EDB2130IB/GB
00381616

Lenze

Antriebstechnik

Operating Instructions

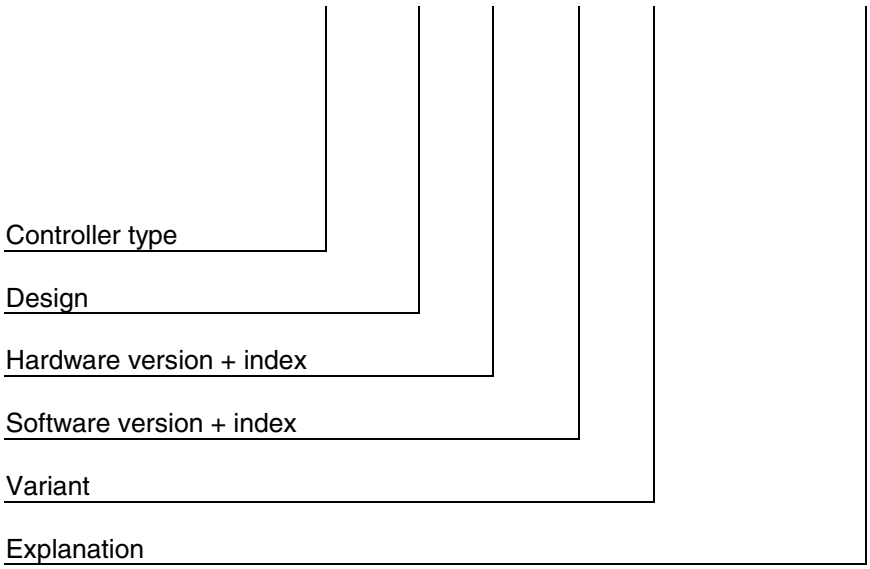
PROFIBUS-FMS/DP
Bus interface module
Type 2130IB

These operating instructions are valid for the interface modules as of nameplate designation:

2130	IB	0x.	0x.	V001	PROFIBUS-FMS/DPwith RS485
2130	IB	0x.	0x.	V002	PROFIBUS-FMS/DP with optical fibre cable

together with the controller series as of

4900	E	3x.	5x.	DC controller
8600	E	5x.	6x.	Frequency inverter
9200	E	4x.	4x.	Servo controller
		4x.	5x.	
		5x.	5x.	
2211	PP.	0B.	1x.	Position control
2212	WP.	0B.	1x.	Winding calculator



Important:
These operating instructions are only valid together with the operating instructions of the suitable controllers or automation modules!

corresponds to the German edition of 15 February, 1995

		revised
Edition of:	10.04.1995	
Date of print:	24.04.1995	

How to use these operating instructions...

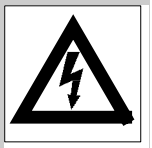
To locate information on specific topics, simply refer to the table of contents at the beginning and to the index at the end of the operating instructions.

These operating instructions use a series of different symbols to provide quick reference and to highlight important items.

This symbol refers to items of information intended to facilitate operation.

Notes which should be observed to avoid possible damage to or destruction of equipment.

Notes which should be observed to avoid health risks to the operating personnel.



Safety information

The equipment described is intended for use in industrial drive systems.

This equipment can endanger life through rotating machinery and high voltages, therefore it is essential that guards for both electrical and mechanical parts are not removed.

The following points should be observed for the safety of the personnel:

- Only qualified personnel familiar with the equipment are permitted to install, operate, and maintain the devices
- System documentation must be available and observed at all times.
- The system must be installed in accordance with local regulations.

A qualified person is someone who is familiar with all safety notes and established safety practices, with the installation, operation and maintenance of this equipment and the hazards involved. It is recommended that anyone who operates or maintains the electrical or mechanical equipment should have a basic knowledge of First Aid. As a minimum, they should know where the First Aid equipment is kept and the identity of the official First Aiders.

These safety notes do not represent a complete list of the steps necessary to ensure safe operation of the equipment. If you require further information, please contact your nearest Lenze representative.

The information in these operating instructions applies only to the hardware and software versions that are indicated on the cover page.

The specifications, processes, and circuitry described in these operating instructions are for guidance only and must be adapted to your own specific applications.

Lenze does not guarantee the suitability of the processes and circuitry described in these operating instructions.

The specifications in these operating instructions describe the features of the products, without guarantee.

Lenze personnel have carefully checked these operating instructions and the equipment it describes, but cannot be held responsible for its accuracy.

Contents

Planning

Programming

Lenze

Planning

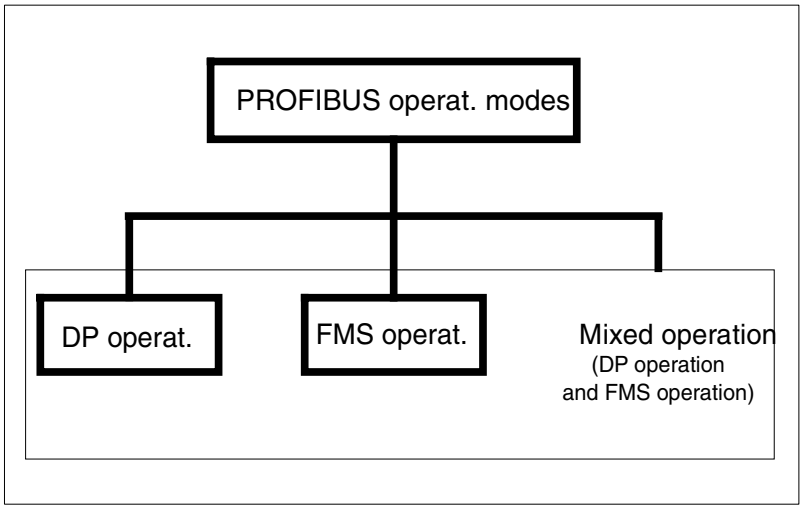
1. General information about PROFIBUS

The 2130IB interface module is used for serial connection of Lenze controllers with the standardized serial communication system PROFIBUS (Process Field Bus). PROFIBUS is suitable for parameter setting and control of controllers via a host.
The following PROFIBUS variants are supported (see figure below):

- PROFIBUS-FMS (DIN 19245 part 1 and part 2)
- PROFIBUS-DP (DIN19245 part 1 and part 3)

In a PROFIBUS system, hosts, PC or PLC are called master, and controllers are slaves.

The different PROFIBUS operating modes



Both PROFIBUS variants have an identical wiring. Their communication profile, however, is different.
Data are transmitted via RS485 bus (2130IB.V001) or optical fibre cables (2130IB.V002).

For the complex tasks in power transmission it has become a necessity for the component suppliers to agree about the most important device functions and parameters. Therefore, more than 30 international drive manufacturers have come together to form the DRIVECOM User Group e.V.
Lenze and the other members have brought these functions together in a so-called profile (DRIVECOM profile power transmission 21) on the basis of the PROFIBUS standard (part 2). This profile is implemented on the 2130IB bus interface module 2130IB.
The DRIVECOM profile definition is a useful supplement of standardardized communication for the user and describes in general terms the data contents and the controller behaviour.

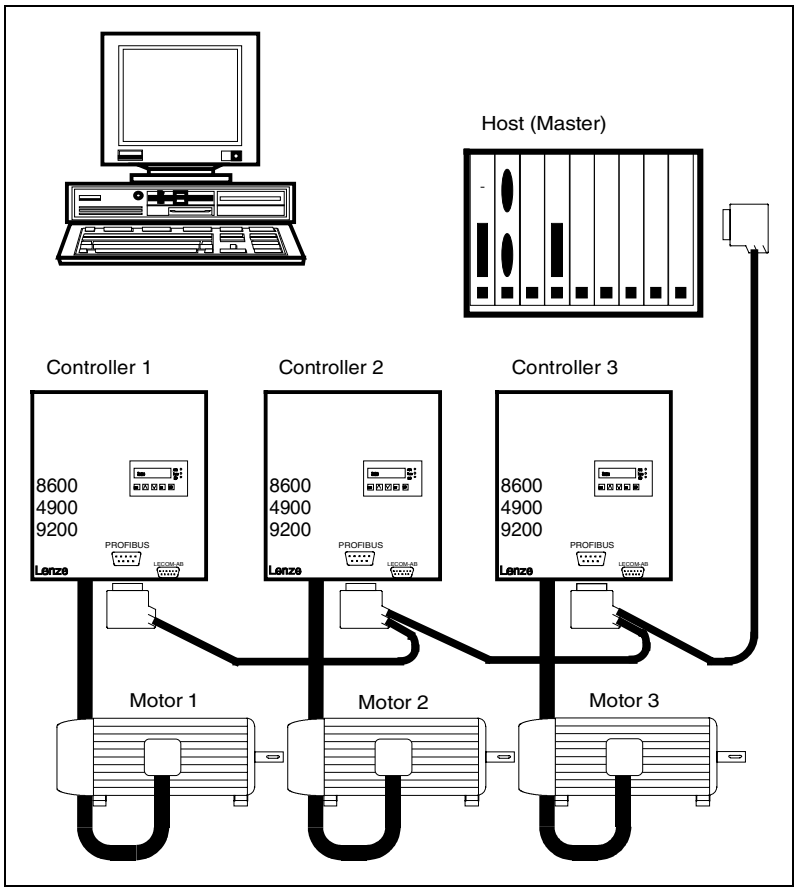
The 2130IB bus interface module has the following features:

- Slave interface module for the communication system PROFIBUS with the communication profiles PROFIBUS-FMS and PROFIBUS-DP
- Bus connection according to the RS485 standard (2130IB.V001) or optical fibre cables according to Siemens SINEC-L2FO (2130IB.V002).
- Baud rate from 93.75 kBaud to 1.5 MBaud
- Additional module for the Lenze series 4900, 8600 and 9200.
- Can be combined with the automation modules 2211PP, 2212WP
- Standardised parameters and controller functions according to the DRIVECOM profile 21
- Parameter setting channel as option for PROFIBUS-DP
- Access to all Lenze parameters
- LECOM-A/B interface at the device remains active
- Intelligent module with 16-bit microprocessor

1.1. Structure of the PROFIBUS system

The PROFIBUS network according to DIN 19245 part 1, consists of an RS485 connection.
As standard, you can connect a maximum of 32 participants (including hosts) to the RS 485 bus. Using repeaters this structure can be extended to a maximum of 127 participants in the whole bus system.
The repeaters can also be used to achieve line or tree topologies. The maximum extension of the bus system depends on the baud rate and the number of repeaters.
For more information, please consult the documentation of the control manufacturer.

PROFIBUS using RS485 connection (without repeaters)



Apart from the RS485 connection you can also use an optical fibre cabling. Here, the Siemens system SINEC-L2FO is used mainly, where point-to-point and star connections (using active star connectors) are possible.

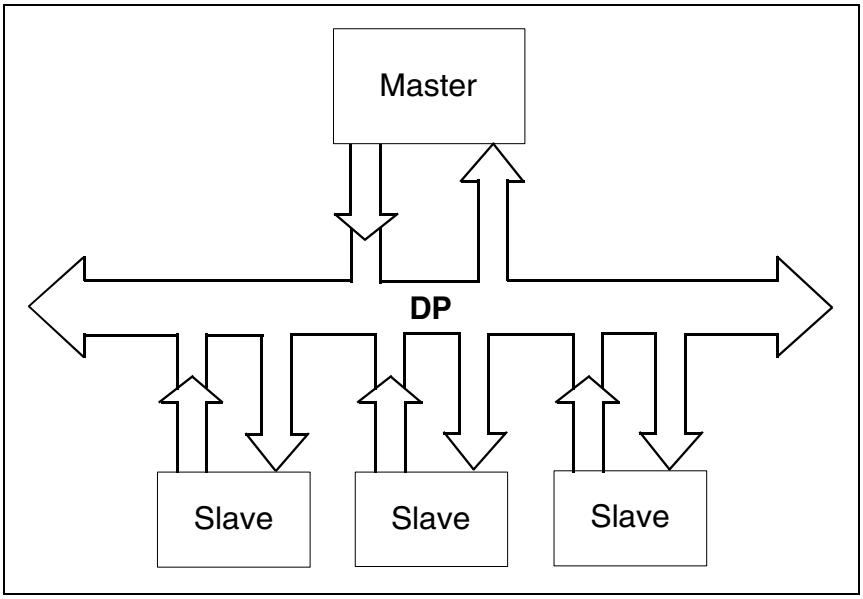
Note:

The module variant 2130IB.V002 has a connection for OFC plastic fibres for distances from 5 m to 25 m.

1.1.1. Explanations about PROFIBUS-DP

PROFIBUS-DP is the variant for sensors/actors, when a higher process response is required. PROFIBUS-DP connects the central automation devices, like for example programmable logic controllers, via a fast serial connection using decentral input and output devices, sensors and actors such as controllers.
The main task of the PROFIBUS-DP system is the fast cyclic data exchange between the central automation device (master) and the peripherial devices (slaves); see figure "standard structure".

Standard structure

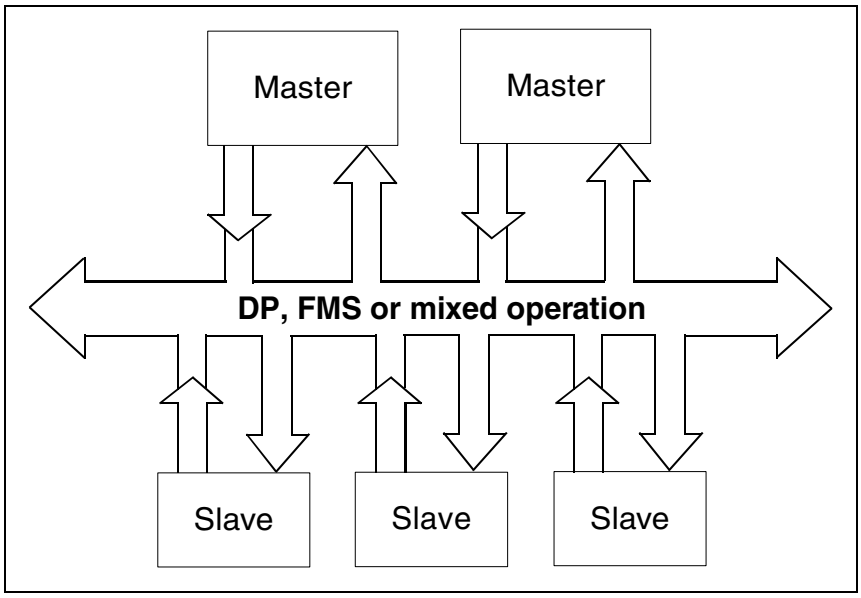


The explanation of the PROFIBUS-DP functions of the Lenze controller can be obtained from the paragraph "Operating mode PROFIBUS-DP" (page 35).

1.1.2. Explanations about PROFIBUS-FMS / mixed operation

PROFIBUS-FMS is the standard PROFIBUS according to part 1 and part 2 of DIN19245. This operating mode supports the communication on a bus with several masters (e.g. connected PLC systems) and with a number of slaves (e.g. controllers). In addition, a mixed bus access procedure is possible, where several PROFIBUS masters (e.g. PLC systems) with the same priority can have access to PROFIBUS slaves (e.g. controllers); see figure "extended structure".

Extended structure



PROFIBUS-FMS is based on the description of objects. Devices are written in as virtual field devices (VFD = virtual field device); with one device having several VFDs. Parameters or variants are displayed as objects, which can be read out or written in using the services "Read" or "Write", when an index (index + subindex) is specified. The FMS device supplies an object description of every variable or data type which contains the most important information about the communication.

In a mixed PROFIBUS system, you can operate PROFIBUS-DP devices and PROFIBUS-FMS devices on the same bus.
In a mixed system, however, only participants with the same communication profile (FMS or DP) are able to communicate with each other.

Lenze controllers have both communication profiles. In the operating mode "mixed operation" PROFIBUS-FMS and PROFIBUS-DP are active at the same time. This means that in a mixed system the Lenze controller can be called up by PROFIBUS-FMS masters and PROFIBUS-DP masters.
A disadvantage of the mixed operation compared with the pure PROFIBUS-DP operation is the lower protocol efficiency. There are no disadvantages compared with the pure PROFIBUS-FMS operation. Therefore, a special operating mode for PROFIBUS-FMS for the controller is not necessary.

The description of the PROFIBUS-FMS functions of the Lenze controller can be obtained from the chapter "operating modeOperating mode PROFIBUS mixed operation (FMS/DP)" (page 46).

1.2.3. Selection of the PROFIBUS operating mode

Select the desired PROFIBUS operating mode using the following table.

	PROFIBUS operating mode for the controllers (parameter L-C1900)	
Criteria	**DP operation** (factory setting)	**Mixed operation**
PROFIBUS-DP master available	yes	yes (DP)
PROFIBUS-FMS master available	no	yes (FMS)
Several control masters necessary	no	yes (FMS)
Control of the controller	yes	yes (FMS/DP)
Parameter setting of the controller	yes	yes (FMS/DP)
DRIVECOM profile 21	yes	yes (FMS/DP)
Baud rate up to 1.5MBaud	yes	yes (FMS/DP)
Automatic baud rate recognition	yes	no
Data transmission time / cycle time	small	medium

1.2.4. Compatibility with Siemens SINEC-L2

Siemens designates the PROFIBUS communication as SINEC-L2 . There are a number of variants; their compatibilty with the module 2130IB is listed in the following.

Siemens SINEC-L2 variant	**Comp. w. 2130IB**	**Explanations**
SINEC-L2-FMS	Yes	FMS = "Fieldbus Message Specification" Implementation acc. to PROFIBUS standard DIN 19245 part1 and part 2
SINEC-L2-DP (standard)	Yes	DP = Decentral peripherial units Implementation acc. to PROFIBUS standard DIN 19245 part1 and part 3 (COM ET 200 as of version V4.0)
SINEC-L2-DP (Siemens)	No	DP = Decentral peripherial units. Older Siemens-specific DP implementations which are not compatible with the DP standard (COM-ET200 up to version V3.x).
SINEC-L2-STF or SINEC L2-TF	No	STF = "Siemens Technologische Funktio-onen" (Siemens technological functions). Siemens-specific Layer7 implementation
SINEC-L2-Layer2	No	Siemens-specific communication of a direct Layer2 access
SINEC-L2-FO	Yes	Optical fibre cable connection using plastic OFC / HP duplex Lenze module variant 2130IB.V002.

