific information).
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Enter parameter value in field ”Data/Error“.
4.	Job / service = Write job and the bit ”Job / handshake“ must be changed (DP output data).
5.	Check whether the bit ”Job / handshake“ is the same for the DP input data and the DP output data. If the bit ”Job / handshake“ is the same, the response has been received. You should implement a time monitoring.
6.	Check whether the bit ”Job / status“ is set: ● If the bit ”Job / status“ is not set: The job was executed faultlessly ● If the bit ”Job / status“ is set: The job was not executed faultlessly if the bit ”Job / status“ is set. Field ”Data / error“ contains the error information.

Example: Write parameter

The controller acceleration time (C0012) is to be set to T_{ir} = 20 s.

► Byte 1: Job

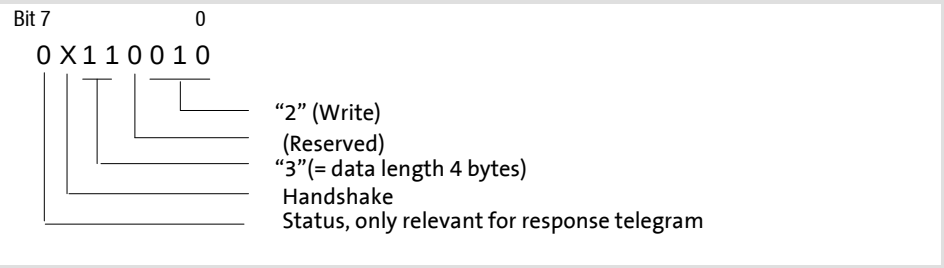


Fig. 11.6-7 Example

► Byte 2: Subindex

Subindex = 0, as there is no subindex under code C0012.

► Byte 3/4: Index (calculation)

Index = 24575 - code number

Index = 24575 - 12 = 24563 = 5F F3$_{hex}$ (5F$_{hex}$ = high byte, F3$_{hex}$ = low byte)

► Byte 5 - 8: Data

Calculation of the acceleration time: 20 s x 10,000 = 200,000 = 00 03 0D 40$_{hex}$

Result:

► Request telegram from master to drive

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
72_{hex} $0111\ 0010_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**$5F_{hex}$** $0101\ 1111_{bin}$	**$F3_{hex}$** $1111\ 0011_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**03_{hex}** $0000\ 0011_{bin}$	**$0D_{hex}$** $0000\ 1101_{bin}$	**40_{hex}** $0100\ 0000_{bin}$
Wait for change of handshake bit (bit 6 here: 0 → 1)							

► Response telegram from drive to master (for faultless execution)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Service	Subindex	Index (High byte)	Index (Low byte)	Data 4	Data 3	Data 2	Data 1
70_{hex} $0100\ 0110_{bin}$	00_{hex} $0000\ 0000_{bin}$	$5F_{hex}$ $0101\ 1111_{bin}$	$F3_{hex}$ $1111\ 0011_{bin}$	00_{hex} $0000\ 0000_{bin}$	00_{hex} $0000\ 0000_{bin}$	00_{hex} 00000000_{bin}	00_{hex} $0000\ 0000_{bin}$
Wait for change of handshake bit (bit 6 here: 1 → 0)							

Tab. 11.6-7 Telegram exchange in DRIVECOM parameter data channel

11.6.5.4 PROFIDrive parameter data channel (PKW, profile for variable speed drives, version 2)

Access to the Lenze codes of the controller

Direct access to the codes of the first parameter set (C0000 - C1999) is possible. Conversion is not required.

Enter parameter value

The required parameter value is mapped in the data range.

Lenze parameters are mainly represented in fixed point format with four decimal positions (data type FIX32, transmission as double word). These parameters are multiplied by 10000 to get integer values.

Example:

Set C0039 (JOG) = 150.4 Hz.

