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L-force Drives

Software Manual

8400

E84AVSCxxxxx

Inverter Drives 8400 motec

Lenze

Overview of technical documentation for Inverter Drives 8400

Project planning, selection & ordering
☐ 8400 motec hardware manual
Catalogue

Mounting & wiring
MA 8400 motec
MA for the accessories

Parameterisation	
BA for diagnosis terminal	
☐ SW 8400 motec	← **This documentation**
☐ KHB for communication unit	

Drive commissioning	
☐ SW 8400 motec	← **This documentation**
→ Chapter "Commissioning"	
→ Chapter "Diagnostics & error management"	

Establishing networks
☐ KHB for communication unit
MA for the accessories

Legend:	
	Printed documentation
☐	Online documentation (PDF/Engineer online help)
Abbreviations used:	
BA	Operating Instructions
KHB	Communication manual
MA	Mounting instructions
SW	Software Manual

Contents

1 About this documentation

Danger!

The controller is a source of danger which may lead to death or severe injury of persons.

To protect yourself and others against these dangers, observe the safety instructions before switching on the controller.

Please read the safety instructions in the mounting instructions and the hardware manual of the 8400 motec controller. Both documents are supplied with the controller.

This software manual contains information on the parameterisation of the 8400 motec controller by means of the L-force »Engineer«.

The information in this software manual is valid for the 8400 motec controller with the following nameplate data:

Product series	Type designation	From software version
8400 motec	E84DGDVBxxxxxxx	01.00

All screenshots in this documentation are application examples. Depending on the software version of the controller and the version of the installed »Engineer« software, the screenshots in this documentation may differ from the representation in the »Engineer«.

Tip!

Information and tools around the Lenze products can be found in the download area on

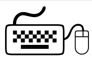
http://www.Lenze.com

1.1 Document history

Version			Description
1.0	04/2010	TD05	First edition
1.1	05/2010	TD05	Corrections
1.2	10/2010	TD05	Corrections
2.0	02/2011	TD05	• Extended by new functions for 8400 motec V02.00.00 • Extended by chapter "Application examples"
2.1	03/2011	TD05	Corrections

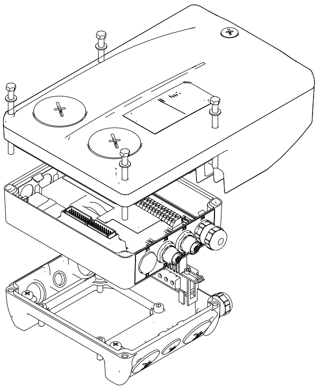
1.2 Conventions used

This Software Manual uses the following conventions to distinguish between different types of information:

Type of information	Writing	Examples/notes
Spelling of numbers		
Decimal separators	Point	The decimal point is generally used. For example: 1234.56
Text		
Version info	Blue text colour	Information that is only valid for or as from a certain software version of the controller are marked accordingly in this manual. Example: The function extension is available for software version V04.00.00 and higher!
Program name	» «	The Lenze »Engineer« PC software ...
Window	*Italics*	The *Message window*... / The *Options* dialog box...
Variable name		Set *bEnable* to TRUE to...
Control element	**Bold**	The **OK** button... / The **Copy** command... / The **Properties** tab... / The **Name** input field...
Sequence of menu commands		If the execution of a function requires several commands, the individual commands are separated by an arrow: Select **File→Open** to...
Shortcut	**<Bold>**	Press **<F1>** to open the online help.
		If a command requires a combination of keys, a "+" is placed between the key symbols: Use **<Shift>+<ESC>** to...
Hyperlink	underlined	Optically highlighted reference to another topic. In this documentation activated by mouse-click.
DIP switch	\ ("Backslash")	For separating the data of the DIP-Schalterbank from the switch number, the Backlash" is used. For instance, S2\8 indicates bank S2 and switch 8 (on the far right).
Icons		
Page reference	(🕮 11)	Optically highlighted reference to another page. In this documentation activated by mouse-click.
Step-by-step instructions		Step-by-step instructions are indicated by a pictograph.

Information that is only valid for or as from a certain software version of the controller are marked accordingly in this manual.