2. Technical data

2.1. General data

Communication media	RS485 (2130IB.V001) OFC (SINEC-L2FO) (2130IB.V002)
Communication profile	PROFIBUS-FMS (DIN 19245 p1+p2) PROFIBUS-DP (DIN 19245 p1+p3)
PROFIBUS participant	Slave
Drive profile	DRIVECOM 21
Baud rate [kBit/s]	93.75, 187.5, 500, 1500
Permissible pollution	Degree of pollution 2 according to VDE 110 part 2
Permissible humidity	80% relative humidity no condensation
Surge strength to the bus system	250V AC (2130IB.V001) infinite (2130IB.V002)
Ambient temperature	0...45°C

2.2. Protocol specific data

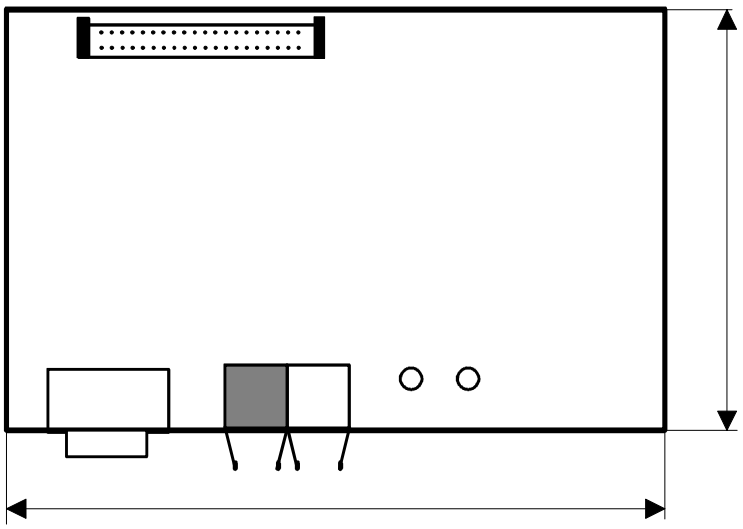
2.2.1. PROFIBUS-DP

Max. number of controllers	31 (without repeater) 122 (with repeater)
Supported services	Data_Exchange, RD_inp, RD_outp, Slave_Diag, Set_Prm, Chk_Cfg, Get_Cfg, Global_Control, Set_Slave_add
Functions available as options	Sync, Clear_Data
Maximum PDU length	32 Byte
User data length	12 Byte with DP parameter setting channel 4 Byte w/o DP parameter setting channel
Lenze PNO identification number	0082_{hex}
Controller master data file for DIN E 19245 part3 Simatic-S5 COM-ET200/IM 308-B	 L_AR0082.GSD LE0082TD.200
DP parameter setting data	10100000_{bin}
Configuration data with DP parameter setting channel without DP parameter setting channel	 $B7_{hex}$ (183_{dez}),$A3_{hex}$ (163_{dez}), 93_{hex} (147_{dez}) $A3_{hex}$ (163_{dez}),93_{hex} (147_{dez})

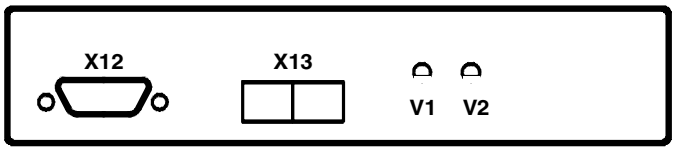
2.2.2. PROFIBUS-FMS

Max. number of controllers	31 (without repeater) 126 (with repeater)
Supported services	Initiate, Abort, Identify, Status, Get-OV-long, Read, Write
Maximum PDU length	150 Byte
Communication relations	Reference 1: Default Management Reference 2: MSAC

2.3. Dimensions of the 2130IB board



Connections of 2130IB



View of 2130IB with front plate

Explanations:

X4 **Automation interface**
34-pole plug connector for the connection with the control board of the controller

X12 **RS485 bus connection**
9-pole SubD socket
(only 2130IB.V001)

X13-W30 **OFC receiver**
(only 2130IB.V002)

X13-W31 **OFC transmitter**
(only 2130IB.V002)

V1 **(LED green) supply 2130**
OFF: Module has no supply voltage. The controller is switched off or the connection to the controller is interrupted (X4).
ON: Module has supply voltage.

V2 **(LED yellow) Communication 2130**
OFF: No supply or 2130 and controller is not initialized.
ON: Module 2130 and base device are initialized but there is no PROFIBUS communication.
FAST FLASHING: (4 times per sec.) PROFIBUS-DP communication with user data
SLOW FLASHING: (once per sec.) PROFIBUS-FMS communication is established

2.4. Scope of supply

Variants of the 2130IB bus interface module:

Variant	Communication medium	Service no.
2130IB.V001	RS485	33.2130IB.V001
2130IB.V002	Optical fibre cable Siemens SINEC-L2FO (plastic OFC/HP duplex)	on request

The scope of supply of the 2130IB module includes the following components:

- 2130IB board
- Diskette 3 1/2", DOS format 1.44 MByte including:
  - INSTALL.EXE — Installation program for the following software
  - L_AR0082.GSD — Controller master data file according to DIN E 19245 part 3 (PROFIBUS-DP)
  - LE0082TD.200 — Controller master data file for Simatic-S5 COM-ET200/ IM-308B (SINEC-L2-DP)
  - 2130@@ST.S5D — Example program for Simatic-S5
  - LEMOC2 — PC program for parameter setting of the drive as of version V2.2
- 2130IB operating instructions

The controllers can be supplied as a complete system.

2.5. Manufacturer's Declaration

We hereby certify that the electronic controllers listed in these Operating Instructions are control components for variable speed motors intended to be assembled into machines or to form a machine together with other components. According to the "Council directive ... relating to machinery" 89/392/EWG, the controllers cannot be called machines.

These Operating Instructions give advice and recommendations for the installation and use of the electronic equipment.

As long as the conformity with the protection and safety guidelines required by the "Council directive ... relating to machinery" 89/392/EWG and its amendment 91/368/EWG is not proved, commissioning of the machine is prohibited.

The measures required for typically configured controllers to comply with the EMC limit values are indicated in these Operating Instructions. The electromagnetic compatibility of the machines depends on the method and accuracy of the installation. The user is responsible for the compliance of the machine with the "Council directive ... relating to electromagnetic compatibility" 89/336/EWG and its amendment 92/31/EWG.

Considered standards and regulations:

- Electronic equipment for use in electrical power installations and their assembly into electrical power installations: DIN VDE 0160, 5.88
- Standards for the erection of power installations: DIN VDE 0100
- Degrees of protection: EN 60529, 10.91
- Base material for printed circuits: DIN IEC 249 part 1, 10.86; DIN IEC 249 part 2-15, 12.89
- Printed circuits, printed boards: DIN IEC 326 part 1, 10.90; EN 60097, 9.93
- Creepage distances and clearances: DIN VDE 0110 part 1-2, 1.89; DIN VDE 0110 part 20, 8.90
- Electrostatic discharge (ESD): prEN 50082-2, 8.92, IEC 801-2, 9.87 (VDE 0843, part 2)
- Electrical fast transient interference (Burst): prEN 50082-2, 8.92, IEC 801-4, 9.87 (VDE 0843, part 4)
- Surge immunity requirements: IEC 801-5, 10.93
- Radio interference suppression of electrical equipment and plants: EN 50081-2, 3.94; EN 55011 (VDE 0875, part 11, 7.92)
- Radio interference suppression of radio frequency equipment for industrial purposes: VDE 0871, 6.78

2.5.1. Application as directed of the 2130IB module

The 2130IB module is an additional module for Lenze controllers of the 4900, 8600, 9200 series. These controllers are industrial equipment for use in industrial high power plants. They are designed for use in machinery to control variable speed drives.
Further notes about the use can be obtained from the operating instructions of the corresponding controller.

3. Installation

3.1. Installation

You can integrate the 2130IB bus interface module into the controllers of the 4900, 8600, 9200 series.
It is also possible to use it together with the Lenze automation module for positioning (2211PP) and winding applications (2211WP).
If you purchase the bus interface module separately, you will need an installation kit.

Name	Service no.	Explanation
Installation kit 8600-4900/2130IB	33.4900_N.V013	Installation kit for the 8600 and 4900 series
Installation kit 9200/2130IB	33.9200_N.V008	Installation kit for the 9200 series

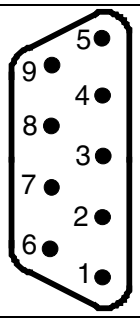
Assembly instructions are included in the installation kits.
Further installation kits for the controllers of the 9200 series can be obtained on request.

3.2. Wiring

3.2.1. 2130IB.V001 (RS485)

Communication media	RS485 (2-wire)
Network topology	Line
Number of controllers	31 without repeater. With repeater max.126.
Maximum cable length	1200 m (depending on the desired baud rate and cable type. See following cable specification)
Maximum baud rate	1500 kBaud

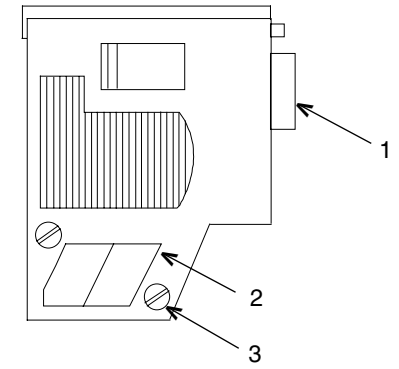
X12 Socket 9-pole SubD (RS485)

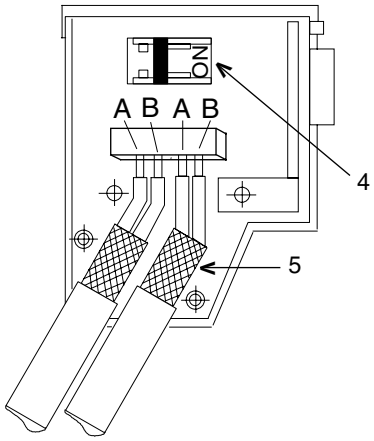
View	Pin no.	Signal name	Name
	1	PE	Protective earth
	2	–	–
	3	RxD / TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Data reference potential
	6	P5V2	Supply plus
	7	–	–
	8	RxD / TxD-N	Data line A
	9	–	–

How to wire the module

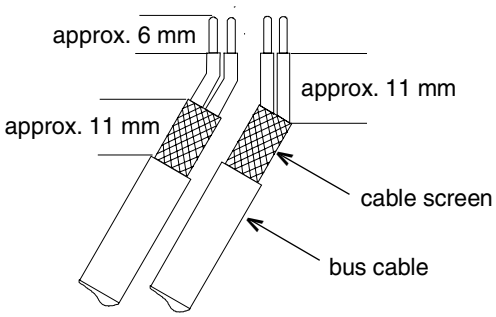
- Only use cables according to the following cable specification.
- Observe the following illustrations concerning the bus connector.
- Make the connection to the controllers using the bus connector. The bus system is not interrupted if you disconnect the plug from the controller.
- Connect a terminating resistor at the physical bus ends . This resistor is integrated in the bus connection plug. You can activate it by using a switch.
- If the 2130IB bus interface module is not supplied with power any more, the bus system continues to operate. The connected controller, however, cannot be called by the host.
- If you want to disconnect individual bus participants, make sure that the terminating resistors at the physical cable ends remain active.
- Further notes and wiring instructions can be obtained from the documentation of the control manufacturer.

Connection of the bus cable in the bus connector





1 = 9-pole SubD connector
2 = Guides for the bus cable
3 = Housing screw
4 = Terminating resistor (not connected))
5 = Cable screen; must lay bare on the metal guide



Lenze

Accessories for the wiring of the RS485 connection

Name	Part no.	Explanation
Bus connector Service designation: Bus connector PROFIBUS RS485	363 695	Bus connector for 9-pole SubD socket with plug terminals to connect the bus cable. Bus terminal resistor can be added. Service designation: Siemens 6ES5 762-1AA12
Cable: Service designation: Sinec-L2 bus cable 2-core Cable resistance Capacitance per unit length Loop resistance Wire diameter Wire cross-section Wires Length	363 677 (sold by the meter)	 135 - 165 Ω/km (f = 3 - 20 MHz) ≤ 30 nF/km <110 Ω/km >0.64mm >0.34qmm double twisted, insulated and screened 1200m at 93.75 kBaud 1000m at 187.50 kBaud 400m at 500.00 kBaud 200m at 1500.00 kBaud Service designation: Siemens SINEC L2 bus cable (sold by the meter) 6XV1 830-0AH10

- These service designations and technical data of component manufacturers other than Lenze may not be the latest information. Therefore they are to be understood as guidelines only. Precise data can be obtained from the documentation of these manufacturers.

3.2.2. 2130IB.V002 (OFC)

Communication media	Optical fibre cable (plastic) HP duplex plug connection
Network topology	Point-to-point (star network when using star couplers)
Number of controllers	1 (per star coupler 15-1, number of star couplers in a cascade depends on the baud rate)
Minimum cable length	5m
Maximum cable length	25m

OFC wiring

- A star coupler is not necessary for the wiring to a drive controller (point-to-point connection).
- If you want to connect several controllers, you must use star couplers.

Accessories for wiring using optical fibre cables are available from the Siemens SINEC-L2FO products.

3.2.3. Additional procedure for FMS / mixed operation

When using the FMS / mixed operation, some parameters must be set for the controller and the field bus module, which is only possible by means of the LECOM1 interface.
For the parameter setting of the controllers using the LEMOC2 program, connect the PC (RS232) and the controller (LECOM1; X6) by means of a PC system cable.

Name	Part no.	Explanation
PC system cable 5 m	338 094	System cable 5m between PC (9-pole socket) and controller
PC system cable 10 m	338 095	System cable 10m between PC (9-pole socket) and controller
Cable type Cable resistance Capacitance per unit length Length	–	LIYCY 4 x 0.25mm screened < 100 Ω/km < 140nF/km ≤ 15m

Wiring of the system cable

Controller 9-pole SubD socket Pin no.	PC or similar 9-pole socket Pin no.	PC or similar 25-pole socket Pin no.
2 (RxD)	3 (TxD)	2 (TxD)
3 (TxD)	2 (RxD)	3 (RxD)
5 (GND)	5 (GND)	7 (GND)

Only use metallized SubD housings. Connect the screen to the housings at both ends.

Programming

The programming section using the 2130IB bus interface module is divided into the following chapters:

- Commissioning
- Code table 2130IB
- PROFIBUS operating modes
- DRIVECOM parameters
- Lenze parameters
- Glossary

Commissioning
This chapter contains important information about the initial connection of the 2130IB together with a controller base device and an automation module.

In addition, you will obtain information about the installation of the LEMOC2 PC program, which is necessary for the parameter setting of the 2130IB.

Code table 2130IB
In the code table 2130IB those parameters are listed which are used for the setting of the module and the bus system. You can set these parameters by means of LECOM-A/B or the LEMOC2 PC program or PROFIBUS.

PROFIBUS operating modes
This chapter contains information about the selection of the operating modes PROFIBUS-DP or PROFIBUS mixed operation DP/FMS.
For these operating modes, the required settings of the master and the controller are described. For PROFIBUS-DP, an example program for the SIMATIC-S5 is briefly explained.

DRIVECOM parameters
This chapter describes the DRIVECOM profile parameters which are implemented on the module. These are, among others, the DRIVECOM states and the status and control word as well as the configuration of the process data and the monitoring functions for communication.

Lenze parameters
This chapter describes the access to Lenze parameters in the base controller or in the automation module.
In addition, the control of the device together with an automation module is explained.

Glossary
In this chapter, all the important technical terms and abbreviations (e.g. AIF, PDU, subindex) are explained, which you will find in these operating instructions.

1. Commissioning

1.1. Code numbers / Index

The parameters of the controller are addressed by means of numbers. These numbers are called "index" according to the PROFIBUS system. Lenze designates them as code numbers .
All Lenze code numbers begin with 0. They are in an index range from 22576 (5830_{hex}) to 24575 ($5FFF_{hex}$). You can recognize Lenze code numbers by the preceeding letters "L-C" (e.g.: L-C000 for Lenze code number 000).
The conversion for the address method between code number and index is given on page 67.

1.2. How to install the PROFIBUS software

The attached "Lenze PROFIBUS diskette" contains important data and programs about parameter setting and control of the controller using PROFIBUS.

The diskette (3 ½", DOS format, 1.44 MByte) contains the following files:

Diskette 3 1/2", DOS format 1.44 MByte including:

INSTALL.EXE	Installation program for the following software
L_AR0082.GSD	Controller master data file according to DIN E 19245 part 3 (PROFIBUS-DP)
LE0082TD.200	Controller master data file for Simatic-S5 COM-ET200/ IM-308B (SINEC-L2-DP)
2130@@ST.S5D	Example program for Simatic-S5
LEMOC2	PC program for parameter setting of the drive as of version V2.2

To install the software, insert the diskette into the disk drive. Enter:

a:\install or **b:\install**

Further information about the installation is provided by the "install program".

1.3. Commissioning sequence

The initial commissioning of the 2130IB bus interface module together with a controller and possibly an automation module is divided into the following phases:

Base setting of the controller
In this phase the controller receives information about additional modules and the source of the control information.
This setting is possible using the keypad at the controller of the LEMOC2 PC program.

PROFIBUS bus parameters
It is not necessary to set PROFIBUS bus parameters for the operation with PROFIBUS-DP. With the factory setting, the 2130IB module is set automatically to the baud rate of the master.
In addition, you can enter the PROFIBUS address via PROFIBUS.
Modified bus parameters are automatically saved permanently.

For PROFIBUS-FMS or PROFIBUS mixed operation, a local setting of the baud rate and the address is necessary. These parameters can be set using the LEMOC PC program, which is included on the attached diskette. For this, make a LECOM-A/B connection for commissioning.

PROFIBUS drive control
The drive system is controlled via PROFIBUS. Control information is transmitted to the controller, and the controller returns feedback information to the master.

1.3.1. Base setting of the drive system

For the base setting, the keypad on the controller or LEMOC2 can be used.