► 150.4 x 10000 = 1504000_{dez} ($0016F300_{hex}$)

Telegram structure (overview)

The PROFIDrive parameter data channel is (same as the DRIVECOM parameter data channel) in the first 8 bytes of cyclic data.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	Parameter value (PWE)			

Byte 1 and 2: Parameter identification

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	Parameter value (PWE)			

Parameter identification structure

Byte 1							Byte 2							
4	3	2	1	11	10	9	8	7	6	5	4	3	2	1
Job identification / Response identification				Code										

► Job / response identification (high nibble of byte 1)

PKE	Job identification
0	No job
1	Read simple parameter
2	Write simple parameter (word)
3	Write simple parameter (double word)
6	Read array parameter
7	Write array parameter (word)
8	Write array parameter (double word)

PKE	Response identification	
	Positive	**Negative**
0	No response	
1	Transmit simple parameter value (word)	
2	Transmit simple parameter value (double word)	
4	Transmit array parameter value (word)	
5	Transmit array parameter value (double word)	
4	Transmit array parameter value (word)	
5	Transmit array parameter value (double word)	
7		Job cannot be executed, see error number

► Code (low nibble of byte 1 + byte 2)

Value range: 0 - 2000 (C0001 - C1999)

Byte 3: Lenze subcode

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		**Subcode (IND)**	Reserved	Parameter value (PWE)			

Value range: 0 - 255

Byte 4: 0, reserved

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	**Reserved**	Parameter value (PWE)			

Byte 5 - 8:
Parameter value (data)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	**Parameter value (PWE)**			

Depending on the data format, the length of the parameter value is between 1 to 4 bytes. Data are saved in the Motorola format, i.e. first the high byte or high word, then the low byte or low word.

Byte 5	Byte 6	Byte 7	Byte 8
High byte 1	Low byte 1	High byte 2	Low byte 2
High word		Low word	
Double word			

Assignment of bytes 5 .. 8 with parameter values of different lengths

Byte 5	Byte 6	Byte 7	Byte 8
Parameter value (length 1)	00	00	00
Parameter value (length 2)		00	00
Parameter value (length 4)			

A slave provides the response until the master creates a new job.

For responses containing parameter values, the slave always replies with the current value (cyclic processing).

Byte 7 and 8:
Error number

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Parameter identification (PKE)		Subcode (IND)	Reserved	00	00	**Error number**	

Error number	Meaning
0	Wrong code number
1	Parameter value can only be read
2	Value range exceeded
3	Wrong subindex
4	No array
5	Wrong data type (wrong data length)
17	Wrong operating status

11.6.5.5 Programming of read jobs

Step	Read job
1.	Define the user data range of the controller, i.e. define the location of the DP user data in the host system.
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Job/Service = AK
4.	Job/Service = Read job
5.	Check whether index and subindex correspond with the job and whether the job identification is ≠ 0: ● If the criteria are fulfilled, the desired controller data from the field “Parameter value” are transmitted to the master. ● If these criteria are not met, the response identification is negative, i.e. high nibble of byte 1 = 7_{hex} In this case the error information can be read out from the entry in the low word.

Example: Read parameter

The controller heatsink temperature (assumption: ϑ = 43° C) is to be read (C0061).

► Job identification (high nibble in byte 1)
– Read simple parameter: “1”

► Code: (low nibble in byte 1 and byte 2)
– C0061: 61 = $3D_{hex}$

► Lenze subcode (byte 3):
– Subindex = 0, as there is no subindex under code C0061.

► Byte 5 ...8: Data (not contained in the request telegram)
– Data 1 to data 4 = 43° C x 10000 = 430000 = 00 06 8F $B0_{hex}$

Result:

► Request telegram from master to drive

Byte 1*	Byte 1* +2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
1_{hex} 0001_{bin}	**$03D_{hex}$** 000000111101_{bin}	**00_{hex}** 00000000_{bin}	**00_{hex}** 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}
Wait for response identification with code = 03D and subcode 0							

► Response telegram from drive to master (for faultless execution)

Byte 1*	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
2_{hex} 0010_{bin}	$03D_{hex}$ 000000111101_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	**00_{hex}** 0000 0000_{bin}	**06_{hex}** 0000 0110_{bin}	**$8F_{hex}$** 10001111_{bin}	**$B0_{hex}$** 1011 0000_{bin}

Tab. 11.6-8 Telegram exchange in PROFIDrive parameter data channel

11.6.5.6 Programming of write jobs

Step	Write job
1.	Define the user data range of the controller, i.e. define the location of the DP user data in the host system.
2.	Enter the address of the desired parameter in the field ”Index and subindex“ (DP output data).
3.	Enter parameter value in field ”Data/Error“.
4.	Job/Service = Write job
5.	Check whether index and subindex correspond with the job and whether the job identification is ≠ 0: ● If the criteria are fulfilled, the desired master data from the field “Parameter value” are accepted by the controller. ● If these criteria are not met, the response identification is negative, i.e. high nibble of byte 1 = 7_{hex} In this case the error information can be read out from the entry in the low word.