1.3 Terminology used

Term	Meaning
Drive unit Communication unit Wiring unit 	The 8400 motec controller is designed modularly. It consists of the modules "drive unit", "communication unit" and "wiring unit". • The drive unit is available in different power ratings. • In case of the communication unit you can select between: – No fieldbus – AS-i option (simple/complete) – CANopen option (simple/complete) – PROFIBUS option (simple/complete) • The wiring unit provides flexible connections for an easy integration into the power supply of the machine.
»Engineer«	Lenze PC software which supports you in "engineering" (parameterisation, diagnostics and configuration) throughout the whole life cycle, i.e. from planning to maintenance of the commissioned machine.
Application	A technology application is a drive solution equipped with Lenze's experience and know-how in which function and system blocks interconnected to a signal flow are the basis for implementing typical drive tasks.
ASM	Asynchronous motor
Code	Parameter used for controller parameterisation or monitoring. The term is usually called "index".
DC injection brake	The DC injection brake is to brake and/or hold the motor. For this purpose, the 8400 motec creates a quasi DC field at the stator of the asynchronous machine. The energy to be dissipated is converted into heat in the rotor.
Diagnosis terminal / keypad	The diagnosis terminal combines the keypad with a housing and a connecting cable. The diagnosis terminal serves to check or change various settings. In a quick commissioning menu, the controller can be parameterised in the basic settings by means of the diagnosis terminal. **Note:** If this documentation contains descriptions of settings with the keypad, use the diagnosis terminal instead for the 8400 motec, since the keypad cannot directly be plugged into the diagnostic interface of the 8400 motec.
Display code	Parameter that displays the current state or value of an input/output of a system block.
EPM	Memory module on which all parametes of the drive system are saved non-volatilely. These include the parameters of the controller and communication-relevant parameters for the communication unit used.
Function block	A function block can be compared with an integrated circuit that contains a certain control logic and delivers one or several values when being executed. • Each function block has a unique identifier, e.g. "L_MPot_1" (motor potentiometer function)
Holding brake	The holding brake serves to hold the rotor by means of a mechanical unit.
LA	Abbreviation: **L**enze **A**pplication block • Example: "LA_NCtrl" – block for the "actuating drive speed" application.
Lenze setting	This setting is the default factory setting of the device.
LP	Abbreviation: **L**enze **P**ort block • Example: "LP_Network_In" – port block for fieldbus communication.
LS	Abbreviation: **L**enze **S**ystem block • Example: "LS_DigitalInput" – system block for digital input signals.
Port block	Block for implementing the process data transfer via a fieldbus

Term	Meaning
QSP	Quick stop
Service brake	The service brake serves to shutdown rotary or translatory masses in motion in a controlled manner. The energy to be dissipated in this process is converted into heat in the form of friction energy. This process is a regular and recurring operating mode.
SLVC	Motor control: Sensorless vector control ("**S**ensor**L**ess **V**ector **C**ontrol")
Subcode	If a code contains several parameters, the individual parameters are stored under "subcodes". This Manual uses a slash "/" as a separator between code and subcode (e.g. "C00118/3"). The term is usually called "subindex".
System block	In the application, system blocks provide interfaces to basic functions and to the hardware of the controller (e.g. to the digital inputs).
USB diagnostic adapter	The USB diagnostic adapter is used for the operation, parameterisation, and diagnostics of the controller. Data are exchanged between the PC (USB connection) and the controller (diagnostic interface on the front) via the diagnostic adapter. • Order designation: E94AZCUS
VFCplus	Motor control: V/f characteristic control ("**V**oltage **F**requency **C**ontrol")
VFCplusEco	Motor control: V/f characteristic control - energy-saving In this motor control mode, the controller adapts the motor voltage to the requirements of the load. Especially at speeds lower than 50 % of the rated speed and a reduced torque, losses in the motor and in the controller can be reduced. Hence, the usually bad efficiency of the drive in partial load operational range is increased significantly.

1.4 Definition of the notes used

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

Safety instructions

Layout of the safety instructions:

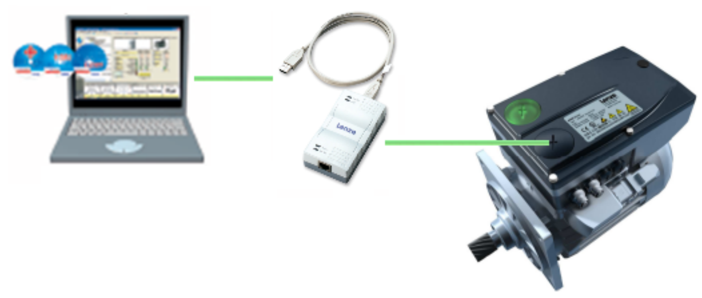
> **Pictograph and signal word!**
>
> (characterise the type and severity of danger)
>
> **Note**
>
> (describes the danger and informs how to prevent dangerous situations)

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

Application notes

Pictograph	Signal word	Meaning
	Note!	Important note to ensure trouble-free operation
	Tip!	Useful tip for easy handling

2 Introduction: Parameterising the controller



[2-1] Exemplary constellation for parameterising the controller

Being a component of a machine which includes a speed-variable drive system, the controller needs to be adjusted to its drive task and the motor. The controller is adjusted by changing parameters which are saved in the memory module.

Danger!

In general, changing a parameter causes an immediate response in the controller!

- This may lead to undesirable behaviour on the motor shaft if the controller has been enabled!
- Setpoint sources, for instance, may switch over all of a sudden (e.g. when configuring the signal source for the main setpoint).

Certain device commands or settings which may cause critical states of drive behaviour constitute exceptions. Such parameter changes are only possible if the controller is inhibited. Otherwise, a corresponding error message will be issued.

The parameters can optionally be accessed from the diagnosis terminal, or the L-force »Engineer«, or a master control via fieldbus communication:

- ▶ Simply connect the diagnosis terminal to the diagnostic interface being located on the top of the device.
- ▶ The USB diagnostic adapter, for instance, can be used for the communication between the PC (including the L-force »Engineer« software) and the controller, see illustration. The USB diagnostic adapter is the connection between the PC (free USB port) and the controller (diagnostic interface).
- ▶ For fieldbus communication, you can choose between different communication units: AS-i, CANopen and PROFIBUS.

Information on how to commission the 8400 motec using the diagnosis terminal can be found in the hardware manual!

2.1 General notes on parameters

All parameters for controller parameterising or monitoring are saved as so-called "codes".