Setting using the keypad on the controller

1. Inhibit controller (press STP key).
2. Set parameter code set (L-C000) to -2-. Now you have access to the extended parameter set using the keypad.
   Confirm the setting using SH + PRG.
3. Set parameter operating mode (L-C001) to -0- or -1-. Now a parameter setting is possible via the keypad.
   Confirm the setting using SH + PRG.
4. Enter automation module code (L-C370).
   For this, set parameter L-C370 to -1- .
   With this setting, the controller recognizes the interface module.
   Confirm the setting using SH + PRG.

4a. ***Only required for automation module:***
Set parameter code set (L-C1000) of the automation module to -2-.
Now you have access to the extended parameter set using the keypad. Confirm the setting using SH + PRG.

4b. ***Only required for automation module:***
Enter field bus module code (L-C1120).
For this, set parameter L-C1120 to -3-.
With this setting, the controller recognizes the interface module.
Confirm the setting using SH + PRG.

Note:

After the setting, the operation changes automatically to the code number which was set last in the base controller (e.g. L-C370), since the operation re-initializes. This, however, does not influence the parameters which are already set.

5. Set the operating mode (L-C001).
   This setting determines the write access to the drive parameters.
   The following combination is effective:

L-C001	Source of parameter setting	Source of control (e.g. set-values)
0	Keypad	Terminal
1	Keypad	Keypad
2	LECOM 1 (LECOM-A/B)	Terminal
3	LECOM 1 (LECOM-A/B)	LECOM 1 (LECOM-A/B)
4	LECOM 2 (PROFIBUS)	Terminal
5	LECOM 2 (PROFIBUS)	LECOM 2 (PROFIBUS)
6	Keypad	LECOM 2 (PROFIBUS)
7	LECOM 1 (LECOM-A/B)	LECOM 2 (PROFIBUS)

   For normal operation using PROFIBUS, select 5.
   Confirm the setting using SH + PRG.
   The read access of LECOM1 (LECOM-A/B) or LECOM2 (PROFIBUS) is possible in any operating mode.

6. To save the setting of L-C001 and L-C370 permanently, set parameter L-C003 "Save parameter set" to 1 (parameter set 1). Confirm the setting using SH + PRG.

6a. ***Only required for automation module:***
To save the setting of the parameter change in the automation module permanently, save the parameter set (L-C1003 = 1). Confirm the setting using SH + PRG.

7. Enable the controller (press SH + STP keys). It may be necessary to undo other controller inhibit sources (terminal 28, TRIP, L-C40).

Note:

If you activate the function "Load factory setting" at the controller, the settings described under 1 to 7 are deleted.

Setting using the LEMOC2 PC program

1. Change to your LEMOC2 directory (...\LM2\BIN) and start LEMOC2 by entering **LM2**.
2. Load the file "2130_xxx.PDB" (x = serial number) in the menu "file / controller description".
3. Load a parameter which contains the corresponding factory setting in the menu "file / load parameter set".
   The following parameter sets are available:
   2130_FMS.VAR Parameter set for PROFIBUS-FMS or mixed operation
   2130_DP.VAR Parameter set for PROFIBUS-DP
4. Connect your PC to the controller and switch LEMOC2 on-line. For this, use the option "setting / general settings".
5. Inhibit controller (press STP key or F9 key or use controller inhibit terminal 28).
6. The 2130IB module can now be activated in the menu "main menu / drive system"
   Set parameter L-C370 (C0370-000) to -1- and transmit the value to the controller.

6a. ***Only required for automation module:***
Set parameter L-C1120 (C1120-000) to -3- and transmit the value to the controller.

Note:

When L-C370 or L-C1120 are modified, the internal interfaces between the modules are re-initialized. This may result in a delay or refusal of other services for the time of initialization (max. 30 s). If this is the case, repeat the service.

7. Set the operating mode with parameter L-C001 (C0001-000), according to the keypad setting, item 5, and transmit the value to the controller.
8. Save the setting in the controller by setting parameter L-C003 to -1- and by transmitting the value to the controller.

8a. ***Only required for automation module:***
Save the setting in the controller by setting parameter L-C1003 to -1- and transmitting the value to the controller.

9. Enable the controller (press SH + STP keys or F8 key, depending on item 5). It may be necessary to undo other controller inhibit sources (terminal 28, TRIP, L-C40).
10. Further information about LEMOC2 and possible error messages can be obtained from the LEMOC2 help function (key 1 or "help" menu).

Note:

If you activate the function "Load factory setting" at the controller, the settings described under 1 to 7 are deleted.

Without automation module

- For the 4900 or 8600 series, the freely assignable inputs (Lenze codes L-C112 and L-C113) must not be assigned to the following functions with a control using PROFIBUS (L-C001=LECOM2).
  - Trip reset (L-C112 = 1..n; L-C113 = 3)
  - Ramp generator stop (L-C112 = 1..n; L-C113 = 9)
  - Ramp generator input = 0 (L-C112 = 1..n; L-C113 = 10)

  n = maximum number of freely assignable inputs

  The reason is that these function are in the DRIVECOM control word (Index=6040_{hex}) and therefore functions may be inhibited or activated twice.
- For configuration (L-C005) using digital frequency input, the speed set-value is not accepted by the bus system.

With automation module

- When using an automation module, the DRIVECOM profile parameters are not completely available. Only the DRIVECOM profile parameters 6000_{hex} to 6011_{hex} are supported (page 52).

1.3.2. PROFIBUS bus parameters

The PROFIBUS parameters do not have to be changed for the operating mode PROFIBUS-DP. For PROFIBUS-FMS or PROFIBUS mixed operation, you can set important parameters like address or baud rate in the LEMOC2 menu "main menu / PROFIBUS". You can transmit the parameters to the controller individually or as a whole set (F5 key).

Detailed explanations about the PROFIBUS setting can be obtained from the chapter "operating mode PROFIBUS mixed operation (FMS/DP) on page 46 or "operating mode PROFIBUS-DP" on page 35.

1.3.3. PROFIBUS drive control

Without automation module

1. The controller accepts control and parameter setting data from PROFIBUS. The controller is controlled by DRIVECOM process data.
   Here you have to distinguish whether the control system (e.g. PLC) controls to PROFIBUS-DP (page 40) or PROFIBUS-FMS (page 47) controls the controller.
2. Enable controller
   Enable the drive using the DRIVECOM control word and display the controller states using the DRIVECOM status word (page 56).

   For standard enabling of the controller, proceed as follows:

   1. Change to the state "READY TO SWITCH ON
      POW1 = 0000 0000 0111 1110_{bin} ($007E_{hex}$)
   2. Wait until state "READY TO SWITCH ON" is reached
      PIW1 = xxxx xxxx x01x 0001_{bin}
   3. Change to state "OPERATION ENABLED"
      POW1 = 0000 0000 0111 1111_{bin} ($007F_{hex}$)
   4. Speed set-value (2nd process word; POW2)
      is provided.

   PIW = Process input word

   POW = Process output word

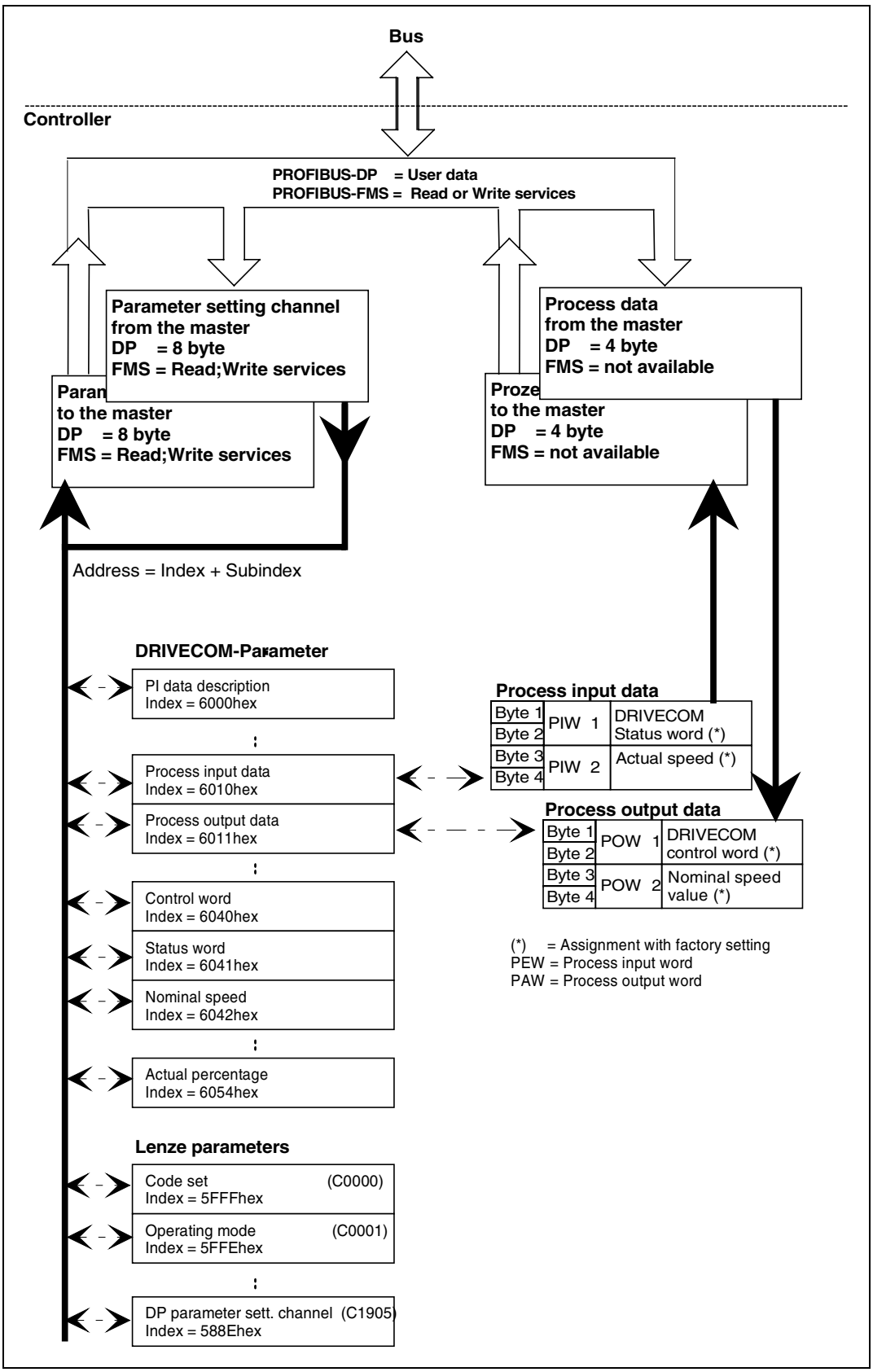
Without automation module

1. The controller accepts control and parameter setting data from PROFIBUS. The controller is controlled by DRIVECOM process data.
   Here you have to distinguish whether the control system (e.g. PLC) controls to PROFIBUS-DP (page 40) or PROFIBUS-FMS (page 47) controls the controller. Please note that the operating mode PROFIBUS-DP is provided as factory setting.
2. Enable controller
   Switch on the controller using the automation control word (page 79) and display the controller states (page 56) using the automation status word (page 82).
3. For standard enabling of the controller, proceed as follows:
   1. Change to state "READY TO SWITCH ON"
      POW1 = 0000 0000 0000 1110_{bin} ($000E_{hex}$)
   2. Wait until state "READY TO SWITCH ON" is reached
      PIW1 = xxxx xxxx x01x 0001_{bin}
   3. Change to state "OPERATION ENABLED"
      POW1 = 0000 0000 0000 1111_{bin} ($000F_{hex}$)
   4. Enter other control information in the second process word (POW2).

   PIW = Process input word

   POW = Process output word

Communication principle for the access to the controller data



The diagram explains the PROFIBUS access to controller data. Here you have to distinguish between access to process data and parameter data.

Process data
Process data are data memories where several individual parameters are combined to form a new parameter: the process data. These process data are exchanged as fast as possible and cyclically between the controller and the master. Typical process data are set-value and control information as well as actual value and status information.

Process data can be divided into process output data (PO data) and process input data (PI data) and they have a fixed length of 4 byte, viewed from the master. A summary of parameters is described in the chapter "process data configuration".

For PROFIBUS-DP, the process data in the user data phase are permanently exchanged between master and controller. The exact assignment of the DP user data phase can be obtained from the chapter "DP user data".

For PROFIBUS-FMS, process data are accessed via parameter setting using the PROFIBUS services Read or Write. The process time is considerably longer than for PROFIBUS-DP.The process data can be accessed under the following index:
Index = 6010hex process input data
Index = 6011hex process output data

Parameter data
Parameters are all DRIVECOM and Lenze controller parameters. A read and write access is possible for all these parameters. The parameter is addressed by its index and subindex. The process time in the controller is considerably longer than the process data access.

For PROFIBUS-DP, the parameters are accessed using the DP parameter setting channel, which is transmitted cyclically in the user data. Here, it uses the first 8 byte. The parameter setting channel can be deactivated using code L-C1905, the DP user data being reduced by 8 byte.

For PROFIBUS-FMS, the access is possible using the PROFIBUS services Read or Write.

From the diagram you can see that a parameter which is defined as a process data value, can be accessed in several ways. The DRIVECOM parameter, for example, can be directly accessed by its index 6040hex. It can also be accessed as process output value (POW1) in the parameter "process output data (index 6011hex). For PROFIBUS-DP, a direct access using DP user data is also possible. To avoid write access conflicts, parameters which are process data must only be changed directly using the user data for PROFIBUS-DP. For PROFIBUS-FMS, the write access must always be via the parameter "process output data".

2. 2130IB code table

In the following, parameters of the 2130IB module are listed which you can set via the LECOM1 interface (LECOM-A/B).

The parameters listed in the code table are automatically and permanently saved.

Explanations:

Code: Lenze code number of the parameter. Preceeding zeros may be omitted.
Name: Name of the parameter
Parameter: Content or meaning of the parameter values.

Parameters printed in bold show the factory setting.

Code L-C	Name	Parameter (Factory setting is printed in bold)	Your settings
1810	Software identification	33S2130I_xy000 Software identification of the 2130IB module x = Software main version y = Software subversion	–
1900	PROFIBUS operating mode	**-0- DP operation. Only PROFIBUS-DP** -1- Mixed operation. PROFIBUS-FMS and PROFIBUS-DP services are possible at the same time The operating mode defines the masters which are able to communicate with the controller. In operating mode 0 only pure DP masters can be used, and in operating mode 1 the controller can communicate with DP or FMS masters. Data transmission in operating mode 0 is much more efficient than in operating mode 1. When changing the operating mode, codes L-C1903 and L-C1904 are also loaded with the corresponding factory settings.	
1901	Station address	**126** 1 to 126 Number for precise addressing of the drive in the PROFIBUS network. This number must only be assigned once in the bus system.	
1902	Baud rate	-2- 93.75 kBaud -3- 187.5 kBaud **-4- 500.0 kBaud** -6- 1500.0 kBaud In the bus system, all participants must have the same baud rate. In the operating mode DP operation (L-C1900 = 0) and automatic baud rate recognition (L-C1903 = 1), this code number has no meaning.	
1903	Baud rate recognition	**-0- inactive (L-C1900 = 0)** **-1- active (L-C1900 = 1)** Automatic baud rate recognition is only possible in DP operation; i.e. the drive is set automatically to the baud rate of the master.	

Code L-C	Name	Parameter (Factory setting is printed in bold)	Your settings
1904	min T_{SDR}	11 to 255 Bit-times **11** **(L-C1900 = 0)** **125** **(L-C1900 = 1;L-C1902 = 2)** **250** **(L-C1900 = 1;L-C1902 = 3)** **255** **(L-C1900 = 1;L-C1902 = 4)** **255** **(L-C1900 = 1;L-C1902 = 6)** Minimum reaction time of the controller on a telegram of the master (protocol acknowledgement). The setting is in bit-times and therefore depends on the selected baud rate. Setting is only possible in the PROFIBUS operating mode mixed operation (L-C1900 = 1).	
1905	DP parameter setting channel	-0- inactive **-1-** **active** DRIVECOM parameter setting channel for DP operation; i.e. DRIVECOM and Lenze parameters can also be accessed during the user-data phase.	

3. PROFIBUS operating mode

The PROFIBUS operating mode determines the participants for the bus system. We distinguish between two operating modes:

- pure PROFIBUS-DP operation
- mixed operation of PROFIBUS-DP and PROFIBUS-FMS

In the following, criteria for the selection of the suitable operating mode are listed.

Criteria	**Code numbers**	**Mixed operation** (FS = factory setting)	**DP operation** (FS = factory setting)
PROFIBUS-DP master exists	–	possible	necessary
PROFIBUS-FMS master exists	–	possible	no
Station address can be set	L-C1901	yes FS = 126	yes FS = 126
Station address can be set via bus	–	no	yes
Baud rate up to 1.5MBaud	L-C1902	yes FS = 500 kBaud	yes FS = 500 kBaud
Automatic baud rate setting	L-C1903	no	possible FS = active
DP parameter setting channel	L-C1905	possible FS = active	possible FS = active
Data transmission time / cycle time	–	medium	low

The PROFIBUS operating mode is selected under L-C1900.

L-C1900	PROFIBUS operating mode	**-0-** -1-	**DP operating mode. Only pure PROFIBUS-DP** Mixed operation. PROFIBUS-FMS and PROFIBUS-DP services are possible at the same time

The selection of the operating mode causes other bus parameters to be set automatically to the default values of this operating mode so that, especially for the DP operating mode, further setttings are not required.

3.1. PROFIBUS-DP operating mode

In the following only the settings for pure PROFIBUS-DP operation are explained.

Settings for the master

Most of the controller manufacturers demand a controller description file (controller master data file). Therefore, the following files are saved in the DOS format on the attached diskette:

File name	Meaning
L_AR0082.GSD	Controller master data file according to DIN E 19245 part 3
LE0082TD.200	Controller master data file (type file) for Simatic-S5 COM-ET200/IM308-B

The master must be set as follows:

Function	Setting (depending on the type of master)
Baud rate	500 kBaud (factory setting) Value as controller parameter L-C1902 (page 32).
Communication profile (Bus profile)	PROFIBUS-DP DIN E 19245 part 3 (DP standard) Value in controller parameter L-C1901 = 0 (page 32).
Slave station address (Station number)	126 (factory setting) Value as controller parameter L-C1901 (page 32).
DP configuration data (configuration) with DP parameter setting channel (L-C1905=1) (factory setting) without DP parameter setting channel (L-C1905=0)	 $B7_{hex}$ (183_{dez}),$A3_{hex}$ (163_{dez}), 93_{hex} (147_{dez}) $A3_{hex}$ (163_{dez}),93_{hex} (147_{dez})
Lenze PNO identification number	0082_{hex}
DP parameter setting data	10100000_{bin}
DP user data length	12 byte (with DP parameter setting channel) 4 byte (without DP parameter setting channel) Setting as controller parameter L-C1905 (page 32).