Example: Write parameter

The controller acceleration time (C0012) is to be set to T_{ir} = 20 s.

► Job identification (high nibble in byte 1)
– Transmit simple parameter value: “1”

► Code: (low nibble in byte 1 and byte 2)
– C0012: 12 = $0C_{hex}$

► Lenze subcode (byte 3):
– Subindex = 0, as there is no subindex under code C0012.

► Byte 5 ...8: Data
– Data 1 to data 4 = 20 s x 10000 = 200000 = 00 03 0D 40_{hex}

Result:

► Request telegram from master to drive

Byte 1*	Byte 1* +2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
3_{hex} 0011_{bin}	**$00C_{hex}$** 000000001100_{bin}	**00_{hex}** 00000000_{bin}	**00_{hex}** 00000000_{bin}	00_{hex} 00000000_{bin}	03_{hex} 00000011_{bin}	$0D_{hex}$ 00001101_{bin}	40_{hex} 01000000_{bin}
Wait for response identification with code = 00C and subcode 0							

► Response telegram from drive to master (for faultless execution)

Byte 1*	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
AK	Code	Subcode	Reserved	Parameter value			
2_{hex} 0010_{bin}	$00C_{hex}$ 000000001100_{bin}	00_{hex} 00000000_{bin}	00_{hex} 00000000_{bin}	**00_{hex}** $0000\ 0000_{bin}$	**00_{hex}** $0000\ 0000_{bin}$	**00_{hex}** 00000000_{bin}	**00_{hex}** $0000\ 0000_{bin}$

Tab. 11.6-9 Telegram exchange in PROFIDrive parameter data channel

11.6.6 Parameter set transfer

Note!

Always switch the mains after you have transferred the parameter sets with keypad!

Observe the options for parameter set transfer with keypad marked with “Keypad⇨“ under code C0002.

If an address is assigned via C1509, the address must be reassigned via the parameter data channel after a parameter set transfer. Afterwards mains switching is required. The address modified via keypad becomes effective immediately.

11.7 Troubleshooting

Two LEDs at the function module display the status:

LED status	LED green	LED yellow
Blinking	The initialisation between function module and controller is not yet completed	Telegram receipt
On	Function module is connected to voltage supply, no fault.	-
OFF	Function module has no voltage supply	No telegram receipt

Fault	Possible cause	Remedy
PROFIBUS-DP master indicates bus error and yellow LED on the function module is off	Short circuit/open circuit	Check PROFIBUS-DP wiring
	Bus termination not connected	Connect bus terminating resistor of the last bus device.
	Incorrect station address	Set correct station address.
PROFIBUS-DP master indicates bus error and yellow LED on the function module is blinking	Incorrect PROFIBUS-DP configuration data	Check the configuration data sent by the master under C1526. Permitted configuration data: 📖 11.5-9
Controller cannot be enabled	Not enabled via control word	Transmit $007F_{hex}$
	Controller inhibit via terminal active	X3/28 = HIGH (+12 ... +30 V)
	No setpoint selected	C0412/1 =200 (PROFIBUS-DP setpoint source) must be set
		Assign setpoint to process output data in C1511

11.8 Code table

How to read the table

Column	Meaning		
Code **	(Lenze) code The value of a configurable code marked by double asterisks (**) is not transmitted by parameter set transfer.		
Subcode	Subcode		
Index	Data on code addressing		
Lenze	Lenze setting of the code		
	Disp	Display code The code cannot be configured.	
Selection	Minimum value	[smallest step size / unit]	maximum value
	For a display code, the displayed values are given.		
Data type	• FIX32: 32-bit value with sign; decimal with 4 decimal positions • U16: 2 bytes, bit-coded • U32: 4 bytes, bit-coded • VS: Visible string, character string with defined length		

C0002: Parameter set management

(Extract from code table)

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C0002	0	24573_d = $5FFD_h$	0		FIX32

Parameter set management (selection 0):

Selection	Important
0 Ready	**PAR1 ... PAR4:** ● Parameter sets of controller ● PAR1 ... PAR4 **FPAR1:** ● Module-specific parameter set of function module ● FPAR1 is stored in the function module

Restore delivery condition:

Selection	Important
1 Lenze setting ⇨PAR1	Restore delivery condition in the selected parameter set
2 Lenze setting ⇨PAR2	
3 Lenze setting ⇨PAR3	
4 Lenze setting ⇨PAR4	
31 Lenze setting ⇨FPAR1	Restore delivery condition in the function module
61 Lenze setting ⇨PAR1 + FPAR1	Restore delivery condition in the selected parameter set of the controller and in the function module
62 Lenze setting ⇨PAR2 + FPAR1	
63 Lenze setting ⇨PAR3 + FPAR1	
64 Lenze setting ⇨PAR4 + FPAR1	

Transfer parameter sets using the keypad:

Selection		Important
You can use the keypad to transfer parameter sets to other controllers. During transfer, access to the parameters via other channels is inhibited!		
	Keypad ⇨ Controller	Overwrite all available parameter sets (PAR1 ... PAR4, FPAR1 if available) with the corresponding keypad data
70	With function module	
10	(other)	
	Keypad ⇨ PAR1 (+ FPAR1)	Overwrite selected parameter set and FPAR1 (if available) with the corresponding keypad data
71	With function module	
11	(other)	
	Keypad ⇨ PAR2 (+ FPAR1)	
72	With function module	
12	(other)	
	Keypad ⇨ PAR3 (+ FPAR1)	
73	With function module	
13	(other)	
	Keypad ⇨ PAR4 (+ FPAR1)	
74	With function module	
14	(other)	
	Controller ⇨ Keypad	Copy all available parameter sets (PAR1 ... PAR4, FPAR1 if available) into the keypad
80	With function module	
20	(other)	
	Keypad ⇨ Function module	Overwrite only the module-specific parameter set FPAR1 with the keypad data
40	Only with function module	
	Function module ⇨ Keypad	Copy only the module-specific parameter set FPAR1 into the keypad
50	Only with function module	

Save your own setting:

Selection		Important
9	PAR1 ⇨ Own setting	You can store your own setting for the parameters of the controller (e.g. delivery condition of your machine): 1. Check that parameter set 1 is active 2. Inhibit controller 3. Set C0003 = 3, confirm with ENTER 4. Set C0002 = 9, confirm with ENTER, your own setting is stored 5. Set C0003 = 1, confirm with ENTER 6. Enable controller
		You can use this function to simply copy PAR1 to the parameter sets PAR2 ... PAR4
5	Own setting ⇨PAR1	Restore your own setting in the selected parameter set
6	Own setting ⇨PAR2	
7	Own setting ⇨PAR3	
8	Own setting ⇨PAR4	

C0126:
Behaviour with communication error

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C0126	-	24449_d = $5F81_h$	10	0: All monitoring is deactivated. 2: Monitoring of internal communication active	FIX32

Monitoring of internal communication between function module and controller.

A communication abort with activated monitoring initiates TRIP (CE5).

Tip!

A description of the complete selection for this code is given in the Operating Instructions of your basic device.

C1500: Software identification code

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1500	-	23075_d = $5A23_h$	Disp	-	VS

The code contains a string with a length of 14 bytes. The identification code is displayed, e.g. 82ZAFU0C_1XXXX.

C1501: Software creation date

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1501	-	23074_d = $5A22_h$	Disp	-	VS

The code contains a string with a length of 17 bytes. The software creation date and time are displayed, e.g. Jun 21 2000 12:31.

C1502: Display of software identification code

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1502	1 ... 4	23073_d = $5A21_h$	Disp	-	U32

Display of code C1500 in 4 subcodes, 4 characters each.

C1503: Display of software creation date

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1503	1 ... 4	23072_d = $5A20_h$	Disp	-	U32

Display of code C1501 in 4 subcodes, 4 characters each.

C1509: Bus device addressing

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1509		23066_d = $5A1A_h$	1	1	[1]	126	FIX32

This code can be used for bus device addressing. The code is only effective if the address switches S1-S7 were set to OFF prior to mains switching.

Note!

The change of the bus device address will only be effective after mains switching of the module/drive.

C1510: Configuration of process input data

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1510		23065_d = $5A19_h$			FIX32
	1 (PIW1)		18	see table below	
	2 (PIW2)		3		
	3 (PIW3)		4		
	4 (PIW 4)		5		
	5 (PIW 5)		6		
	6 (PIW 6)		7		
	7 (PIW 7)		8		
	8 (PIW 8)		9		
	9 (PIW 9)		10		
	10 (PIW 10)		11		

The bit status information or the actual values of the controller can be freely assigned to the max. 10 process data input words (PIW) of the master.