- The codes are numbered and indicated by the prefix "C" before the code, e.g. "C00002".
- In addition, every code has a name and specific attributes:
  - Access type (read, write)
  - Data type
  - Limit values
  - Lenze setting (factory-set scaling)
- For the sake of clarity, some codes contain "subcodes" for saving parameters. This Manual uses a slash "/" as a separator between code and subcode, e.g. C00115/1".
- According to their functionality, the parameters are divided into three groups:

Parameter group	Examples
Setting parameters Parameters for specifying setpoints and for setting device / monitoring functions.	C00007: Selection of control mode C00012: Acceleration time - main setpoint C00039: Fixed setpoints
Configuration parameters Parameters for configuring signal connections within the device, e.g. assignment of the digital input terminals to the control inputs of the application.	C00620: System connection list: 16-bit C00621: System connection list: Bool C00700: LA_NCtrl: Analog connection list C00701: LA_NCtrl: Digital connection list
Diagnostic/Display parameters Parameters for displaying device-internal process factors, current actual values, and status messages, e.g. for diagnostic purposes. These are read-only parameters.	C00052: Motor voltage C00137: Device state C00150: Status word C00165: Error information

Tip!

The terms "code" and "subcode" generally correspond to the terms "index" and "subindex" and "parameter" and "subparameter".

2.2 Handling the memory module

Danger!

After power-off, wait at least three minutes before working on the controller. When removing the memory module, ensure that the controller is deenergised.

All parameters of the drive system are saved non-volatilely on the memory module. These include the parameters of the controller and communication-relevant parameters for the communication unit used.

The plug-in version is especially suited for

- restoring an application after replacing a device.
- duplicating identical drive tasks within the frequency inverter series8400 motec, e.g. by using the optionally available EPM Programmer.

Note!

- When the device is switched on, all parameters are automatically loaded from the memory module to the main memory of the controller.
  - When the DIP switches are active (DIP switches S1\1 = "ON"), the controller operates with the settings made via the DIP switches and displays them in the corresponding codes.
- The 8400 BaseLine and 8400 motec controllers use the same (grey) memory module. The memory module can be shifted between these controllers but the controller must be reparameterised afterwards.

When handling the memory module, a distinction is drawn between the following scenarios:

Delivery status

- The memory module is plugged into the EPM slot of the drive unit.
- The Lenze setting of the parameters is stored in the memory module.
- The memory module is available as a spare part - without any data.

During operation

- Parameter sets can be saved manually.
- Parameter sets can be loaded manually.
- Parameter changes can be saved automatically.

Replacing the controller

- In the event of a device replacement, the entire parameter data of an axis can be copied to the replacement device by "taking along" the memory module, so that additional PC or diagnosis terminal operations are not required.
- When replacing the controller, the versions of the old device and the new device are of importance. Before data are actually transferred, the versions are internally checked. Basically, the following applies:
  - Parameter sets of old devices with V 1.0 can be processed on new devices ≥ V 1.0 (downward compatibility).
  - Parameters of devices with higher versions are not supported on devices with lower versions. An error message will be issued if the parameter set versions of the two devices are not compatible.

Saving the parameters in the memory module safe against mains failure

Controller parameter changes via the »Engineer«, the diagnosis terminal, or a master control via fieldbus communication will be lost after mains switching of the controller unless the settings have been explicitly saved.

You have several options to avoid data loss by saving the parameter sets in the memory module:

- Automatic saving of parameter changes (📖 37)
- Manual saving of parameter settings (📖 37)

Parameter set transfer using the »Engineer«

When an online connection to the controller has been established, the following transfer functions can directly be executed via the *Toolbar* or the **Online** menu using the L-force »Engineer«:

Symbol	Menu command	Shortcut
	Download parameter set	<F5>
	Read parameter set from device	<F7>
	Save parameter set	

Tip!

Detailed information on parameter set transfers using the »Engineer« can be found in the »Engineer« online help.

3 Commissioning

The 8400 motec controller is commissioned in one of the following ways:

- Commissioning with PC/»Engineer«
  - The »Engineer« provides a comfortable access to all parameters of the 8400 motec controller and hence full flexibility in the commissioning process.
- Commissioning with diagnosis terminal
  (If only a few parameters have to be adapted)
- Commissioning via the DIP switches/potentiometers at the 8400 motec
  (for simple applications)

This chapter provides information on how to commission the 8400 motec using the »Engineer«.

Information on how to commission the 8400 motec via the DIP switches/ potentiometers can be found in the mounting instructions!

Information on how to commission the 8400 motec using the diagnosis terminal can be found in the hardware manual!

3.1 Safety instructions with regard to commissioning

General safety instructions

In order to prevent injury to persons or damage to material assets

- before connecting the mains voltage, check
  - The wiring for completeness, short circuit, and earth fault
  - The "emergency stop" function of the entire system
  - The motor circuit configuration (star/delta) must be adapted to the output voltage of the controller
  - The in-phase connection of the motor
  - The direction of rotation or the encoder (if available)
- Check the setting of the most important drive parameters before enabling the controller:
  - The V/f rated frequency must be adapted to the motor circuit configuration!
  - The drive parameters relevant for your application must be set correctly!
  - The configuration of the I/O terminals must be adapted to the wiring!
- Make sure that no speed setpoint is pending before controller enable.

Danger!

The RFR control input is connected as default with a bridge to +24 V, which means that the controller is enabled!