Controller settings

Code	Name	Parameter	
L-C1900	PROFIBUS operating mode	**-0-**	**DP operation. Only pure PROFIBUS-DP**
		-1-	Mixed operation. PROFIBUS-FMS and PROFIBUS-DP services are possible at the same time

You can set the controller from the master via the bus.
The controller has an automatic baud rate recognition (see L-C1903). If you want to set the controller locally, proceed just like in the operating mode mixed operation. More detailed information can be obtained from the chapter "2130IB code table" (page 32).

3.1.1. Simatic-S5

Lenze controllers comply with the standard of PROFIBUS-DP participants. For communication with Simatic-S5, the following hardware and software components are necessary:

- S5 interface module IM308-B as from version 5.
- Programming software COM ET200 as from version 4.0

3.1.1.1. COM-ET200 settings

In the following, specific settings for Lenze controllers are listed when using the COM-ET 200 program package.

Menu: ET200 system parameters

Bus profile:	DP standard

Menu: Configuration

Station type:	Lenze 2130 Vxx For this setting, copy the file LE0082TD.200 from the diskette to the COM-ET200 directory.
Configuration:	User data with DP parameter setting channel (controller parameter L-C1905 = 1; factory setting) 0. = 183; 1. = 163; 2. = 147 User data without DP parameter setting channel 0. = 163; 1. = 147

3.1.1.2. Example program

For easier commissioning, an example program in STEP5 is provided on the attached diskette (file: 2130@@ST.S5D). The following function modules (FB) are included:

FB182:	Process data communication. Simplified control of the controller. The standard functions of the Lenze controller are mapped to the DRIVECOM profile.
FB183	Parameter data communication. Support of the DP parameter setting channel. All DRIVECOM and Lenze parameters can be read and written.

3.1.2. Diagnosis data

The controller supplies the following diagnosis data:

Station status_1 (1 byte)	Diagnosis data of the controller part 1 Bit no. Meaning --- 0 Controller available? 0 = controller available 1 = controller not available. **Caution!** The other bit information is not defined. 1 Controller communication status 0 = controller is ready to communicate 1 = controller is not ready to communicate 2 Comparison of configuration data between master and controller 0 = configuration data identical 1 = configuration data not identical 3 Controller diagnosis 0 = no fault information 1 = fault (TRIP) 4 Invalid service request from the master 0 = no invalid service request 1 = invalid service request 5 Invalid response from the controller 0 = no invalid response 1 = invalid response 6 Status DP parameter setting (DP service DDLM_Set_Prm) 0 = no fault 1 = fault 7 Information about the source of parameter setting. 0 = parameter setting by the momentary master 1 = parameter setting by another master

Station status_2 (1 byte)	Diagnosis data of the controller part 2 Bit no. Meaning --- 0 Controller requests new parameter setting. 0 = no request 1 = request for new parameter setting, e.g. since the DRIVECOM parameter setting channel was changed. 1 User data status 0 = Controller is able to supply user data 1 = Controller is not able supply user data, because e.g. initializing between communication module and controller is not yet finished. 2 fixed on 1 3 Communication monitoring in the controller 0 = inactive 1 = active 4 not used 5 Controller input data 'frozen' (Sync) 0 = input data not frozen 1 = input data frozen 6 reserved 7 Information, if the controller parameter set is inactive and the controller was removed from the cyclic user data transfer 0 = parameter setting active 1 = parameter setting inactive

Station status_3 (1 byte)	Diagnosis data of the controller part 3 Bit no. Meaning --- 0 - 6 reserved 7 Overflow of diagnosis information 0 = no overflow 1 = overflow

Master_Add (1 byte)	1 to 126 PROFIBUS station address of the DP master which has set the controller parameters. If the parameters are not yet set, the value 255 is returned.

Ident_Number (2 byte)	0082_{hex} Fixed identification number for Lenze controllers

Ext_Diag_Data_1 (1 byte)	Bit no. Meaning --- 0 - 5 fixed value 3 6 - 7 fixed value 0

Ext_Diag_Data_2 (2 byte)	Controller-related diagnosis information. Fault code according to DRIVECOM profile parameter $603F_{hex}$.

3.1.3. DP process data

Process data are data memories where several individual parameters are combined to form a new parameter, the process data. These process data are exchanged as fast as possible and cyclically between the controller and the master.

Process data can be divided into process output data (PO data) and process input data (PI data), viewed from the master, that means PO data are input data for the controller. The controller receives control information from the master and supplies feedback information to the master. Process data have a fixed length of 4 byte. A summary of parameters is described in the chapter "process data configuration" (page 67).

Factory setting of process input data:

Byte no. (x) = with DP parameter setting channel		**Auto-mation module**	**Meaning**	**Index**
1 (9)	Wort1/High-Byte Bit 8 - 15		PIW1	
2 (10)	Word1/Low-Byte Bit 0 - 7	no yes	DRIVECOM status word Automation status word	6041_{hex} $58C4_{hex}$
3 (11)	Word2/High-Byte Bit 8 - 15		PIW 2	
4 (12)	Word2/Low-Byte Bit 0 - 7	no yes	DRIVECOM actual speed Automation FDO1	6044_{hex} $5A98_{hex}$

Factory setting of process output data:

Byte no. (x) = with DP parameter setting channel		**Auto-mation module**	**Meaning**	**Index**
1 (9)	Word1/High-Byte Bit 8 - 15		POW1	
2 (10)	Word1/Low-Byte Bit 0 - 7	no yes	DRIVECOM control word Automation control word	6040_{hex} $58C5_{hex}$
3 (11)	Word2/High-Byte Bit 8 - 15		PIW 2	
4 (12)	Word2/Low-Byte Bit 0 - 7	no yes	DRIVECOM nominal speed Automation FDI1	6042_{hex} $5A9B_{hex}$

Important note

- If a parameter is set to the process output data, such as for example DRIVECOM control word in the above table, the parameter (e.g. index 6040_{hex}) may not be written directly.

3.1.4. DP user data

With PROFIBUS, process data are exchanged cyclically between master and controller in the user-data phase. In addition to the process data you can activate a DP parameter setting channel which will use the first 8 byte of the user data. The data structure is the same for input and output data, see following tables.

Data structure of user data		
Byte no.	**with parameter setting channel**	
1	Service	
2	Subindex	Parameter setting
3	Index (High-Byte)	channel
4	Index (Low Byte)	
5	Data/Error-Byte 1	
6	Data/Error-Byte 2	
7	Data/Error-Byte 3	
8	Data/Error-Byte 4	
9	PIW1/POW 1 (High-Byte)	
10	PIW1/POW 1 (Low-Byte)	Process data
11	PIW2/POW2 (High-Byte)	
12	PIW2/POW2 (Low-Byte)	
Byte no.	**without parameter setting channel**	
1	PIW1/POW 1 (High-Byte)	
2	PIW1/POW 1 (Low-Byte)	Process data
3	PIW2/POW2 (High-Byte)	
4	PIW2/POW2 (Low-Byte)	

3.1.5. DP parameter setting channel

For the DP parameter setting channel, parameter setting and diagnosis is possible in the user data operation. This enables the access to all DRIVECOM and Lenze specific parameters.

If the DP parameter setting channel is active (module parameter L-C1905 = 1), this channel uses the first 8 byte of the input and output process data. The DP parameter setting channel has the same structure for both directions of transmission.

Service (1 byte)	Service and response control for the parameter setting channel Bit no. Meaning --- 0 - 2 Service. Service to the controller. The bits are only set by the master. The controller copies this informationi into its response telegram. 0 = no service 1 = Read service (read data from the controller) 2 = Write service (write data to the controller) 3 reserved 4 - 5 Data length. Data length in the field Data/Error. 0 = 1 byte 1 = 2 byte 2 = 3 byte 3 = 4 byte 6 Handshake. Code that a new service must be processed. This bit is changed with every new service. The controller copies the bit into its response telegram. 7 Status. Status information from the controller to the master with the service confirmation. Using this bit, the master is informed whether the service was processed without errors. 0 = Service processed without errors. 1 = Service not processed. An error has occurred. The data in the field Data/Error are recognized as fault indication.

Subindex (1 byte)	Additional address to an index. If a parameter consists of several values (e.g. L-C38 = JOG selection; L-C39 = JOG), the subindex can be used to directly address a value. Example: subindex 3 addresses JOG 3

Index (2 byte)	Address of a parameter. For DRIVECOM parameters see chapter "DRIVECOM" (page 52) and Lenze parameter see chapter "Lenze parameters" (page 77). The data are filed in the Motorola format: Byte 3 High Byte Byte 4 Low-Byte

Data/Error (4 byte)	Parameter value or fault information in case of an invalid access. The status of bit service/status determines the meaning of the data field. **Data** Parameter value which has 1 - 4 bytes, depending on the data format. Strings or data blocks cannot be transmitted. The data filed in the Motorola format; i.e. first the High byte/word, then the low byte/word. Byte 5 high byte 1 ⎫ high word ⎫ Byte 6 low byte 1 ⎭ ⎪ ⎪ double word Byte 7 high byte 2 ⎫ low word ⎪ Byte 8 low byte 2 ⎭ ⎭ **Error** Error code. For description see the following table. Byte 5 Error-Class Byte 6 Error-Code Byte 7 ⎫ Additional-Code (high byte) Byte 8 ⎭ Additional-Code (low byte)

Error messages in the Error field (Data/Error):

Error-Class	Error-Code	Additional-Code [hex]	Meaning
6	3	0 0	No access
6	5	1 0	Non-permissible service parameter
6	5	1 1	Invalid subindex
6	5	1 2	Data too long
6	5	1 3	Data too short
6	6	0 0	Object is no parameter
6	7	0 0	Object does not exist
6	8	0 0	Data types are not identical
8	0	0 0	Service cannot be executed
8	0	2 0	Service can currently not be executed
8	0	2 1	Cannot be executed because of local control
8	0	2 2	Cannot be executed because of controller status
8	0	3 0	Out of value range or parameter can only be changed when controller is inhibited
8	0	3 1	Parameter value too high
8	0	3 2	Parameter value too small
8	0	3 3	Out of range subparameter
8	0	3 4	Value of subparameter too high
8	0	3 5	Value of subparameter too small
8	0	3 6	max. value smaller than min. value
8	0	4 1	Communication object cannot be mapped to process data
8	0	4 2	Process data length exceeded
8	0	4 3	Collision with other values in general

The parameter communication with the controller has the following sequence:

Read service

1. Determine user-data range of the controller; i.e. the location of the DP user data in the host.
2. Enter address of the desired parameter in the field "index and subindex" (DP output data)
3. Service/service = Read service and the bit "service/handshake" must be exchanged (DP output data).
4. Check if the bit "service/handshake" of the DP input data and DP output data is identical. If this is the case, the reply has been received. It is useful to implement a time monitoring.
5. Check if the bit "service/status" is set. If this is not the case, the field "data/error" contains the desired parameter value. If the bit "service/status" is set, the read service has not been carried out correctly, and the field "data/error" contains error information.

Write service

1. Determine user-data range of the controller; i.e. the location of the DP user data in the host.
2. Enter address of the desired parameter in the field "index and subindex" (DP output data)
3. Enter parameter value in the field "data/error".
4. Service/service = Read service and the bit "service/handshake" must be exchanged (DP output data).
5. Check if the bit "service/handshake" of the DP input data and DP output data is identical. If this is the case, the reply has been received. It is useful to implement a time monitoring.
6. Check if the bit "service/status" is set. If this is the case, the service has not been carried out correctly, and the field "data/error" contains error information. Otherwise, the service has been carried out correctly.

3.1.6. DP command Sync/Unsync

The Sync command is used to 'freeze' the controller process input data. This means that the controller works with those process data which it has used during receipt of the Sync command. The controller receives new data from the master, but it does not use them. Therefore, the master can load process data in the controller and activate them simultaneously using a Sync command to one or several drives.
A Sync command can be sent several times. The Unsync command cancels the Sync command.

Caution! This function also causes the DP parameter setting channel to be inactive.

3.1.7. DP command Clear_Data

The Clear_Data command is used to the set controller process input data to 0.

Caution! This function also makes the DP parameter setting channel inactive.

3.2. Operating mode PROFIBUS mixed operation (FMS/DP)

In the operating mode mixed operation, the controller can be called up by an FMS master or by a DP master. In the following, only these settings for PROFIBUS-FMS are explained, since the operation using PROFIBUS-DP is explained on page 35. Notes about restrictions of DP functions in the operating mode mixed operation are given on page 34.

Settings of the master

Function	Setting
Communication relation (Connecting mode)	MSAC acyclic master-slave connection
Slave-LSAP (Foreign LSAP)	2
Slave-Password (Password)	0 no password function
Slave station address (Foreign L2 address)	126 (factory setting) Value must be the same as the controller setting in L-C1901 (page 32).
Maximum PDU length (Max. PDU length)	150
Baud rate	500 kBaud (factory setting) Value must be the same as the controller setting in L-C1902 (page 32).

Settings of the controller

Function	Setting
Station address L-C1901	**126** 1 bis 126 Number for precise addressing of the drive in the PROFIBUS network. This number can only be assigned once per bus system (page 32).
Baud rate L-C1902	-2- 93.75 kBaud -3- 187.50 kBaud **-4- 500.00 kBaud** -6- 1500.00 kBaud Baud rate. In the bus system, all participants must have the same baud rate (page 32).

3.2.1. FMS process data

Process data are data memories where several individual parameters are combined to form a new parameter, the process data. These process data are exchanged as fast as possible and cyclically between the controller and the master. Process data can be divided into process output data (PO data) and process input data (PI data), viewed from the master, that means PO data are input data for the controller. The controller receives control information from the master and supplies feedback information to the master. Process data have a fixed length of 4 byte. A summary of parameters is described in the chapter "process data configuration" (page 67).

Factory setting of process input data:

Byte no.		Auto-mation module	Meaning	Index
1	Word1/High-Byte Bit 8 - 15		PIW1	
2	Word1/Low-Byte Bit 0 - 7	No Yes	DRIVECOM status word Automation status word	6041_{hex} $58C4_{hex}$
3	Word2/High-Byte Bit 8 - 15		PIW 2	
4	Word2/Low-Byte Bit 0 - 7	No Yes	DRIVECOM actual speed Automation FDO1	6044_{hex} $5A98_{hex}$

Factory setting of process output data:

Byte no.		Auto-mation module	Meaning	Index
1	Word1/High-Byte Bit 8 - 15		POW1	
2	Word1/Low-Byte Bit 0 - 7	No Yes	DRIVECOM control word Automation control word	6040_{hex} $58C5_{hex}$
3	Word2/High-Byte Bit 8 - 15		PIW 2	
4	Word2/Low-Byte Bit 0 - 7	No Yes	DRIVECOM nominal speed value Automation FDI1	6042_{hex} $5A9B_{hex}$

Important note

- If a parameter is set to the process output data, such as for example DRIVECOM control word in the above table, the parameter (e.g. index 6040_{hex}) may not be written directly.

3.2.1.1. Access to process data

You can reach the process data via the PROFIBUS services "Read" or "Write" with the following index:

Index = 6010_{hex}Process input data
Index = 6011_{hex}Process output data

Further information can be obtained from the chapter "process data" (page 70).

3.2.2. Communication services

The following FMS communication services are supported by Lenze controllers:

- Initiate Make connection from master to controller.
- Abort Abort connection
- Status Read status of the controller
- Get-OV Read object dictionary
- Identify Identification of the controller
- Read Reading of parameters
- Write Writing of parameters

All transmission parameters can be obtained from the host descriptions. The next chapter contains a list of parameter contents which are returned by the Lenze controllers.

3.2.2.1. Entries in the communication reference list

You must enter the communication reference list entries yourself. The following entries in a communication reference list can be set up for the 2130IB:

Communication reference	**1**	**2**
Connection type	Master-Slave acyclic	Master-Slave acyclic
Connection attribute	Defined	Defined
Remote LSAP	1	2
R/S Address	0	0
Max-PDU Sending-High-Prio	0	0
Max-PDU Sending-Low-Prio	16	150
Max-PDU Receiving-High-Prio	0	0
Max-PDU Receiving-Low-Prio	16	150
Supported Services Request	00 00 00_{hex}	80 30 00_{hex}
Supported Services Response	00 10 00_{hex}	00 00 00_{hex}
Max. SCC	1	1
Max. RCC	0	0
Max. SAC	0	0
Max. RAC	0	0
CCI	0	0

3.2.2.2. Initiate

The initiate service is used for the logic initiation between two participants. The controller returns the following parameters:

	Value	Meaning
Profile-Number:	21_{hex}	DRIVECOM profile of version 1
When using the automation module:	0	No profile
Password:	0	The password function of PROFIBUS is not supported
Access Groups:	0	No access groups
Access Protection Supported:	TRUE	Access protection is supported
Version OV	Value:	0

3.2.2.3. Abort

The abort service is used to abort a logic communication.

3.2.2.4. Status

This service supplies status information about the controller.
The following parameters are returned by the controller:

Status	Value	Meaning
Logical Status	0 ready to communicate (L-C001 = 5) 1 limited number of services (L-C001 <> 5)	Information about the momentary operating state (Lenze parameter L-C001) of the controller concerning communication.
Physical Status	0 ready for operation controller state "OPERATION ENABLED" 1 partially operational, all other possible controller states	Information about the momentary operating state of the controller. Please refer to controller states in figure 5.
Local Detail	Parameter "status word"	24-bit value, which contains the profile parameter "status word" (index 6041_{hex}) in the bits 0 to 15. Bits 16 to 23 are set to 0.