Selection		Scaling
1	FIF status word 1 (FIF-STAT1)	16 bits
2	FIF status word 2 (FIF-STAT2)	16 bits
3	Output frequency with slip (MCTRL1-NOUT+SLIP)	±24000 ≡ ±480 Hz
4	Output frequency without slip (MCTRL1-NOUT)	±24000 ≡ ±480 Hz
5	Apparent motor current (MCTRL1-IMOT)	2^{14} ≡ 100 % rated device current
6	Actual process controller value (PCTRL1-ACT)	±24000 ≡ ±480 Hz
7	Process controller setpoint (PCTRL1-SET)	±24000 ≡ ±480 Hz
8	Process controller output (PCTRL1-OUT)	±24000 ≡ ±480 Hz
9	Controller load (MCTRL1-MOUT)	$\pm 2^{14}$ ≡±100 % rated motor torque
10	DC-bus voltage (MCTRL1-DCVOLT)	1ph: 960 ≡ DC 400 V 3ph: 975 ≡ DC 800 V
11	Ramp function generator input (NSET1-RFG1-IN)	±24000 ≡ ±480 Hz
12	Ramp function generator output (NSET1-NOUT)	±24000 ≡ ±480 Hz
13	FIF-OUT.W1	16 bits or 0 ... 65535
14	FIF-OUT.W2	16 bits or 0 ... 65535
15	FIF-OUT.W3	0...65535
16	FIF-OUT.W4	0...65535
17	DRIVECOM control word (DRIVECOM-CTRL)	16 bits
18	DRIVECOM status word (DRIVECOM-STAT)	16 bits
19	PROFIDrive control word (PROFIDrive-CTRL)	16 bits
20	PROFIDrive status word (PROFIDrive-STAT)	16 bits

C1511: Configuration of process output data

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1511		23064_d = $5A18_h$			FIX32
	1 (POW1)		17	see table below	
	2 (POW2)		3		
	3 (POW3)		4		
	4 (POW 4)		5		
	5 (POW 5)		6		
	6 (POW 6)		7		
	7 (POW 7)		8		
	8 (POW 8)		9		
	9 (POW 9)		10		
	10 (POW 10)		11		

The process data output words (POW) of the master can be freely assigned to bit control commands or setpoints of the controller via C1511.

Selection		Scaling
1	FIF control word 1 (FIF-CTRL1)	16 bits
2	FIF control word 2 (FIF-CTRL2)	16 bits
3	Setpoint 1 (NSET1-N1)	±24000 ≡ ±480 Hz
4	Setpoint 2 (NSET1-N2)	±24000 ≡ ±480 Hz
5	Additional setpoint (PCTRL1-NADD)	±24000 ≡ ±480 Hz
6	Actual process controller value (PCTRL1-ACT)	±24000 ≡ ±480 Hz
7	Process controller setpoint (PCTRL1-SET1)	±24000 ≡ ±480 Hz
8	Reserved	
9	Torque setpoint or torque limit value (MCTRL1-MSET)	2^{14} ≡ 100 % rated motor torque
10	PWM voltage (MCTRL1-VOLT-ADD)	STOP Only for special applications. Modify only after having contacted Lenze!
11	PWM angle (MCTRL1-PHI-ADD)	
12	Reserved	
13	FIF-IN.W1	16 bits or 0 ... 65535
14	FIF-IN.W2	16 bits or 0 ... 65535
15	FIF-IN.W3	0...65535
16	FIF-IN.W4	0...65535
17	DRIVECOM control word (DRIVECOM-CTRL)	16 bits
18	Reserved	
19	PROFIDrive control word (PROFIDrive-CTRL)	16 bits

C1512:
Enable process output data

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1512**		23063_d = $5A17_h$	1	1	[1]	65535	FIX32

When C1511 is modified, the process output data are automatically inhibited in order to ensure data consistency.

Use C1512 to reenable individual or all POWs.

Due to the different decimal values of the bit positions, any combinations of process data output words can be enabled.

► 0 = Inhibit output word

► 1 = Enable output word

Valency of bit positions				
POW 10	POW 9	...	POW 2	POW 1
2^9	2^8		2^1	2^0

The value 65535 ($FFFF_{hex}$) in code C1512 enables all process output data.

C1513:
Monitoring response time of PZD communication

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1513	-	23062_d = $5A16_h$	3000	0	[1 ms]	65535	FIX32

The value of the monitoring response time is provided by the master.