- This input can also be used for switching on/off the drive. For this purpose, the bridge must be replaced by cabling.

Safety instructions with regard to motor operation

Danger!

- For thermal reasons, continuous operation of self-ventilated motors at a low field frequency and rated motor current is not permissible!
  - In the Lenze setting, the Motor temperature monitoring (PTC) is activated. (📖 125)
- In the Lenze setting, the Brake resistor monitoring (I2xt) is activated. The activation of the monitoring function causes a switch-off of the braking operation. (📖 126)
- With regard to the setting of the V/f base frequency (C00015), observe the following difference to the controllers 8400 StateLine/HighLine/TopLine: In case of the 8400 motec, the reference voltage for the V/f base frequency is the rated motor voltage (C00090) according to the motor nameplate (independent of the supply voltage).

3.2 LED status display

Information on some operating states can be quickly obtained via the two-colored LED display on the top of the device.

The meaning can be seen from the table below.

green "DRIVE READY"	red "DRIVE ERROR"	Description	Device state (Display in C00137)
Off	Off	OFF or initialisation active	Init
	Off	Safe torque off is active	SafeTorqueOff
	Off	Device is ready to start	ReadyToSwitchON
	Off	Device is switched on	SwitchedON
	Off	Motor data identification/operation	OperationEnabled
		The controller is ready to switch on, switched on or the operation is enabled and a warning is indicated.	
Off		Trouble is active	Trouble
Off		Fault is active	Fault

Legend
The symbols used for indicating the LED states have the following meaning:

	LED is flashing once approx. every 3 seconds (*slow flash*)
	LED is flashing once approx. every 1.25 seconds (*flash*)
	LED is flashing twice approx. every 1.25 seconds (*double flash*)
	LED is blinking every second
	LED is permanently on

Tip!

Information on failures can be transmitted e.g. to a master control via the fieldbus.

Detailed information on diagnostics using the »Engineer« and a description of possible error messages can be found in the chapter entitled "Diagnostics & error management". (193)

3.3 Commissioning with the »Engineer«

Commissioning with the »Engineer« is suited for every drive task and in particular for drive tasks with more demanding requirements/more comprehensive parameter setting.

In the following, commissioning of the controller is described step by step. Please process the chapters consecutively and execute all steps carefully. This procedure will help you to commission the controller quickly and as safe as possible:

3.3.1 Preconditions for commissioning with the »Engineer«

For commissioning, you need

- a PC that satisfies the following requirements:
  - processor with 1.4 GHz or higher
  - at least 512 MB RAM and 650 MB free hard disc space
  - Microsoft® Windows® 2000 operating system (from service pack 2 onwards) or Windows® XP
- the Lenze »Engineer« PC software
- a connection to the controller (via the diagnostic interface or fieldbus)

Tip!

How to obtain/update the L-force »Engineer« software:

- **Download from the Internet:**
  The full version of the »Engineer StateLevel« is provided free of charge. Current software can be found on the Internet in the "Services & Downloads" area under http://www.Lenze.com.
- **Requesting the CD**
  You can also request the L-force »Engineer« separately on CD free of charge at your Lenze representative. See the "About Lenze" area on our homepage for e.g. the corresponding German address.

3.3.2 Preparing the 8400 motec for commissioning

Danger!

Take all the necessary safety precautions before you carry out the following commissioning steps and switch the device on!

▶ Safety instructions with regard to commissioning (📖 20)

1. Wiring the power and control terminals
   – Use the mounting instructions supplied with the controller in order to connect the power and control terminals correctly.
   – Assign the digital inputs so that your application can be displayed by one of the preconfigured control modes (C00007) for terminal control:

	Assignment of the digital terminals				
Control mode	**DI1**	**DI2**	**DI3**	**DI4**	**DI5**
Terminals 0	JOG 1/3	JOG 2/3	DCB	Cw/Ccw	BrkRelease
Terminals 2	JOG 1/3	JOG 2/3	QSP	Cw/Ccw	BrkRelease
Terminals 11	Cw/Ccw	DCB	MPotUp	MPotDown	BrkRelease
Terminals 16	JOG 1/3	JOG 2/3	Cw/QSP	Ccw/QSP	BrkRelease

Abbreviations used:

JOG	Selection of the fixed setpoints 1 ... 3 parameterised in C00039/1...3
DCB	Manual DC-injection braking
Cw/Ccw	CW/CCW rotation
QSP	Quick stop
MPotUp	Motor potentiometer: Increase speed
MPotDown	Motor potentiometer: Decrease speed
Cw/QSP	Fail-safe selection of the direction of rotation in connection with quick stop
Ccw/QSP	
BrkRelease	Release holding brake manually • In the Lenze setting, the brake control is switched off (not active). → Set operating mode in C02580.

2. Check the switches DIP1 and DIP2 at the bottom of the Drive Unit.
   – DIP1/switch 1 must be set to "OFF" in order that no parameters of the memory module are overwritten when the device is started.
   – See display parameters C01911 and C01912 for details.
3. Set the DIP3 switch on the communication unit to CANopen or PROFIBUS.
4. Position the drive unit carefully onto the communication unit and fix it using the four screws.
5. Inhibit controller: Set RFR terminal to LOW level or open the contact.