3.2.2.5. Get-OV

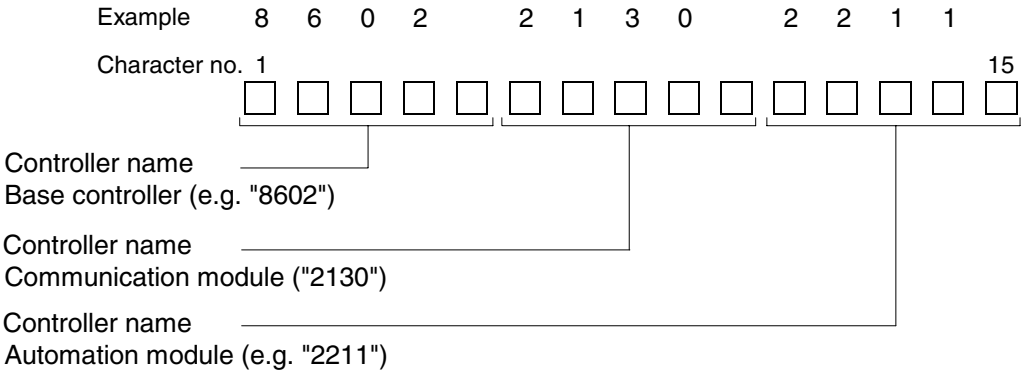
Listing of object description for every parameter and data type.

3.2.2.6. Identify

The identify service is used to identify the controller. The controller supplies the following parameters:

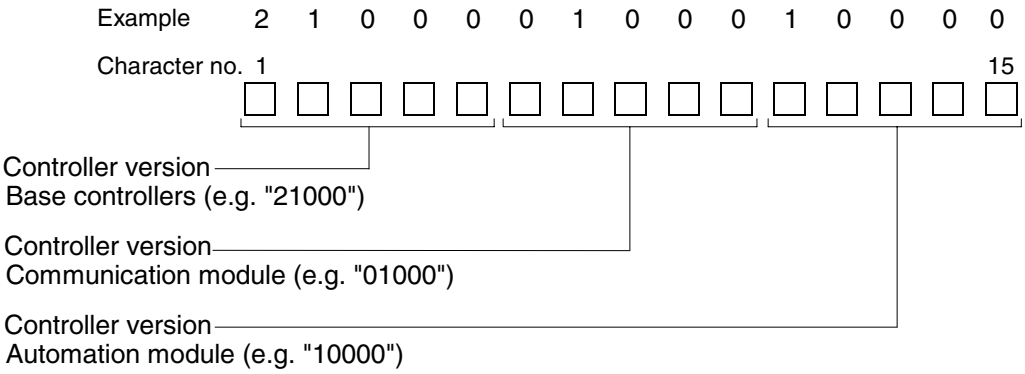
	Value	Meaning
Name of manufacturer	"Lenze"	Company´s name as visible string
Name of the controller	Visible string with 15 characters	Controller identification
Version of the controller	Visible string with 15 characters	Controller software versions

Name of the controller



Every controller name consists of: 4 characters for the name of the controller, 1 blank. If a module is not available, this part is filled with blanks.
Example: "`8602 2130 `"

Controller version



Every controller name consists of 2 characters for the base version, 2 characters for variant, 1 character for version of variant. If the module is not available, this part is filled with blanks.
Example: "`2100010000 `"

Base controller: V2.1 /no variant / no variant version
Comm. module: V1.0 /no variant / no variant version
Auto. module: V1.0 /no variant / no variant version

3.2.2.7. Read / Write

The Read service is used to read parameters. Either the value or a fault indication is output.

The Write service is used to write parameters. An acknowledgement or a fault indication are output .

Lenze controllers support the following fault indications:

Error-Class	Error-Code	Additional-Code [hex]	Meaning
6	3	0 0	No access
6	5	1 0	Non-permissible service parameter
6	5	1 1	Invalid subindex
6	5	1 2	Data too long
6	5	1 3	Data too short
6	6	0 0	Object is no parameter
6	7	0 0	Object does not exist
6	8	0 0	Data types are not identical
8	0	0 0	Service cannot be executed
8	0	2 0	Service can currently not be executed
8	0	2 1	Cannot be executed because of local control
8	0	2 2	Cannot be executed because of controller status
8	0	3 0	Out of value range or parameter can only be changed when controller is inhibited
8	0	3 1	Parameter value too high
8	0	3 2	Parameter value too small
8	0	3 3	Out of range subparameter
8	0	3 4	Value of subparameter too high
8	0	3 5	Value of subparameter too small
8	0	3 6	max. value smaller than min. value
8	0	4 1	Communication object cannot be mapped to process data
8	0	4 2	Process data length exceeded
8	0	4 3	Collision with other values in general

4. DRIVECOM parameters

4.1. DRIVECOM code table

The following parametes are implemented according to the standardization of controller parameters in compliance with the DRIVECOM profile 21:

Index hex	Index dez	Parameter name	R/W	PCD	PS	Dat.Str.	Data type	Data num.	Data leng.
6000	24576	PI data description	Ra/W	–	n	R	PDS	9	13
6001	24577	PO data description	Ra/W	–	n	R	PDS	9	13
6002	24578	PO data enable	Ra/W	–	n	S	OS	1	1
6010	24592	Process input data	Ra		n	S	OS	4	4
6011	24593	Process output data	Ra/W		n	S	OS	4	4
603F	24639	Malfunction code	Ra	–	n	S	U16	1	2
6040	24640	Control word	Ra/W	POI	–	S	OS	2	2
6041	24641	Status word	Ra	PI	–	S	OS	2	2
6042	24642	Nominal speed	Ra/W	POI	–	S	I16	1	2
6043	24643	Speed reference variable	Ra	–	–	S	I16	1	2
6044	24644	Actual speed	Ra	PI	–	S	I16	1	2
6046	24646	Speed-Min-Max-amount	Ra/W	–	n	A	U32	2	8
6048	24648	Speed acceleration	Ra/W	–	n	R	RS	2	6
6049	24649	Speed deceleration	Ra/W	–	n	R	RS	2	6
604A	24650	Speed quick stop	Ra/W	–	n	R	RS	2	6
604B	24651	Face value factor	Ra/W	–	n	A	I16	2	4
604D	24653	Pole number	Ra/W	–	y	S	U8	1	1
604E	24654	Speed reference value	Ra/W	–	y	S	U32	1	4
604F	24655	Ramp function time	Ra/W	–	y	S	U32	1	4
6050	24656	Slow down time	Ra/W	–	y	S	U32	1	4
6051	24657	Quick stop time	Ra/W	–	y	S	U32	1	4
6052	24658	Nominal percentage	Ra/W	POI	–	S	I16	1	2
6053	24659	Percentage reference variable	Ra	–	–	S	I16	1	2
6054	24660	Actual percentage	Ra	PI	–	S	I16	1	2

Meaning

R/W	Read-Write authorization via LECOM2 (PROFIBUS)
Ra	Read-only always permitted
Ra/W	Reading is always permitted; writing is restricted (e.g. depending on L-C001 ("operating mode") or operating state (change only after controller inhibit).

PCD	Mapping to PROFIBUS process data (Index 6010_{hex}, 6011_{hex})
PI	Process input data (from controller to host)
PO	Process output data (from host to controller)
POI	Process input and output data (see PI and PO)
–	Process data mapping is not possible

SP	Non-volatile parameter saving
y	Yes – Parameter will be saved
n	No – Parameter will not be saved
–	Parameter depends on the process and is not saved.

Data str.	Data structure
S	Simple variable (simple parameter). The parameter has only one value. Addressing is only possible with subindex 0.
A	Array variable (field parameter). The parameter has several values which are of the same data type. Direct addressing of single elements is possible with the subindex. With subindex = 0 the complete parameter content is addressed.
R	Record variable (combined variable). The parameter has several values, which may have different data types. Direct addressing of the single elements is possible with the subindex. With subindex = 0, the complete parameter content is addressed.

Data type	Data type
BOL	Boolean (FALSE = 00_{hex}; TRUE = FF_{hex})
I8	Integer8 (-128 <= x <= 127)
I16	Integer16 (-32768 <= x <= 32767)
I32	Integer32 (-2147483648 <= x <= 2147483647)
U8	Unsigned8 (0 <= x <= 255)
U16	Unsigned16 (0 <= x <= 65535)
U32	Unsigned32 (0 <= x <= 4294967295)
OS	Unsigned16. 8 bit/byte binary coded
VS	Visible-String. Text, coded to ISO 646
PDS	Process data description structure (Index 20_{hex}). For the description of the structure see chapter "process data configuration" (page 67)
RS	Ramp structure (Index 21_{hex}) Subindex 1: U32 Numerator delta speed in min^{-1} Subindex 2: U16 Denominator delta time in seconds

Data num.	Number of parameter elements

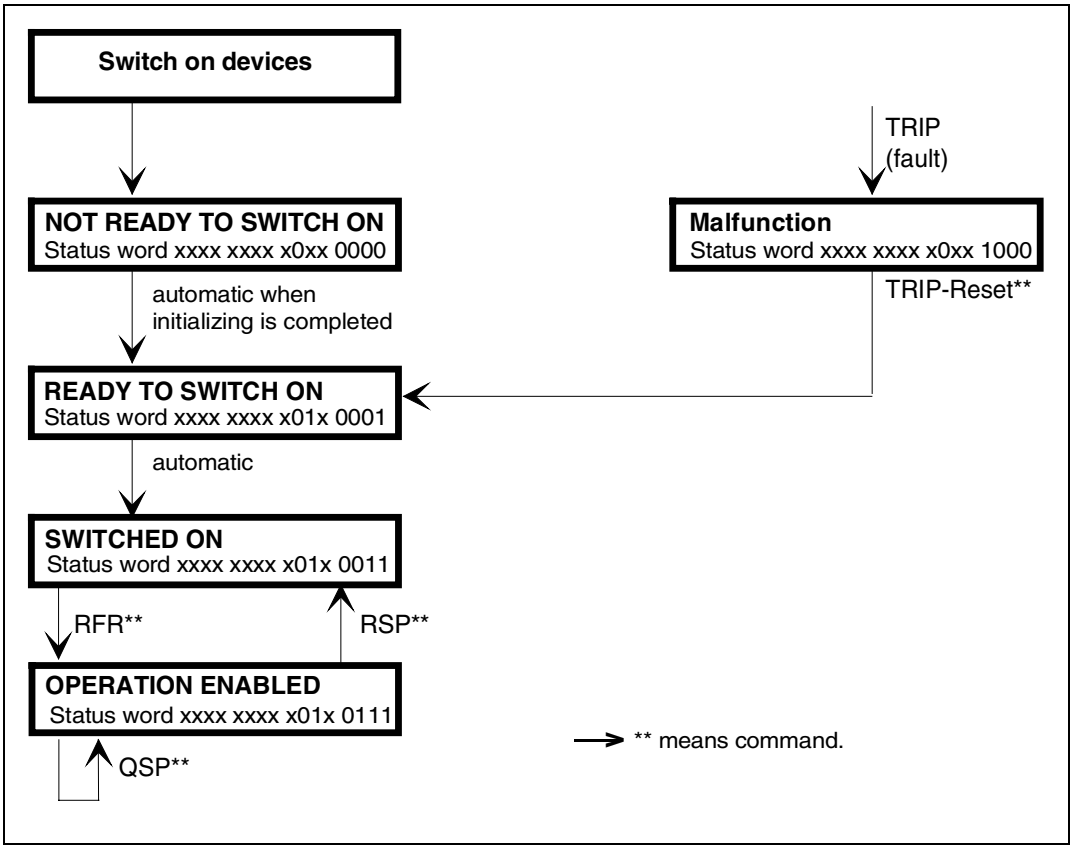
Data leng.	Total length of the parameter in byte.

4.2. Controller states

4.2.1. Status diagram of standard control

For standard control you enter the control information via terminal, keypad or LECOM1 (standard interface LECOM-A/B). The setting is done using Lenze parameter L-C001 (page 24).
The information about the momentary controller state (blocks) are contained in the profile parameter "status word" or "automation status word". Commands in the profile parameter "control word" are switched off and cannot cause a change of the controller state. The commands to change the controller states are entered using the corresponding control inputs (terminal / keypad / LECOM-A/B). These commands are marked with **.

Status diagram standard control

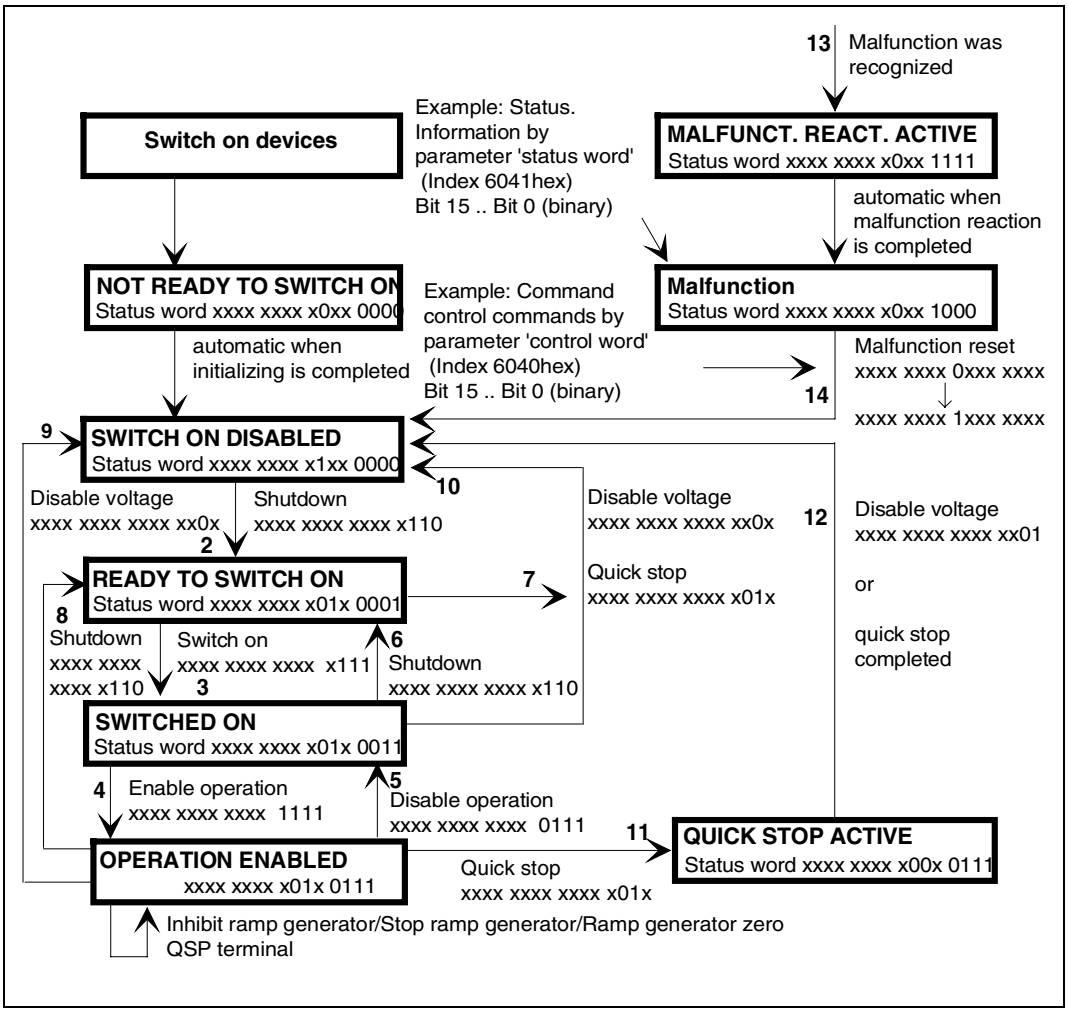


Controller states	Meaning
NOT READY TO SWITCH ON	The controller is being initialized and is not yet ready to operate. It then switches automatically to the state "READY TO SWITCH ON".
READY TO SWITCH ON	The controller is inhibited (RSP) and waits for the power stage to be charged. It then changes automatically to the state "SWITCHED ON".
SWITCHED ON	The controller is inhibited and waits for controller enable.
OPERATION ENABLED	The controller is enabled (RFR). In this state, a pulse inhibit is possible at any time.
MALFUNCTION	The controller is in the state "MALFUNCTION" (TRIP).

4.2.2. Status diagram DRIVECOM control

With LECOM2 control (Lenze parameter L-C001 = 5, 6 or 7), the Lenze controller has the standardized controller states according to the DRIVECOM profile.
The information about the momentary controller status (blocks) is contained in the profile parameter "status word" t or "automation status word" . Commands in the profile parameter "control word" or "automation control word" can cause the controller status to change. These commands are shown by arrows with the corresponding command numbers in the following figure.

Status diagram DRIVECOM control



Controller states	Meaning
NOT READY TO SWITCH ON	The controller is being initialized and is not yet ready to operate. It then switches automaticaly to the state "switch-on disabled".
SWITCH ON DISABLED	The controller is inhibited (RSP) and waits for comand 2 (shutdown).
READY TO SWITCH ON	The controller is inhibited (RSP) and waits for command 3 (switch on).
SWITCHED ON	The controller is inhibited (RSP) and waits for command 4 (operation enabled)
OPERATION ENABLED	The controller is enabled (RFR). In this state, a pulse inhibit is possible any time.
MALFUNCTION REACTION ACTIVE	A fault (TRIP) was recognized and an error response initiated (e.g. controlled deceleration).
MALFUNCTION	The controller is in a state of error (TRIP).
QUICK STOP ACTIVE	In the state "OPERATION ENABLED" the command "quick stop" was given. The controller is decelerated in a controlled way (quick stop ramp). After deceleration, the controller changes automatically to "SWITCH ON DISABLED".