Note!
A change in monitoring is immediately effective.
Monitoring starts with the receipt of the first telegram.

Tip!
The value = 0 in C1513 deactivates monitoring.

C1514:
Monitoring reaction in case of PZD communication fault

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1514	-	23061_d = $5A15_h$	0	0 0: No action; 1: TRIP (fault) 2: CINH (controller inhibit) 3: QSP (quick stop)	[1]	3	FIX32

If the master does not send a message within the monitoring response time (configurable under C1513), the action set under this code is executed.

Note!
A change in the monitoring reaction is immediately effective.

C1516:
Display baud rate

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1516		23059_d = $5A13_h$	Disp	0	[1]	9	FIX32

Selection	Baud rate
0	12 MBit/s
1	6 MBit/s
2	3 MBit/s
3	1.5 MBit/s
4	500 kBit/s
5	187.5 kBit/s
6	93.75 kBit/s
7	45.45 kBit/s
8	19.2 kBit/s
9	9.6 kBit/s

C1517:
Display bus device address

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1517		23058_d = $5A12_h$	Disp	3	[1]	126	FIX32

Display of the bus device address set under C1509.

C1520:
Display of all words to master

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1520	1...10	23055_d = $5A0F_h$	Disp	0	[1]	65535	U16

Display of process data input words PIW1 to PIW10 under the individual subcodes. All words are displayed but only the ones configured are valid.

C1521:
Display of all words from master

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1521	1 (POW1) 2 (POW2) ... 10 (POW10)	23054_d = $5A0E_h$	Disp	0	[1]	65535	U16

Display of the process data output words POW1 ... POW10 of the master under the individual subcodes.

C1522:
Display of all process data words to basic device

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1522	1...16	23053_d = $5A0D_h$	Disp	0	[1]	65535	U16

Display of process data words 1 ... 16 that are transferred from the function module to the basic device:

Subcode	Process data word
1	FIF control word 1 (FIF-CTRL1)
2	FIF control word 2 (FIF-CTRL2)
3	Setpoint 1 (NSET1-N1)
4	Setpoint 2 (NSET1-N2)
5	Additional setpoint (PCTRL1-NADD)
6	Actual process controller value (PCTRL1-ACT)
7	Process controller setpoint (PCTRL1-SET1)
8	Reserved
9	Torque setpoint or torque limit value (MCTRL1-MSET)
10	PWM voltage (MCTRL1-VOLT-ADD)
11	PWM angle (MCTRL1-PHI-ADD)
12	Reserved
13	FIF-IN.W1
14	FIF-IN.W2
15	FIF-IN.W3
16	FIF-IN.W4

C1523:
Display of all process data words from basic device

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1523	1...16	23052_d = $5A0C_h$	Disp	0	[1]	65535	U16

Display of process data words 1 ... 16 that are transferred from the basic device to the function module:

Subcode	Process data word
1	FIF status word 1 (FIF-STAT1)
2	FIF status word 2 (FIF-STAT2)
3	Output frequency with slip (MCTRL1-NOUT+SLIP)
4	Output frequency without slip (MCTRL1-NOUT)
5	Apparent motor current (MCTRL1-IMOT)
6	Actual process controller value (PCTRL1-ACT)
7	Process controller setpoint (PCTRL1-SET)
8	Process controller output (PCTRL1-OUT)
9	Controller load (MCTRL1-MOUT)
10	DC-bus voltage (MCTRL1-DCVOLT)
11	Ramp function generator input (NSET1-RFG1-IN)
12	Ramp function generator output (NSET1-NOUT)
13	FIF-OUT.W1
14	FIF-OUT.W2
15	FIF-OUT.W3
16	FIF-OUT.W4

C1525:
Display of current DIP switch position

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1525	1	23050_d = $5A0A_h$	Disp	0	[1]	127	
	2			0, 1			

This code displays the current switch position.

Subcode1, device address:

Switch	S1	S2	S3	S4	S5	S6	S7
Valency	64	32	16	8	4	2	1

Subcode2, transmission rate:

Switch	S8
Valency	0: 82SAFPC201 1: 82SAFPC0xx

C1526:
Display of last configuration data

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1526	1: 1st byte 2: 2nd byte 3: 3rd byte	23050_d = $5A0A_h$	Disp	0	[1]	65535	FIX32

This code displays the current configuration data.