6. Switch on voltage supply of the controller.
   – Information on some operating states can be quickly obtained via the two-colored LED display on the top of the device. ▶ LED status display (📖 21)
7. Establish a connection to the controller, e.g. via USB diagnostic adapter:
   – Remove the cover of the diagnostic interface on the top of the device and connect the USB diagnostic adapter to the diagnostic interface.
   – Connect the USB diagnostic adapter to the PC via a free USB port.

3.3.3 Creating an »Engineer« project & going online

> You can find detailed information on the general use of the »Engineer« in the online help which you can call with **[F1]**.
> - In the chapter "Working with projects" all options of the *Start-up wizard* are described in order to create a new »Engineer« project.

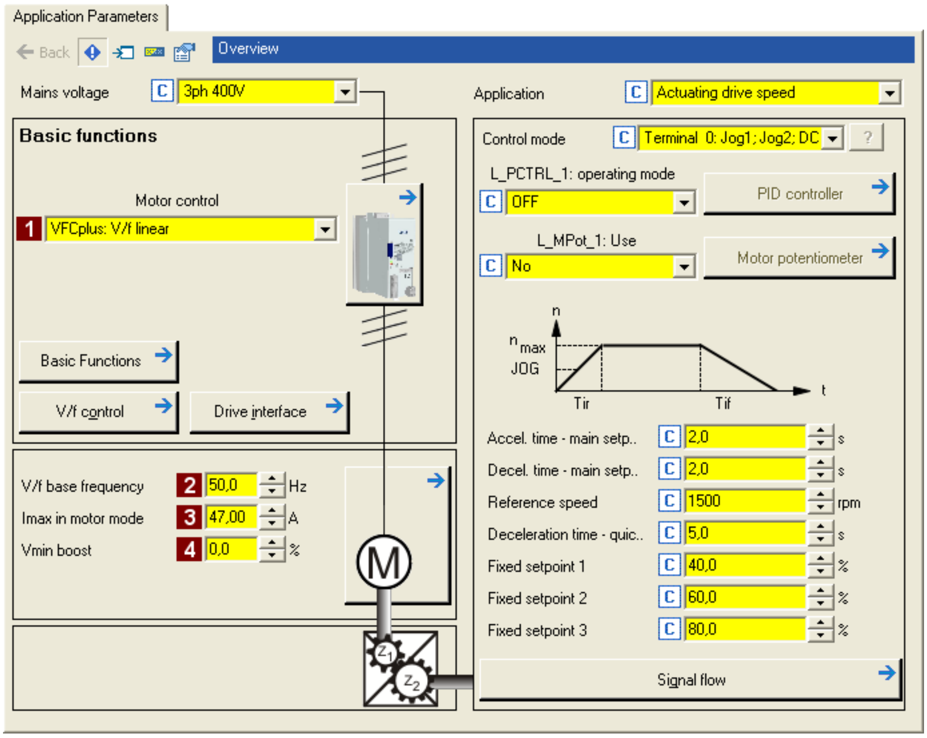
The following steps describe the standard procedure of creating a project using the **Select component from catalogue** option. Here, you select the single components (controller, motor, etc.) from selection lists.

1. Start the »Engineer«.
2. Create a new project by means of the *Start-up wizard* and the **Select component from catalogue** option:
   – In the **Component** dialog step, select the 8400 motec controller.
   – Select the available communication option in the **device modules** dialog step.
   – Select the "actuating drive speed" application in the **Application** dialog step.
   – Select the other components (motor/gearbox) to be added to the project in the **Other components** dialog step.
3. Go online.
   – After a successful connection to the controller, the following status is displayed in the *Status line*:

4. Download parameter set.
   – This command serves to overwrite the current parameter settings in the controller by parameter settings of the »Engineer« project.

3.3.4 Parameterising the motor control

1. Go to *Workspace* and change to the **Application parameters** tab.
   – On the left, the parameters of the motor control are arranged:



2. Go to the 1 **Motor control** list field (C00006) and select the required motor control.

Note!

In the Lenze setting, the V/f characteristic control (VFCplus) with linear characteristic is set in C00006 as motor control.

- The V/f characteristic control (VFCplus) is an motor control for standard frequency inverter applications based on a simple and robust control process which is suitable for the operation of machines with linear or square-law load torque characteristic (e.g. fans).
- The parameter settings have been set in advance in such a way that, if the drive controller and 50 Hz asynchronous machine match each other in terms of performance, the drive controller is immediately ready for operation without any further parameter setting work and the motor works satisfactorily.

3. Adapting the parameters of the motor control:

	Parameter	Lenze setting Value	Unit	Info
2	**V/f base frequency** (C00015)	50.0	Hz	▸ Adapting the V/f base frequency (🕮 72)
3	**Imax in motor mode** (C00022)	47.00	A	▸ Optimising the Imax controller (🕮 74)
4	**Vmin boost** (C00016)	0.0	%	▸ Adapting the Vmin boost (🕮 73)

Tip!