Commands	Meaning
COMMAND 2,6,8 **(Shutdown)** **(CONT-Bit0 = 0)**	Command to change from different states to the state "READY TO SWITCH ON".
COMMAND 3 **(Switch on)** **(CONT-Bit0 = 1)**	Command to change to the state "SWITCHED ON".
COMMAND 4 **(Operation enabled)** **(CONT-Bit3 = 1)**	Command to change to the state "OPERATION ENABLED". Controller inhibit is deactivated.
COMMAND 5 **(Disable operation)** **(CONT-Bit3 = 0)**	Command to change to the state "SWITCHED ON". Controller inhibit is released.
COMMAND 7,9,10,12 **(Disable voltage)** **(CONT-Bit1 = 0)**	Command to change to the state "SWITCH ON DISABLED". Controller inhibit is released.
COMMAND 7,10,11 **(Quick stop)** **(CONT-Bit2 = 0)**	Command to change to the state "SWITCH ON DISABLED". If the controller was enabled, the controller is decelerated in a controlled way (quick stop ramp).
COMMAND 13 **(Malfunction/TRIP)**	The controller has recognized an error. In case of certain faults, a controller deceleration may be necessary (depending on the controller). Once completed, the controller changes to the state "MALFUNCTION".
COMMAND 14 **(Reset malfunction/TRIP)** **(STEU-Bit7 0->1)**	Command to acknowledge a fault. The controller changes to the state "SWITCH ON DISABLED" if an error is no longer recognized.

4.2.3. Control word (6040_{hex})

Data format: Unsigned16

The parameter "control word" is used for the control of the controller. It contains commands for status changes (see chapter "status diagram DRIVECOM control" page 56) and other important control commands.

Structure of the parameter "control word":

Bit	Name	Meaning
0	Switch on	Controller states 0 = commands 2,6,8 (controller inhibit) 1 = command 3 (not controller inhibit)
1	Disable voltage	Controller states 0 = commands 7,9,10,12 (controller inhibit) 1 = not command disable voltage
2	Quick stop	Controller states 0 = command 7,10,11 (quick stop) 1 = not command quick stop
3	Operation enabled	Controller states 0 = command 5 (controller inhibit) 1 = command 4 (not controller inhibit)
4	Disable ramp function generator	Inhibit of ramp function generator. Quick stop is enabled without the controller leaving its state. 0 = disable ramp function generator (quick stop) 1 = not disable ramp function generator
5	Stop ramp function generator[1)]	Output of the ramp function generator (speed set-value integrator) is "frozen". 0 = stop ramp function generator 1 = not stop ramp function generator
6	Ramp function generator zero[1)]	Input of ramp function generator (speed set-value integrator) is set to zero. Therefore controlled deceleration along the set ramp. 0 = ramp function generator zero 1 = not ramp function generator zero
7	Reset malfunction	Reset of an error (TRIP). For this, a bit change from 0 to 1 is necessary.
8	reserved	Reserved for DRIVECOM
9	reserved	Reserved for DRIVECOM
10	reserved	Reserved for DRIVECOM

Bit	Name	Meaning
11	free 1	For base controllers, mapping to the 4th freely assignable input 0 = do not activate function 1 = activate function
12	free 2	For 4900/8600controllers, mapping to the 5th freely assignable input 0 = do not activate function 1 = activate function
13	free 3	For 4900/8600controllers, mapping to the 6th freely assignable input 0 = do not activate function 1 = activate function
14	free 4	For 4900/8600controllers, mapping to the 7th freely assignable input 0 = do not activate function 1 = activate function
15	free 5	For 4900/8600controllers, mapping to the 8th freely assignable input 0 = do not activate function 1 = activate function

1) only for 4900, 8600 series

Important notes:

If the controller has freely assignable inputs (Lenze codes L-C112 and L-C113), you must not assign the following functions to terminals when the control is via PROFIBUS (LECOM2).

– Trip reset (L-C112 = 1..n; L-C113 = 3)
– Ramp function generator stop (L-C112 = 1..n; L-C113 = 9)
– Ramp function generator input = 0 (L-C112 = 1..n; L-C113 = 10)

n = maximum number of freely assignable inputs

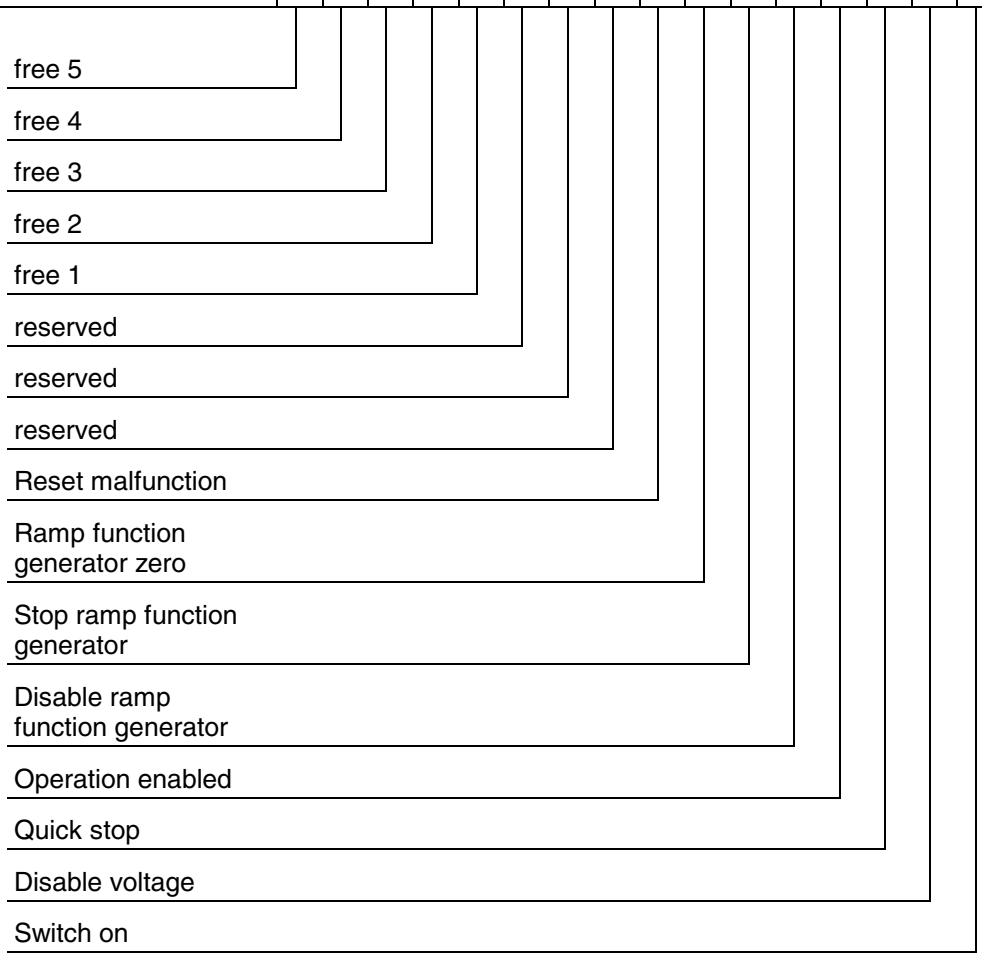
Code L-C112 is the terminal assignment. Code L-C113 determines the function.

The individual bit control commands of the control word are not independent of other bit positions. The following table shows which bits must be assigned to make the desired command effective.

Control state commands	Bits of the control word															
	15							8	7							0
1 Shutdown	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	**0**
2 Switch on	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	**1**
3 Operation enabled	–	–	–	–	–	–	–	–	–	–	–	–	**1**	1	1	1
4 Disable operation	–	–	–	–	–	–	–	–	–	–	–	–	**0**	1	1	1
5 Disable voltage	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**0**	–
6 Quick stop	–	–	–	–	–	–	–	–	–	–	–	–	–	**0**	1	–
8 Reset malfunction	– –	– –	– –	– –	– –	– –	– –	– –	0 1	– –	– –	– –	– –	– –	– –	– –

Several control commands can be given at the same time. Please note that a bit change of bit0 is necessary to change from the status "SWITCH ON DISABLED". This function is necessary to avoid an unintended starting of the drive during switch on.

Control commands	Bits of the control word															
Bit	16							8	7							0
4 Disable ramp function generator	?	?	?	?	?	–	–	–	–	–	–	**0**	1	1	1	1
5 Stop ramp function generator	?	?	?	?	?	–	–	–	–	–	**0**	1	1	1	1	1
6 Ramp function generator zero	?	?	?	?	?	–	–	–	–	**0**	1	1	1	1	1	1
11 free 1	?	?	?	?	**1**	–	–	–	–	1	1	1	1	1	1	1
12 free 2	?	?	?	**1**	?	–	–	–	–	1	1	1	1	1	1	1
13 free 3	?	?	**1**	?	?	–	–	–	–	1	1	1	1	1	1	1
14 free 4	?	**1**	?	?	?	–	–	–	–	1	1	1	1	1	1	1
15 free 5	**1**	?	?	?	?	–	–	–	–	1	1	1	1	1	1	1



Explanation

0 Bit state is 0
1 Bit state is 1
– Bit state is not defined and has no effect
? Since function can be freely assigned, a statement about interdependance is not possible.

Lenze

4.2.4. Status word (6041_{hex})

Data format: Unsigned16

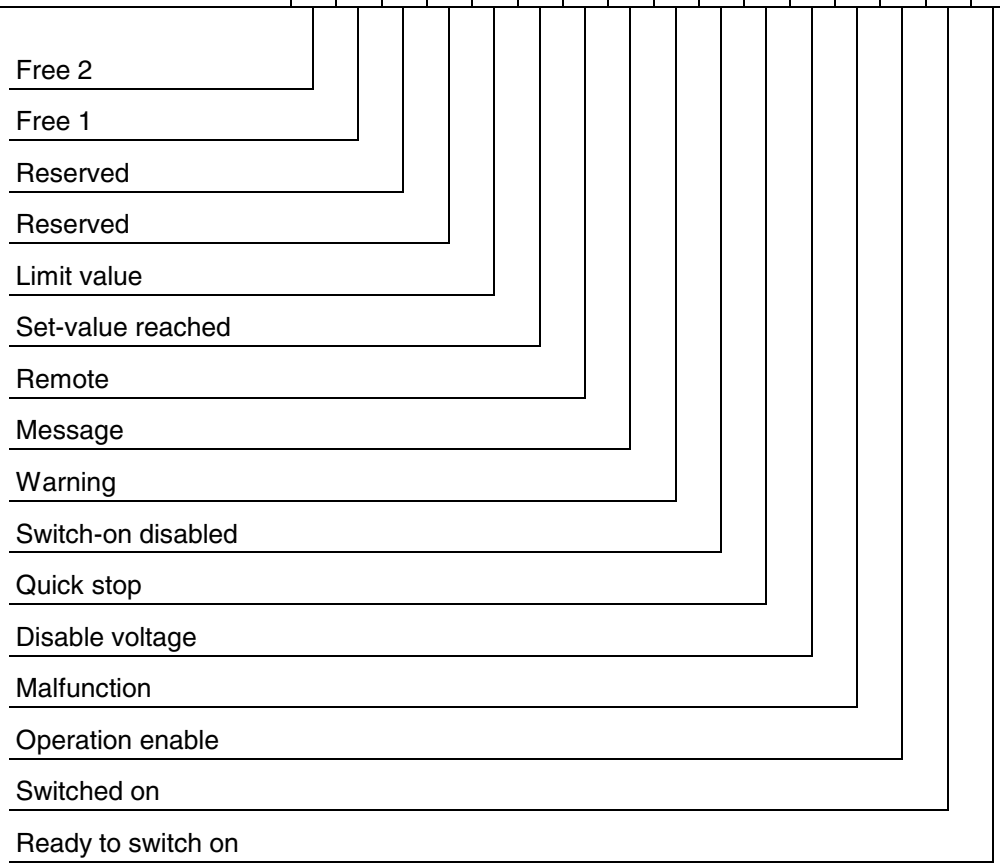
The parameter "status word" is used to show compact information about the controller. It contains status information about controller states (page 56) and further important information.

Structure of the parameter "status word"":

Bit	Name	Meaning
0	Ready to switch on	Controller status information 0 = State at least "READY TO SWITCH ON" 1 = State less than "READY TO SWITCH ON"
1	Switched on	Controller status information 0 = State at least "SWITCHED ON" 1 = State less than "SWITCHED ON"
2	Operation enable	Controller status information 0 = State at least "OPERATION ENABLE" 1 = State less than "OPERATION ENABLE"
3	Malfunction	Controller status information 0 = no malfunction (TRIP) 1 = malfunction (TRIP)
4	Voltage disabled	Information about command "Disable voltage" (see "control word"). 0 = Command is active 1 = Command is not active
5	Quick stop	Information about command "Quick stop" (see "control word"). 0 = Command is active 1 = Command is not active
6	Switch-on disabled	Controller status information 0 = Status not "SWITCH ON DISABLED" 1 = Status "SWITCH ON DISABLED"
7	Warning	Collective warning message (Not supported by the base controllers at the moment) 0 = No warning 1 = Warning
8	Message	Collective message (Not supported by the base controllers at the moment) 0 = No message 1 = Message
9	Remote	Bus access authority, depending on the Lenze parameter "operating mode" (L-C001) 0 = L-C001 <> 5 1 = L-C001 = 5
10	Face value reached	State of speed/frequency deviation 0 = n_{set} <> n_{actual} 1 = n_{set} = n_{actual}
11	Limit value	State of speed/frequency limit 0 = Limit not activated 1 = Limit activated
12	reserved	DRIVECOM reserved
13	reserved	DRIVECOM reserved
14	free 1	For 4900/8600 mapping on the third freely assignable output
15	free 2	For 4900/8600 mapping on the fourth freely assignable output

The precise information about the present controller state can only be obtained by the combination of the controller state information bit (bit 0, 1, 2, 3, 4, 5, 6). This is shown in the following.

Controller states	Bits of the status word															
	15							8	7							0
NOT READY TO SWITCH ON	–	–	–	–	–	–	–	–	–	0	–	–	0	0	0	0
SWITCH ON DISABLED	–	–	–	–	–	–	–	–	–	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
MALFUNCTION	–	–	–	–	–	–	–	–	–	0	–	–	1	0	0	0
MALFUNCTION REACTION ACTIVE	–	–	–	–	–	–	–	–	–	0	–	–	1	1	1	1
QUICK STOP ACTIVE	–	–	–	–	–	–	–	–	–	0	0	–	0	1	1	1



Explanation

0 Bit state is 0
1 Bit state is 1
– Bit state is not defined and has no effect

4.3. Ramps for quick stop / disable ramp function generator / QSP

4.3.1. Ramp-min function

In the DRIVECOM profile, two ramps are defined for the controller commands quick stop, disable ramp function generator and the QSP terminal function (one absolute ramp, one relative ramp). The ramp min function recognizes the slower ramp and transmits it to the controller.

Absolute ramp ('speed quick stop')
The ramp flank is determined by the parameters "delta_speed" / "delta_time". The absolute ramp is deactivated in the factory setting.

Relative ramp ('quick stop time')
The ramp slope is determined by the parameter "delta_time" referred to the speed-reference (L-C011). This corresponds to the Lenze ramp function of L-C012 and L-C013.

4.3.2. Speed quick stop ($604A_{hex}$)

The parameter "speed quick stop" corresponds to the absolute speed ramp of the deceleration for the control commands "quick stop", "disable ramp function generator" or the QSP terminal function. The slope is entered indirectly via the parameter "delta_speed" / "delta_time". The parameter is mapped to the ramp-min function via the Lenze quick stop ramp (L-C105). If the parameter "delta_time"=0, the ramp is switched off.

Index	Sub-index	Data str.	Data type	Range/Initialization
$604A_{hex}$	1	RS (21_{hex})	U32	0 to 4294967295 **0** Delta speed in rpm
$604A_{hex}$	2	RS (21_{hex})	U16	0 to 65535 **0 (ramp is switched off)** Delta time in seconds

4.3.3. Quick stop time (6051_{hex})

The parameter "quick stop time" corresponds to the relative speed ramp of the deceleration for the control commands "quick stop", "disable ramp function generator" or the QSP terminal function. The deceleration time refers to the parameter "speed reference" (index = $604E_{hex}$).

$$Slope = \frac{'Speed\ reference' \quad (Index = 604E_{hex})}{'Quick\ stop\ time' \quad (Index = 6051_{hex})}$$

The parameter is mapped to the ramp-min function via the Lenze quick stop ramp (L-C105). If the quick stop time = 0, the ramp is switched off.

Index	Sub-index	Data str.	Data type	Range/Initialization
6051_{hex}	0	S	U32	0 to 495000 (max L-C105 / 2) L-C105 / 2 Delta time in milliseconds

4.4. Malfunction / Monitoring

4.4.1. Malfunction code ($603F_{hex}$)

Data format: Unsigned16

The malfunction code has an equivalent profile code, if the controller has recognized a fault (TRIP). The Lenze parameter L-C067 (index $5FBC_{hex}$) contains corresponding Lenze error information, possibly with more detailed information. The Lenze parameters L-C161 - 168 (index $5F5E_{hex}$ - $5F57_{hex}$) contain the base controller fault history.

The following DRIVECOM malfunction codes can currently be generated:

Lenze fault indication	DRIVECOM malfunction code hex	dez	Meaning
OC	2300	8960	General overcurrent
OC1	2320	8992	Short circuit, overload
OC2	2330	9008	Earth fault
OC3	2213	8723	Overcurrent during acceleration
OC4	2214	8724	Overcurrent during decleration
OC5	2311	8977	I∗t monitoring
OC6	2312	8978	I^2t monitoring
OC7	2311	8977	I_2∗t monitoring
OU1	3211	12817	Overvoltage during deceleration
OUE	3212	12818	Overvoltage fault
LU1	3130	12592	Phase missing
LP1	3130	12592	Phase failure
LP3	3100	12544	Mains failure
FE	3140	12608	Mains frequency fault
LF	3142	12610	Mains frequency too low
OF	3141	12609	Mains frequency too high
OH	4210	16656	Overheat heatsink
OH1	4410	17424	Overheat supply module
OH2	4210	16912	Overheat axis module
OH3	4310	17168	Overheat motor
CE0	8100	33024	Automation interface time monitoring
U15	5111	20753	Vcc15 supply defective
CCr	6010	24592	System failure
Pr	6310	25360	Parameter reset
PEr	6100	24832	Program error
OL	2300	8960	Overload of outputs
SP	7302	29442	Incorrect polarity of feedback source
Sd1	7301	29441	Analog signal source defective
Sd2	7303	29443	Resolver wire breakage
Sd3	7305	29445	Incremental encoder defective
EEr	9000	36864	External trip
UEr	1000	4096	Unknown fault
dEr	7120	28960	Motor malfunction
ACI	3321	13089	Armature circuit interrupted
Hxx	5000	20480	Self test error
150	8000	32768	General process fault
151	8612	34322	Limit switch negative
152	8612	34322	Limit switch positive
153	8611	34321	Following error 1
154	8611	34321	Following error 2

4.5. Process data configuration

The process data configuration is used to combine different parameters to form a new parameter, in order to transmit this parameter as fast and cyclically as possible. This is the case, for example, for the parameters "speed set-value" (index = 6042) and "control word" (index = 6040_{hex}), which are combined to form process output data (output data of the master).