Configuration data indicate:

- The type of the set parameter channel
- The length of the process data
- The existence/non-existence of consistency

Observe the description for the user data length (📖 11.5-9)

C1530:
PROFIBUS-DP diagnostics

Code	Subcode	Index	Possible settings		Data type
			Lenze	Selection	
C1530		23045_d = $5A05_h$	Disp	see below	FIX32

Code C1530 gives information on the current status of the Profibus.

Selection		
Bit	**Meaning**	**Explanation**
0	Reserved	
1	Reserved	
2	Reserved	
3	Reserved	
5|4	Status of DP state machine (DP-STATE)	
00	"WAIT_PRM"	The slave waits for a parameter telegram after acceleration. Other types of telegrams will be rejected or will not be processed. Data exchange is not yet possible.
01	"WAIT_CFG"	The slave waits for the configuration telegram that determines the number of input and output bytes. The master informs the slave about the number of I/O bytes that will be transferred.
10	"DATA_EX"	If the parameter setting as well as the configuration of the firmware and the application have been accepted, the slave status changes to Data_Exchange (exchange user data with the master)
11	Not possible	
7|6	Status of watchdog state machine (WD-STATE)	
00	"BAUD_SEARCH"	The Profibus slave is able to recognise the transmission rate automatically.
01	"BAUD_CONTROL"	After recognising the correct baud rate, the slave status changes to "Baud_Control" and the transmission rate is monitored.
10	"DP_CONTROL"	The status 'DP_Control' is used for threshold monitoring of the Profibus-DP master.
11	Not possible	
11...8	PROFIBUS-DP transmission rate recognised by SPC3	

Bit	11	10	9	8	
	0	0	0	0	12 MBit/s
	0	0	0	1	6 MBit/s
	0	0	1	0	3 MBit/s
	0	0	1	1	1.5 MBit/s
	0	1	0	0	500 kBit/s
	0	1	0	1	187.5 kBit/s
	0	1	1	0	93.75 kBit/s
	0	1	1	1	45.45 kBit/s
	1	0	0	0	19.2 kBit/s
	1	0	0	1	9.6 kBit/s

12	Reserved
13	Reserved
14	Reserved
15	Reserved

C1531:
Bus status

Code	Subcode	Index	Possible settings				Data type
			Lenze	Selection			
C1531	1 ... 4	23044_d = $5A04_h$	Disp	0	[1]	65535	FIX32

Depending on the subcode, the following bus states are displayed:

- Subcode 1: Data cycles per second
- Subcode 2: Total data cycles
- Subcode 3: Total parameterisation events
- Subcode 4: Total configuration events

Tip!

When the maximum count value of 65535 is reached, the counter starts again with 0.

11.9 Appendix

11.9.1 Special characteristics when using with Lenze basic devices

Use of function module in conjunction with starttec motor starter

Note!

If the function module is used in conjunction with the starttec motor starter, solely the Lenze device control is effective.

In the following table, the bit assignments for the applicable control word 1 (FIF-CTRL1) and status word 1 (FIF-STAT1) are given:

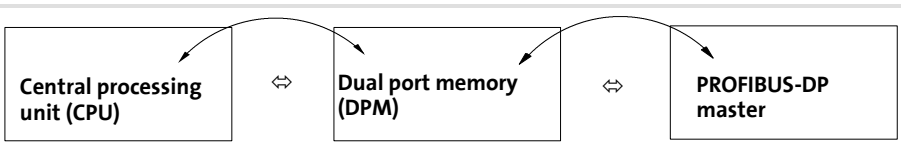
Control word 1 (FIF-CTRL1)		Status word 1 (FIF-STAT1)	
Bit	**Assignment**	**Bit**	**Assignment**
0	**S1**	**0**	Reserved
1	**S2**	**1**	Reserved
2	**Brake**	**2**	Reserved
3	Reserved	**3**	Reserved
4	Reserved	**4**	Reserved
5	Reserved	**5**	Reserved
6	Reserved	**6**	**Fixed 1**
7	Reserved	**7**	**Controller inhibit** 0 Controller enabled 1 Controller inhibited
8	Reserved	**11...8**	**Device status** Bit 11 10 9 8 0 0 1 1 Operation inhibited 0 1 1 0 Operation enabled 1 0 0 0 Fault active 1 1 1 1 Communication with basic device not possible
9	**Controller inhibit** (FIF-CTRL1-CINH) 0 Controller enabled 1 Controller inhibited		
10	**External fault** (FIF-CTRL1-TRIP-SET)		
11	**Fault reset** 0=>1 (FIF-CRTL1-TRIP-RESET) Bit change causes trip reset		
12	Reserved	**12**	Reserved
13	Reserved	**13**	Reserved
14	Reserved	**14**	Reserved
15	Reserved	**15**	**Ready for operation** 0 Not ready for operation (fault) 1 Ready for operation (no fault)

11.9.2 Consistent parameter data

In the PROFIBUS-DP communication system data are permanently exchanged between the master computer (**CPU + PROFIBUS-DP master**) and the basic device via the slave connection module.