Also check the other information on the nameplate against the motor data set in the drive controller. You can find further information in the chapter entitled "Motor selection/Motor data". (🕮 54)

Recommendations for the following application cases:

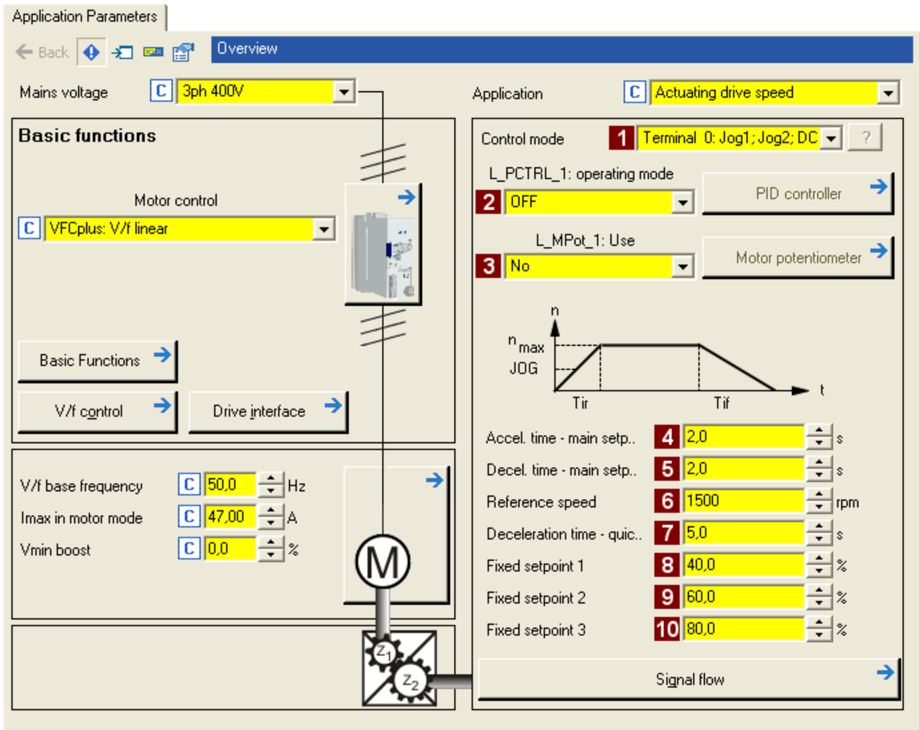
- If the controller and motor differ greatly from each other in terms of performance:
  Set the Imax limit (in motor mode) in C00022 to double the rated motor current.
- If a higher starting torque is required:
  In idle state of the motor, set the Vmin boost in C00016 in such a way that the rated motor current flows at a field frequency of f = 3 Hz (display in C00058).
- If a high torque is to be available at low speed and without a feedback:
  ISelect the "Sensorless vector control (SLVC)" in C00006 as motor control.

Related topics:

▸ Motor control (MCTRL) (🕮 52)
▸ Selecting the control mode (🕮 61)
▸ V/f characteristic control (VFCplus) (🕮 66)
▸ Sensorless vector control (SLVC) (🕮 93)

3.3.5 Parameterising the application

On the right of the **Application parameters** tab, the parameters of the application are arranged:



1. Select the required control mode in the **1** **Control mode** (C00007) list field.
   - The corresponding wiring diagram is displayed in a pop-up window if you click the ? button right to the list field.
   - For a detailed description, see chapter entitled "Terminal assignment of the control modes". (🕮 167)
2. Optional: Use process controller.
   - For this purpose select the required operating mode in the **2** **L_PCTRL_1: Operating mode** (C00242) list field.
   - For a detailed description see the function block L_PCTRL_1. (🕮 325)
   - The parameterisation dialog of the process controller can be accessed via the **Process controller** button.
3. Optional: Use motor potentiometer.
   - For this purpose, select "1: On" in the **3** **L_MPot_1: Use** (C00806) list field.
   - For a detailed description see the function block L_MPot_1. (🕮 314)
   - The parameterisation dialog of the process controller can be accessed via the **Motor potentiometer** button.

4. Adapt parameters of the application:

	Parameter	Lenze setting Value	Unit	Info
4	**Accel. time - main setpoint** (C00012)	2.0	s	The setpoint is led via a ramp function generator with linear characteristic. The ramp function generator converts setpoint step-changes at the input into a ramp. ▸ L_NSet_1 (📖 318)
5	**Decel. time - main setpoint** (C00013)	2.0	s	
6	**Reference speed** (C00011)	1500	rpm	All speed setpoint selections are provided in % and always refer to the reference speed set in C00011. The motor reference speed is given on the motor nameplate.
7	**Deceleration time - quick stop** (C00105)	5.0	s	When "quick stop" is requested, the motor control is decoupled from the setpoint selection and, within the deceleration time parameterised in C00105, the motor is brought to a standstill (n_{act} = 0). ▸ Activate/Deactivate quick stop (📖 39)
8	**Fixed setpoint 1** (C00039/1)	40.0	%	A fixed setpoint for the setpoint generator can be activated instead of the main setpoint via the selection inputs *bJogSpeed1* and *bJogSpeed2*. • The fixed setpoints are selected in [%] based on the reference speed (C00011). ▸ L_NSet_1 (📖 318)
9	**Fixed setpoint 2** (C00039/2)	60.0	%	
10	**Fixed setpoint 3** (C00039/3)	80.0	%	

Tip!