The configuration is done using the parameter "process input data description" (index = 6000_{hex}) and "process output data description (index = 6001_{hex}). The data structure (process data description structure; index = 20_{hex}) of these parameters is shown in the following.

Process data description structure

Sub-index	Data type	Meaning (general)	(Byte PCD)	(Word PCD)	(Double word PCD)
1	U8	process data length value fixed to 4			
2	U16	index for	1st PCD byte	1st PCDword	1st PCD Dword
3	U8	subindex for	1st PCD byte	1st PCD word	1st PCD Dword
4	U16	index for	2nd PCD byte	0 = not used	0 = not used
5	U8	subindex for	2nd PCD byte	0 = not used	0 = not used
6	U16	index for	3rd PCD byte	2nd PCD word	0 = not used
7	U8	subindex for	3rd PCD byte	2nd PCD word	0 = not used
8	U16	index for	4th PCD byte	0 = not used	0 = not used
9	U8	subindex for	4th PCD byte	0 = not used	0 = not used

The table describes the data structure of the parameter and the meaning of the entries for byte, word, or double word parameters. In the first subindex, the length of the process data is entered. The next part is a description of the parameter which is assigned to each byte of the process data. The description is the address of the parameter, which consists of index and subindex.

Byte assignment of the process data
If a word parameter (16 bit) is assigned to the process data, the parameter address (index, subindex) is entered in the first corresponding byte. The second byte is not used and must have a 0. For double word parameters (32 bit), 3 bytes are not used. The configuration can be modified in common (subindex = 0) or only in parts.
To ensure the data consistency of the process output data (output data of the master), the parameter "enable process output data" is necessary.

Example 1 – Changing the process input data:
1. Assignment of the 2nd PCD word with the actual percentage (index = 6054_{hex})
   Write (index = 6000_{hex}; subindex =6_{hex}; value = 6054_{hex})
   Write (index = 6000_{hex}; subindex =7_{hex}; value = 0_{hex}) (may be omitted)

Example 2 – Changing the process output data:
1. Inhibit process output data
   Write (index = 6002_{hex}; subindex =0_{hex}; value = 0_{hex})
2. Assignment of the 2nd PCD word with nominal percentage (index = 6052_{hex})
   Write (index = 6001_{hex}; subindex =6_{hex}; value = 6052_{hex})
   Write (index = 6001_{hex}; subindex =7_{hex}; value = 0_{hex}) (may be omitted)
3. Enable process output data
   Write (index = 6002_{hex}; subindex =0_{hex}; value = FF_{hex})

4.5.1. Process input data description (6000_{hex})

Data format: Process data description structure (index 20_{hex}).
For description see page 67.

Description of the process data which the controller transmits to the master (input data of the master).
The description can be assigned to profile parameters which have the PCD attribute "PI" or "POI" (page 52) or they can be assigned to Lenze AIF process data (page 78) or "AIF process data automation module (page 84). The value of subindex 1 cannot be changed.

Factory setting:

	Base controller (4900, 8600, 9200)		Automation module (2211PP, 2212WP)	
Sub-index	Value (hex)	Meaning	Value (hex)	Meaning
1	04	Number of PCD bytes	04	Number of PCD bytes
2	6041	Status word	58C4	Status word
3	00	Subindex 0	00	Subindex
4	00	empty	00	empty
5	00	empty	00	empty
6	6044	Actual speed	5A98	FDO A1...A16
7	00	Subindex 0	00	Subindex
8	00	empty	00	empty
9	00	empty	00	empty

4.5.2. Process output data description (6001_{hex})

Data format: Process data description structure (index 20_{hex}).
For description see page 67.

Description of the process data which the controller receives from the master (output data of the master). The description can be assigned to profile parameters which have the PCD attribute "POI" (page 52) or it can be assigned to Lenze AIF process data (page 78) or "AIF process data automation module 84). The value of subindex 1 cannot be changed.

Factory setting:

	Base controller (4900, 8600, 9200)		Automation module (2211PP, 2212WP)	
Sub-index	Value (hex)	Meaning	Value (hex)	Meaning
1	04	Number of PCD bytes	04	Number of PCD bytes
2	6040	Control word	58C5	Control word
3	00	empty	00	empty
4	00	empty	00	empty
5	00	empty	00	empty
6	6042	Actual speed	5A9B	FDI E1...E16
7	00	empty	00	empty
8	00	empty	00	empty
9	00	empty	00	empty

4.5.3. Process output data enable (6002_{hex})

Inhibiting and enabling of process output data (output data of the master). More detailed information about the use of the parameter can be obtained from the chapter "process data configuration" (page 67).

Index	Sub-index	Data str.	Data. type	Range / Initialization
6002_{hex}	0	S	OS-1	00_{hex} Inhibit output data **FF_{hex} Enable output data.**

4.6. Process data

4.6.1. Process input data (6010_{hex})

Data format: Unsigned16 with 4 elements

Process data are data memories where several individual parameters are combined to form a new parameter, the process data. These process data are exchanged as fast as possible and cyclically between the controller and the master. Process input data are input data of the master and thus output data of the controller. The process data have a fixed length of 4 byte and a summary of parameters is described in the chapter "process data configuration" (page 67).
Factory setting of the process input data:

Byte no.		Auto-mation module	Meaning	Index
1	Word1/High-Byte Bit 8 - 15		PIW1	
2	Word1/Low-Byte Bit 0 - 7	No Yes	DRIVECOM status word Automation status word	6041_{hex} $58C4_{hex}$
3	Word2/High-Byte Bit 8 - 15		PIW 2	
4	Word2/Low-Byte Bit 0 - 7	No Yes	DRIVECOM actual speed Automation FDO1	6044_{hex} $5A98_{hex}$

4.6.2. Process output data (6011_{hex})

Data format: Unsigned16 with 4 elements

Process data are data memories where several individual parameters are combined to form a new parameter, the process data. These process data are exchanged as fast as possible and cyclically between the controller and the master. Process output data are output data of the master and thus input data of the controller. The process data have a fixed length of 4 byte and a summary of parameters is described in the chapter "process data configuration" (page 67).

Factory setting of the process output dataFactory setting of process output data:

Byte no.		Auto-mation module	Meaning	Index
1	Word1/High-Byte Bit 8 - 15		POW1	
2	Word1/Low-Byte Bit 0 - 7	No Yes	DRIVECOM control word Automation control word	6040_{hex} $58C5_{hex}$
3	Word2/High-Byte Bit 8 - 15		PIW 2	
4	Word2/Low-Byte Bit 0 - 7	No Yes	DRIVECOM nominal speed value Automation FDI1	6042_{hex} $5A9B_{hex}$

4.7. Speed/Velocity channel

4.7.1. Pole number ($604D_{hex}$)

The parameter "pole number" exists only for frequency inverters. It indicates the pole number of asynchronous motors and is used to convert frequency values to speed values and vice versa. Only even numbers are possible.
This is shown on Lenze parameter L-C092.

Index	Sub-index	Data str.	Data type	Range/Initialization
$604D_{hex}$	0	S	U8	2 to 254 L-C092

4.7.2. Face value factor ($604B_{hex}$)

The parameter "face value factor" is used to change the resolution or the setting range of the set-value input. It consists of numerator and denominator. The set-value is multiplied by the factor and the actual values (reference variable, actual vlaue) are multiplied by the inverse factor.

Index	Sub-index	Dat. Str.	Dat. Typ	Range/Initialization
$604B_{hex}$	1	A	I16	-32768 to 32767 **1** Face value factor numerator
$604B_{hex}$	2	A	I16	-32768 to 32767 **1** Face value factor denominator

4.7.3. Speed reference value ($604E_{hex}$)

The parameter "speed reference value" corresponds to the speed reference for the relative speed parameters such as nominal percentage, actual percentage and ramp function time. The profile parameter is mapped to the Lenze parameter L-C011.
A conversion to frequency values is made. The parameter determines the internal maximum speed, which is also active with terminal control.

Index	Sub-index	Data str.	Data type	Range/Initialization
$604E_{hex}$	0	S	U32	4900: 0...C11/2 (2500 rpm) 8600: 0..C11*60/pole number(14400 rpm) 9200: 0 C11/2 (4000 rpm) L-C011/2 in rpm

4.7.4. Nominal speed (6042_{hex})

The parameter "nominal speed" corresponds to the speed set-value in rpm. The set-value is multiplied by the face value factor and mapped to L-C380. Changing the set speed also changes the parameter "nominal percentage".

Index	Sub-index	Dat str.	Data type	Range/Initialization
6042_{hex}	0	S	I16	-32768 to 32767 L-C380 or (L-C046) Nominal speed in rpm

4.7.5. Speed reference variable (6043_{hex})

The parameter "speed reference variable" corresponds to the output of the ramp function generator (set-value integrator) in rpm. The reference variable is multiplied by the inverse of the face value factor and is mapped to L-C381.

Index	Sub-index	Data str.	Data type	Range/Initialization
6043_{hex}	0	S	I16	-32768 to 32767 L-C381

4.7.6. Actual speed (6044_{hex})

The parameter "actual speed" corresponds to the actual speed in rpm. The actual value is multiplied by the inverse of the face value factors and is mapped to L-C382.

Index	Sub-index	Data str.	Data type	Range/Initialization
6044_{hex}	0	S	I16	-32768 to 32767 L-C382 Actual speed in rpm

4.7.7. Nominal percentage (6052_{hex})

The parameter "nominal percentage" corresponds to the nominal speed in per cent. This parameter is scaled to the speed reference (100% = 16383). The set-value is multiplied by the face value factor and is mapped to L-C380. Changing the "nominal percentage" also changes the parameter "nominal speed". When reading, the nominal speed is returned, limited to 200%.

Index	Sub-index	Data str.	Data type	Range/Initialization
6052_{hex}	0	S	I16	-32768 to 32767 L-C380 Nominal speed in per cent (100% = 16383)

4.7.8. Percentage reference variable (6053_{hex})

The parameter "percentage reference variable" corresponds to the speed reference variable (see speed reference variable) in per cent. It is scaled to the speed reference (100% = 16383). The reference is multiplied by the inverse of the face value factor and is mapped to L-C381.

Index	Sub-index	Data str.	Data type	Range/Initialization
6053_{hex}	0	S	I16	-32768 to 32767 **L-C381** Speed reference variable in per cent (100% = 16383)

4.7.9. Actual percentage (6054_{hex})

The parameter "actual percentage" corresponds to the actual speed in per cent. It is scaled to the speed reference (100% = 16383). The actual value is multiplied by the inverse of the face value factor and is mapped to L-C382.

Index	Sub-index	Data str.	Data type	Range/Initialization
6054_{hex}	0	S	I16	-32768 to 32767 L-C382 Actual speed in per cent (100% = 16383)

4.7.10. Speed-min-max-amount (6046_{hex})

The parameter "speed-min-max-amount" corresponds to the speed limit of the maximum and minimum speed set-values in rpm.

Caution! This limit is only effective with LECOM2. The speed limit itself is set by entering the reference speed (index = $604E_{hex}$).

Index	Sub-index	Data str.	Data type	Range/Initialization
6046_{hex}	1	A	U32	0 to 32000 **0** Minimum speed in rpm
6046_{hex}	2	A	U32	0 to 32000 L-C011 in rpm Maximum speed in rpm

4.7.11. Ramps

4.7.11.1. Ramp-min function

In the DRIVECOM profile, there are each two ramps for the nominal speed, one absolute and one relative ramp.

For the absolute ramp, the slope of the ramp is determined by the parameter "delta_speed / "delta_time". Absolute ramps in the DRIVECOM profile are "speed acceleration" and "speed deceleration".
For the relative ramp, the slope of the ramp is determined by the parameter "delta_time", referred to the speed reference (L-C011). This corresponds to the Lenze ramp function of L-C012 and L-C013.
Relative ramps in the DRIVECOM profile are acceleration and deceleration time.
The ramp-min function determines the slower ramp and transmits it to the controller. The absolute ramps are deactivated in the factory setting.

4.7.11.2. Speed acceleration (6048_{hex})

The parameter "speed acceleration" corresponds to the absolute speed ramp of the acceleration. The slope is entered indirectly via the parameters "delta_speed" / "delta_time". The parameter is mapped via the ramp-min function to the Lenze acceleration ramp (L-C012). If the parameter "delta_time" = 0, the ramp is switched off.

Index	Sub-index	Data str.	Data type	Range/Initialization
6048_{hex}	1	RS (21_{hex})	U32	0 to 4294967295 **0** Delta speed in rpm
6048_{hex}	2	RS (21_{hex})	U16	0 bis 65535 **0 (Ramp is switched off)** Delta time in seconds

4.7.11.3. Speed deceleration (6049_{hex})

The parameter "speed deceleration" corresponds to the absolute speed ramp of the deceleration. The slope is entered indirectly via the parameters "delta_speed" / "delta_time". The parameter is mapped via the ramp-min function to the Lenze deceleration ramp (L-C012). If the parameter "delta_time" = 0, the ramp is switched off.

Index	Sub-index	Data str.	Data type	Range/Initialization
6049_{hex}	1	RS (21_{hex})	U32	0 to 4294967295 **0** Delta speed in rpm
6049_{hex}	2	RS (21_{hex})	U16	0 to 65535 **0 (Ramp is switched off)** Delta time in seconds

4.7.11.4. Ramp function time ($604F_{hex}$)

The parameter "ramp function time" corresponds to the relative speed ramp of the acceleration. The ramp function time refers to the parameter "speed reference value" (index = $604E_{hex}$).

$$Slope = \frac{'Speed\ reference' \quad (Index = 604E_{hex})}{'Acceleration\ time' (Index = 604F_{hex})}$$

The parameter is mapped via the ramp-min function to the Lenze acceleration ramp (L-C012). With ramp function time = 0, the ramp is switched off.

Index	Sub-index	Data str.	Data type	Range/Initialization
$604F_{hex}$	0	S	U32	0 to 495000 (max L-C012 / 2) **L-C012 / 2** Delta time in milliseconds

4.7.11.5. Slow down time (6050_{hex})

The parameter "slow down function time" corresponds to the relative speed ramp of the deceleration. The ramp function time refers to the parameter "speed reference value" (index = $604E_{hex}$).

$$Slope = \frac{'Speed\ reference' \quad (Index = 604E_{hex})}{'Deceleration\ time' \quad (Index = 6050_{hex})}$$

The parameter is mapped via the ramp-min function to the Lenze deceleration ramp (L-C013). With slow down time = 0, the ramp is switched off.

Index	Sub-index	Dat. Str.	Dat. Typ	Range/Initialization
6050_{hex}	0	S	U32	0 to 495000 (max L-C012 / 2) **L-C013 / 2** Delta time in milliseconds

5. Lenze parameters

5.1. Lenze code addressing

The access to Lenze parameters is possible. However, the addressing of the parameter (code number) is shifted and is calculated as follows:
Index = 24575 - LENZE_CODE NO
$Index_{hex}$ = 5FFF$_{hex}$ - LENZE_CODE NO$_{hex}$

Example:
The Lenze parameter L-C001 (operating mode) can be accessed under the index 24574 (24575 - 1) using PROFIBUS.

5.2. Lenze data types

The possible Lenze parameters with their ranges are listed in the corresponding operating instructions. The data of the Lenze parameters are mainly represented in a fixed-point format of dat type Integer 32 with four digits after the decimal point.

Example1: L-C039 (JOG) = 150.4Hz
Index = 24575 - 39 = 24536
Index 24536 = 1504000$_{dez}$
(0016F300$_{hex}$)

Example 2: L-C039 (JOG) = -150.4Hz
Index = 24575 - 39 = 24536
Index 24536 = -1504000$_{dez}$
(FFE90D00$_{hex}$)

5.3. AIF process data base controller

At the moment, the following Lenze parameters can be mapped to the PROFIBUS process channel:

Function	Data type	PCD	4900 series (L-C, index)	8600 series (L-C, index)	9200 series
CP-n_{set}	I16	POI	±16384 = ±100% Reference: n_{max} (380;5E83)	±16384 = ±100% Reference: n_{max} (380;5E83)	±26884 = ±100% Reference: 8000 rpm (380;5E83)
CP-n_{set2}	I16	PI	±16384 = ±100% Reference: n_{max} (381;5E82)	±16384 = ±100% Reference: n_{max} (381;5E82)	±26884 = ±100% Reference: 8000 rpm (381;5E82)
CP-n_{actual}	I16	PI	16384 = ±100% Reference: n_{max} (382;5E81)	±16384 = ±100% Reference: n_{max} (382;5E81)	±26884 = ±100% Reference: 8000 rpm (382;5E81)
CP-M_{set}	116	PI	16384 = ±100% Reference: M_{max} Function L-C056 (388;5E7B)	---	±32767 = ±100% Function: L-C056 (387;5E7C)
CP-M_{limit}	116	PO	16384 = ±100% Reference: M_{max} Function L-C047 (388;5E7C)	---	±32767 = ±100% Function: L-C047 (388;5E7B)
CP-actual angle	U16	PI	0 .. 65535 360° = 16384 (391;5E78)	---	0 .. 65535 360° = 16384 391;5E78)
CP-field current set-value	I16	POI	16384 = ±100% Reference: L-C083 (392;5E77)	---	---
CP-additional set-value	I16	PI	16384 = ±100% Function L-C049 (393;5E76)	---	---
CP-FDI1	OS2	POI	Bit 0 ... 7 Terminal E1 ... E8 (136,5F77)	Bit 0 ... 7 Terminal E1 ... E8 (136,5F77)	---
CP-FDO1	OS2	PI	Bit 0 ... 4 Terminal A1 ... A5 (151,5F68)	Bit 0 ... 4 Terminal A1 ... A5 (151,5F68)	---

For explanations about the columns "Data type" and PCD" see chapter "code table DRIVECOM" (page 52).
Further information can be obtained from the operating instructions of the base controllers.