The PROFIBUS-DP master as well as the CPU (central processing unit) of the master computer access a joint memory - the dual port memory (DPM).

The DPM allows data exchange in both directions (write/read):



It could happen that a slower PROFIBUS-DP master writing would be overtaken by a faster CPU reading within a cycle time without any further data organisation.

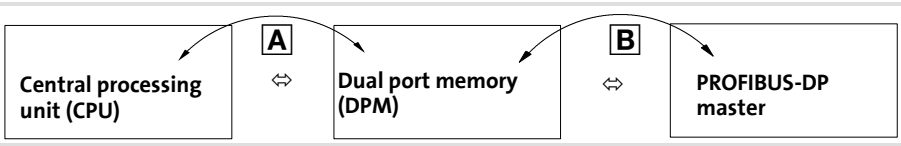
To avoid such a non-permissible status, the parameter data to be transmitted by must be marked as ”consistent”.

Data communication with existing consistency

With consistency, either ”reading” or ”writing” is possible in the memory with simultaneous access of master and CPU:

- ► PROFIBUS-DP master transfers data only as a complete data record.
- ► The CPU can only access completely updated data records.
- ► PROFIBUS-DP master cannot read or write data as long as the CPU accesses consistent data.

The result becomes clear from the example below:



A CPU wants to read!
B Master wants to write simultaneously!
1. As the master can only write if the CPU does not read, the master waits until the data are read completely by the CPU.
2. The master only writes a complete data record into DPM.

Configuring consistent data

Consistency is achieved by a suitable PROFIBUS-DP master configuration. Please use the corresponding Instructions for your configuring software for this purpose.

Tip!

Consistency configuration depends on the PROFIBUS-DP master configuring software. When using a Siemens-S5 PLC, please consider:

- ► Consistency is switched on by any word in the consistent area
- ► Consistency must be switched off by a specific switch-off word.
- ► The type of CPU, consistency and address area depends which word switches off consistency.

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12 Parallel operation of the interfaces AIF and FIF

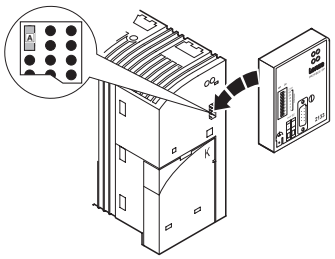
12.1 Possible combinations

Note!

The basic devices 8200 vector and Drive PLC can use a communication module (AIF) and a function module (FIF) at the same time.

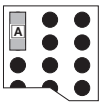
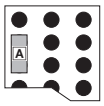
Notes on parallel operation

Attach/detach the communication module to/from the AIF interface. This is also possible during operation.



8200vec073

For internal voltage supply, the jumper A must be plugged on at the indicated position.

External voltage supply (delivery state)	Voltage supply through internal voltage source
	

Possible combinations

Function module on FIF (Design: Standard or PT)		Communication module on AIF	
		Keypad E82ZBC [1] Keypad XT EMZ9371BC [1]	PROFIBUS-DP 2131/2133
Standard I/O	E82ZAFS	✓✓	✓✓
Application I/O	E82ZAFA	✓✓	✓
INTERBUS	E82ZAFI	✓✓	☒
PROFIBUS-DP	E82ZAFP	✓✓	☒
LECOM-B (RS485)	E82ZAFL	✓✓	☒
System bus (CAN) System bus I/O-RS System bus I/O	E82ZAFC E82ZAFC100 E82ZAFC200	✓✓	✓✓
CANopen / DeviceNet [2]	E82ZAFD	✓✓	☒
ASI	E82ZAFF	✓✓	☒

1) Independently of the jumper position always internal voltage supply.
2) In preparation
✓✓ Combination possible, internal or external supply of the communication module
✓ Combination possible, external supply of the communication module!
(✓) Combination possible, communication module can only be used for parameter setting (internal or external supply)
☒ Combination not possible