- Via the **Signal flow** button, you get one dialog level lower to the signal flow of the application with further parameterisation opportunities. See chapter entitled "Parameterisation dialog". (📖 148)
- The preconfigured I/O connection in the selected control mode can be changed via configuration parameters. See chapter entitled "User-defined terminal assignment". (📖 139)

More detailed informaton on the technology application:

▸ Drive application (📖 147)
▸ Interface description (📖 154)
▸ wDriveControl control word (📖 160)
▸ Setting parameters (short overview) (📖 162)

3.3.6 Saving parameter settings safe against mains failure

In order that parameter settings made in the device do not get lost by means of mains switching, you must save the parameter set explicitly safe against mains failure in the device.

▶ Saving parameter set

3.3.7 Enabling controller and selecting speed

Stop!

Before stipulating a speed setpoint, check whether the brake in the form of a holding brake on the motor shaft has been released!

Note!

If the controller is enabled when the mains is switched on and if the auto-start option **Inhibit at power-on** is activated in C00142 (Lenze setting), the controller remains in the "ReadyToSwitchON" status.

In order to change to the "SwitchedON" status, the controller enable must first be cancelled: Set terminal RFR to LOW level.

If the controller is in the "SwitchedON" status:

1. Enable controller: Set terminal RFR to HIGH level.
2. Select speed:
   – In the "Terminals 0" by selecting a voltage at the analog input or by selecting a fixed setpoint via the digital inputs DI1/DI2.

DI1	DI2	Speed selection
LOW	**LOW**	The main speed setpoint is selected via the analog input 1 • Scaling: 10 V ≡ 100 % reference speed (C00011)
HIGH	LOW	The fixed setpoint 1 (C00039/1) is used as main speed setpoint. • Lenze setting: 40 % of the reference speed (C00011)
LOW	HIGH	The fixed setpoint 2 (C00039/2) is used as main speed setpoint. • Lenze setting: 60 % of the reference speed (C00011)
HIGH	HIGH	The fixed setpoint 3 (C00039/3) is used as main speed setpoint. • Lenze setting: 80 % of the reference speed (C00011)

Note!

Observe the actual speed value (display in C00051) and the LED status display at the controller.

Diagnostics options

When the »Engineer« is used, trouble during commissioning can be detected and eliminated conveniently. Proceed as follows:

- Check whether error messages appear in the »Engineer«.
  - You can find a description of each possible message in the chapter entitled "Diagnostics & error management". (193)
- Check the input terminals for their corresponding setpoints.
  - The **Terminal assignment** tab displays the current input/output signals.
- Check the signal flow of the application.
  - To do this, open the **Application Parameters** tab and click on the **Signal flow** button. The signal flow which is then shown enables a view of the setpoints being applied and their processing.

4 Device control (DCTRL)

This chapter provides information on internal device control as well as the device commands which can be executed via the subcodes of C00002.

- The device control causes the controller to take defined device states.
- The device control provides a multitude of status information in many ways:
  - Optically via the LED status display on the top side of the device. (📖 21)
  - As text messages in the Logbook. (📖 197)
  - As process signals via the outputs of the LS_DriveInterface system block. (📖 351)
  - Via diagnostic / display parameters which are included in the »Engineer« parameter list as well as in the **Diagnostics** category in the keypad.

Note!

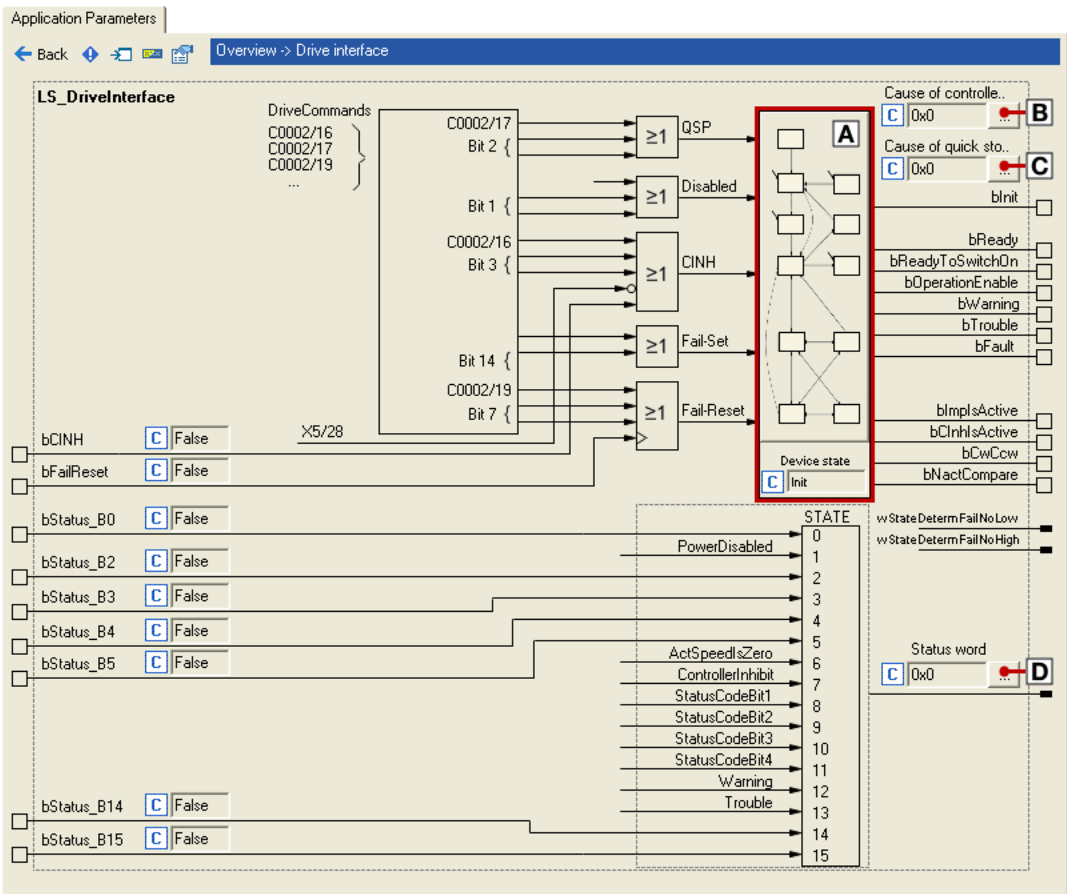
The device states of the controller are based on the operating states of the CiA402 standard. ▸ Device state machine and device states (📖 41)