5.4. Lenze automation module

If you want to use an additional automation module (e.g. 2211PP, 2212WP), please observe the following notes concerning the parameter setting:

1. During connection (PROFIBUS-FMS service "Initiate"), 0 (no profile) is returned instead of profile number 21.
2. The profile numbers ($603F_{hex}$ to 6054_{hex}) are not available any more.
3. There are two parameters in addition. They have a similar function as the DRIVECOM profile parameters "control word" and "status word":
   - Automation control word (index = $58C5_{hex}$)
   - Automation status word (index = $58C4_{hex}$)

   For more detailed information, please consult the following chapters "automation control word" and "automation status word".
4. The DRIVECOM status control is achieved.
5. Detailed fault information can only be obtained from the Lenze parameters. Under the Lenze parameters L-C067 (index $5FBC_{hex}$) for base controllers or L-1067 (index $5BD4_{hex}$) for the automation module, the corresponding fault information can be obtained. Under the Lenze parameters L-C161 - L-C168 (index $5F5E_{hex}$ - $5F57_{hex}$) the fault history of base controllers is stored.

5.4.1. Automation control word ($58C5_{hex}$)

Data format: Unsigned16

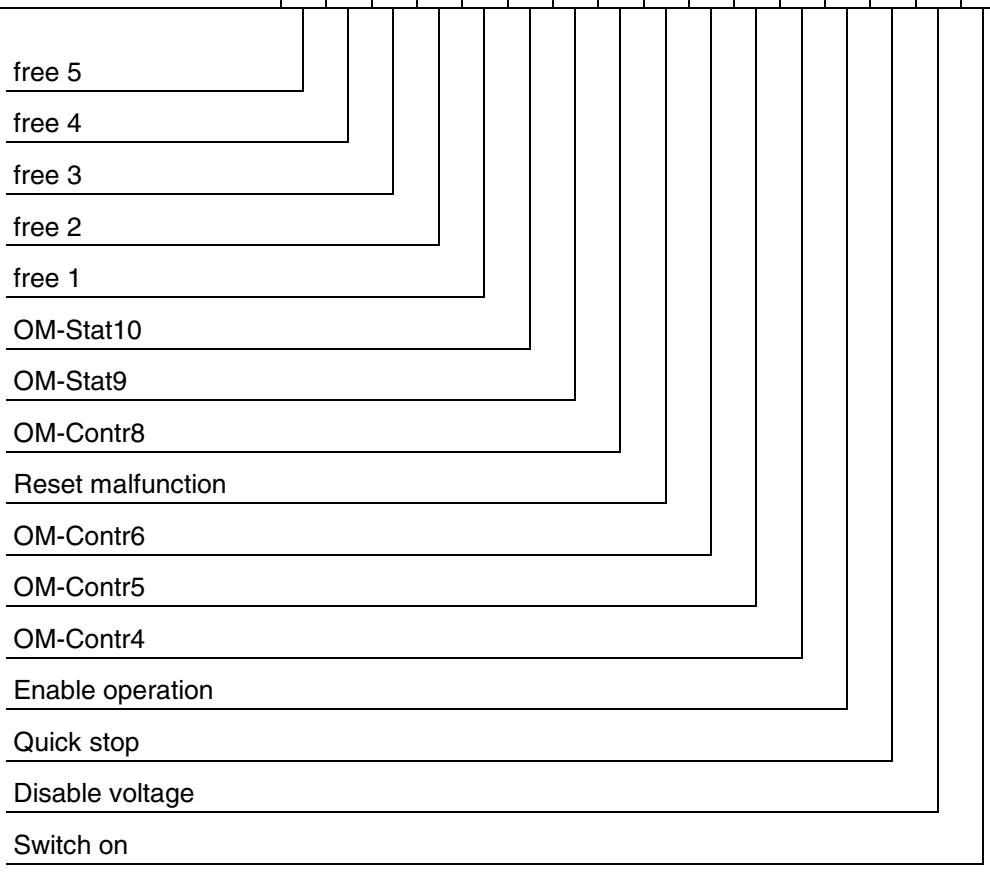
The parameter "automation control word" is used for the control of the drive system, consisting of a base controller, an automation module and the PROFIBUS interface module 2130.
The parameter contains important commands about status transitions and other important control commands.

Structure of the parameter "automation control word":

Bit	Name	Meaning
0	Switch on	Controller states 0 = command 2,6,8 (controller inhibit) 1 = command 3 (not controller inhibit)
1	Disable voltage	Controller states 0 = command 7,9,10,12 (controller inhibit) 1 = not command disable voltage
2	Quick stop	Controller states 0 = command 7,10,11 (quick-Stop) 1 = not command quick stop
3	Operation enabled	Controller states 0 = command 5 (controller inhibit) 1 = command 4 (not controller inhibit)
4	OM-Contr4 2211: PRG-START 2212: not used	Operating mode control function 4 depends on the automation software package. 0 = inactive 1 = active
5	OM-Contr5 2211: PRG-RESET 2212: not used	Operating mode control function 5 depends on the automation software package. 0 = inactive 1 = active
6	OM-Contr6 2211: PRG-STOP 2212: not used	Operating mode control function 6 depends on the automation software package. 0 = inactive 1 = active
7	Malfunction reset	Reset of a fault (TRIP). The bit must be changed from 0 to 1.
8	OM-Contr8 2211: not used 2212: not used	Operating mode control function 8 depends on the automation software package. 0 = inactive 1 = active
9	OM-Contr9 2211: not used 2212: not used	Operating mode control function 9 depends on the automation software package. 0 = inactive 1 = active
10	OM-Contr10 2211: not used 2212: not used	Operating mode control function 10 depends on the automation software package. 0 = inactive 1 = active
11	free 1	Mapping to the 28th freely assignable input (L-1381) 0 = do not activate function 1 = activate function
12	free 2	Mapping to the 29th freely assignable input (L-1381) 0 = do not activate function 1 = activate function
13	free 3	Mapping to the 30th freely assignable input (L-1381) 0 = do not activate function 1 = activate function
14	free 4	Mapping to the 31st freely assignable input (L-1381) 0 = do not activate function 1 = activate function
15	free 5	Mapping to the 32nd freely assignable input (L-1381) 0 = do not activate function 1 = activate function

The individual bit-control commands of the control word are not independent of the other bit positions. The following list shows which bits you have to assign in which way in order to activate the desired command.

Controller state commands	Bits of the control word															
	16							8	7							0
1 Shutdown	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	**0**
2 Switch on	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	**1**
3 Enable operation	–	–	–	–	–	–	–	–	–	–	–	–	**1**	1	1	1
4 Disable operation	–	–	–	–	–	–	–	–	–	–	–	–	**0**	1	1	1
5 Disable voltage	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**0**	–
6 Quick stop	–	–	–	–	–	–	–	–	–	–	–	–	–	**0**	1	–
8 Reset malfunction	– / –	– / –	– / –	– / –	– / –	– / –	– / –	– / –	0 / 1	– / –	– / –	– / –	– / –	– / –	– / –	– / –



Several control commands can be given at the same time. Only a bit change of Bit0 is necessary to change from the status "SWITCH ON DISABLED". This function is required to avoid inadvertant starting of the drive during switch on.

Explanation

0 Bit state is 0
1 Bit state is 1
– Bit state is not defined and has no effect

5.4.2. Automation status word ($58C4_{hex}$)

Data format: Unsigned16

The parameter "automation status word" is used to show compact information about the drive system. It contains status information of the controller states and other important information.

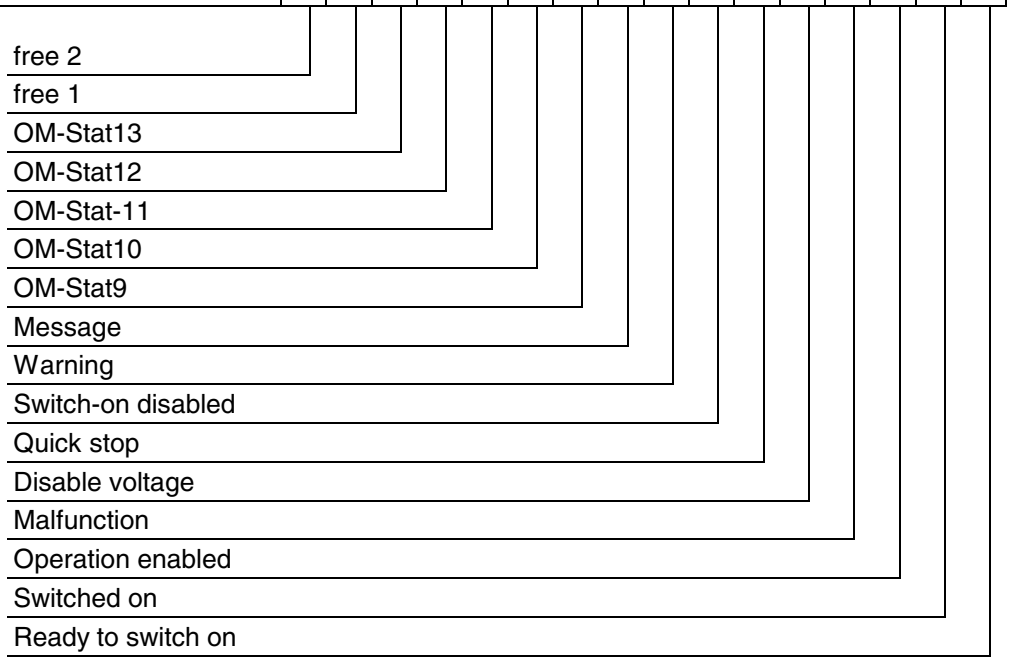
Structure of the parameter "automation status word":

Bit	Name	Meaning
0	Ready to switch on	Controller status information 0 = state at least"READY TO SWITCH ON" 1 = state less than "READY TO SWITCH ON"
1	Switched on	Controller status information 0 = state at least "SWITCHED ON" 1 = state less than "SWITCHED ON"
2	Operation enabled	Controller status information 0 = state at least "OPERATION ENABLED" 1 = state less than "OPERATION ENABLED"
3	Malfunction	Controller status information 0 = no malfunction (TRIP) 1 = malfunction (TRIP)
4	Voltage disabled	Information about command "disable voltage" (see "control word"). 0 = command is active 1 = command is not active
5	Quick stop	Information about command "quick stop" (see "control word"). 0 = command is active 1 = command is not active
6	Switch on disabled	Controller status information 0 = State not "SWITCH ON DISABLED" 1 = State "SWITCH ON DISABLED"
7	Warning	Collective warning; not supported at the moment. 0 = no warning 1 = warning
8	Message	Collective message; not supported at the moment. 0 = no warning 1 = warning
9	Remote	Bus access authority; depending on the Lenze parameter "operating mode" (L-C001) 0 = L-C001 <> 5 1 = L-C001 = 5
10	OM-Stat10 2211: not used 2212: not used	Automation status function 10 depends on the automation software package. 0 = inactive 1 = active
11	OM-Stat11 2211: not used 2212: not used	Automation status function 11 depends on the automation software package. 0 = inactive 1 = active
12	OM-Stat12 2211: not used 2212: not used	Automation status function 12 depends on the automation software package. 0 = inactive 1 = active
13	OM-Stat13 2211: not used 2212: not used	Automation status function 13 depends on the automation software package. 0 = inactive 1 = active

Bit	Name	Meaning
14	free 1	Mapping to the 31st freely assignable input (L-1384) 0 = do not activate function 1 = activate function
15	free 2	Mapping to the 32nd freely assignable input (L-1384) 0 = do not activate function 1 = activate function

The precise information about the present controller state can only be obtained by the combination of the controller state information bit (bit 0, 1, 2, 3, 4, 5, 6).
This is shown in the following.

Controller states	Bits of the status word															
	16							8	7							0
NOT READY TO SWITCH ON	–	–	–	–	–	–	–	–	–	0	–	–	0	0	0	0
SWITCH-ON DISABLED	–	–	–	–	–	–	–	–	–	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
MALFUNCTION	–	–	–	–	–	–	–	–	–	0	–	–	1	0	0	0
MALFUNCTION REACTION ACTIVE	–	–	–	–	–	–	–	–	–	0	–	–	1	1	1	1
QUICK STOP ACTIVE	–	–	–	–	–	–	–	–	–	0	0	–	0	1	1	1



Explanation
0 Bit state is 0
1 Bit state is 1
– Bit state is not defined and has no effect

5.4.3. AIF process data automation module

At the moment, the following Lenze parameters can be mapped to the PROFIBUS process channel:

Function	Data type	PCD	Automation module	
			2211PP (L-C, index)	2212WP (L-C, index)
$CPposition_{act}$ (1385; 5A96)	I32	PI	±1073741824 ($±2^{30}$) in angle units of the feedback system	
CP-FDI1	OS2	POI	Bit 0...15 terminal E1...E16 (1381,5A9B)	Bit 0...15 terminal E1...E16 (1381,5A9B)
CP-FDI2	OS2	POI	Bit 0...15 terminal E17...E32 (1382,5A9A)	Bit 0...15 terminal E17...E32 (1382,5A9A)
CP-FDO1	OS2	PI	Bit 0...15 terminal A1...A16 (1383,5A98)	Bit 0...15 terminal A1 ...A16 (1383,5A98)
CP-FDO2	OS2	PI	Bit 0...15 terminal A17...A32 (1384, 5A97)	Bit 0...15 terminal A17...A32 (1384, 5A97)

For explanations about the columns "Data type" and PCD" see chapter "code table DRIVECOM" (page 52).
Further information can be obtained from the operating instructions of the base controllers.

6. Glossary

AIF	**A**utomation **i**nter**f**ace. Interface between controller and automation/field bus modules. Among others, it contains defined process data.
bin	Values in the binary format (0,1). A character marked "x" can be any binary character. Value: MSB ... LSB
Bit time	Transmission of one bit.
Controller	General name for frequency inverters (8600 series, servo drives (9200 series) and DC drives (4900 series).
CRL	**C**ommunication **r**eference **l**ist
Data format	Data description, consisting of the components data structure and data type. For the description see chapter "cDRIVECOM" (page 52).
DP	**D**ecentral **p**eripherial units. Inputs/Ouput units which are connected to the central control via a serial connection.
DP operation	Operating mode with only DP masters.
DP master (class 1)	DP master which processes the user data transfer with its assigned DP slaves
DP master (class 2)	DP master which is used as commissioning or diagnosis devices; normally a programming device.
DRIVECOM	Group of more than 30 drive manufacturers, creating uniform communication solutions for power transmission and definition of drive profiles.
FDO	**f**reely assignable **d**igital **o**utput
FDI	**f**reely assignable **d**igital **i**nput
FMS	**F**ieldbus **M**essage **S**pecification. PROFIBUS part 2.
Handshake	Defined data transmission procedure (achieved by software).
hex	Value in the hexadecimal format (0...9, A, B, C, D, F). A character marked "x" can be any hexadecimal character. Value: MSB ... LSB
Index	Parameter number corresponding to the PROFIBUS and DRIVECOM definitions. See chapter "cDRIVECOM" (page 52) and chapter "Lenze parameters" (page 77). If a parameter has several values (e.g. for arrays and records), these are addressed with an additional subindex.
L-Cxxx	Parameter number according to the Lenze definition (code number). "xxx" means the Lenze code number. This code number can only be accessed in the PROFIBUS system via a conversion (see chapter "Lenze parameters" (page 77).

LSB	**L**east **s**ignificant **b**it
Master	Bus participant with independent sending authority. Masters are hosts, like PLCs or PCs.
Mixed operation	Operating mode, when there are PROFIBUS-FMS and DP masters
Mixed device	Device which incorporates functions according to PROFIBUS-FMS and PROFIBUS-DP. Lenze controllers are mixed devices on PROFIBUS or so-called Combislaves.
MSAC	Communication relation between master and slave, acyclic
MSB	**M**ost **s**ignificant **b**it
OFC	**O**ptical **f**ibre **c**able
User data	For PROFIBUS DP: data which are exchanged in cycles between control and controller
PO data	**P**rocess **o**utput data
POWx	**P**rocess **o**utput **w**ord of PROFIBUS, viewed from the master (host); i.e. data from the master to the drive. "x" means the word address (starting with 1).
PC	Personal computer
PCD	see process data
PDU	Process Data Unit. User data length of a PROFIBUS telegram
PI data	**P**rocess **i**nput data
PIWx	**P**rocess **i**nput **w**ord of PROFIBUS, viewed from the master (host); i.e. data from the drive to the master. "x" means the word address (starting with 1).
PLC	**P**rogrammable **l**ogic **c**ontroller such as Siemens SIMATIC S5
PROFIBUS	**Pro**cess **Fi**eld **Bus** Communication standard DIN19245, consisting of part 1, part 2, and part 3
PNO	**P**ROFIBUS-**N**utzer**o**rganisation e.V. Group for the promotion of PROFIBUS.
PROFIBUS DP	Communication standard to DIN 19245 part 1 and part 3 (draft) DP means "decentral peripherial units"
PROFIBUS-FMS	Communication standard to DIN 19245 part 1 and part 2 (FMS protocol)
Profile	The word profile is taken from the communication standard PROFIBUS (DIN 19245) and describes supplementary or restrictive regulations which are valid within industries or device groups. The DRIVECOM User Group has standardized some important controller functions in the DRIVECOM profile 21. Using the 2130 interface module, the Lenze controllers support the DRIVECOM profile.
Process data	For example set-values and actual values of controllers, which must be transmitted in a very short time. These are small amounts of data (e.g. two words with DRIVECOM and Lenze), which are transmitted cyclically. For PROFIBUS, these data are transmitted in the logic process data channel.

QSP	Quick-Stop
Repeater	Repeaters are used for the regeneration of the bus signals (RS485) and therefore for an extension of the bus system. Repeaters are offered, for example, by Siemens.
RFR	**R**egler**fr**eigabe (Controller enable)
RSP	**R**egler**sp**erre (Controller inhibit)
RS485	Interface standard with difference signals
Slave	Bus participant which is only allowed to transmit after a request by the master. Controllers are slaves.
Subindex	See index
TD	Technical description or operating instructions
TRIP	Fault
User data	For PROFIBUS DP: data which are exchanged in cycles between control and controller

Index