How to get to the parameterisation dialog of the device control:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Go to the *Overview* dialog level and click the **Drive interface** button.

Parameterisation dialog in the »Engineer«

The parameterisation dialog shows the input / output signals and the internal signal flow of the LS_DriveInterface system block which displays the device control in the application:



Range / Meaning		Display parameter
A	Display of the internal state machine and the current device state	C00137
B	Display of all active sources of a controller inhibit	C00158
C	Display of all active sources of a quick stop	C00159
D	Display of the status word of the device control	C00150

4.1 Device commands (C00002/x)

The following subchapters describe the controller commands which are provided in the subcodes of C00002 and can be carried out using the keypad or, alternatively, the »Engineer« when an online connection has been established.

The controller commands serve to directly control the controller, to organise parameter sets, and to call diagnostic services.

Regarding the execution of the controller commands, a distinction is drawn between:

- Controller commands which have an immediate effect on control (e.g. "Activate quick stop")
  - After being called in C00002/x, these controller commands provide static status information ("On" or "Off").
- Controller commands with longer execution durations (several seconds)
  - After being called in C00002/x, these device commands provide the status information "Work in progress".
  - The execution of the controller command has not finished successfully until the "Off / ready" status information is provided in C00002/x.
  - In the event of an error, the "Action cancelled" status information is provided in C00002/x. In this case, further details can be obtained from the status of the controller command executed last which is displayed in C00003.

Note!

- Before activating device commands through a master control, wait for the "ready" signal of the controller.
- The device will reject a write process to C00002/x if the value is >1 and issue an error message.
- C00003 displays the status of the controller command executed last.

Detailed information on the various controller commands can be found in the following subchapters.

- Before you follow the instructions given therein, ensure that you have selected the controller in the *Project view*.

Controller commands - short overview

C00002 Subcode:	Device command	Controller inhibit required	Status information
1	Load Lenze setting	●	dynamic
2	Load parameter set 1	●	dynamic
7	Save parameter set 1 ▸ Save parameter settings		dynamic
11	Save all parameter sets ▸ Save parameter settings		dynamic
12	Importing EPM data		static
16	Enable/Inhibit controller		static
17	Activate/Deactivate quick stop		static
19	Reset error		static
21	Delete logbook		static
23	Identify motor parameter	●	dynamic
26	CAN reset node		static

* Subcodes which are not listed are reserved for future extensions.

Activate controller command

When an online connection has been established, you can simply use the »Engineer« to activate a controller command by selecting the corresponding option from the **Parameters** tab in C00002/x ("0: Off" or "1: On / start").

- Alternatively, the controller command can also be activated via e.g. keypad or through a master control by writing to C00002/x.
- Some of the frequently used controller commands (such as "Save parameter set") can also be executed via *toolbar* icons of the »Engineer« when an online connection has been established:

Symbol	Function
	Enable controller
	Inhibit controller
	Save parameter set (for 8400: Save all parameter sets)

Note!

Controller commands that can be executed via the *toolbar* of the »Engineers« always affect the element currently selected in the *Project view* including all subelements!

- If no controller, but e.g. a system module is selected in the *Project view*, the corresponding controller command will be activated in all lower-level controllers having an online connection with the »Engineer«.

Before the desired action is carried out, a confirmation prompt appears first, asking whether the action is really to be carried out.

4.1.1 Load Lenze setting

The C00002/1 = "1: On / start" device command resets the parameters to the Lenze setting which are saved in the controller Firmware.

- Can only be executed if the controller is inhibited; otherwise, the feedback C00002/1 = "6: No access - controller inhibit" will be returned.
- All parameter changes which have been carried out after the last time the parameter set was saved will be lost!
- This controller command has an effect on the settings of the parameters of the operating system, application and module.

How to load the Lenze setting:

1. If the controller is enabled, it must be inhibited, e.g. by executing the "Enable/Inhibit controller" device command (C00002/16 = "0: Off / ready").
2. Execute the "Load Lenze setting" device command:
   C00002/1 = "1: On / start"

   The load process may take a couple of seconds. After the device command has been called in C00002/1, a dynamic status information ("Work in progress" → "Off / Ready") is returned.

4.1.2 Load parameter set 1

The C00002/2 = "1: On / start" device command reloads all parameters from the memory module to the controller.

- The DIP switches are not used anymore to overwrite data.
- Can only be executed if the controller is inhibited; otherwise, the feedback C00002/2 = "6: No access - controller inhibit" will be returned.
- All parameter changes which have been carried out after the last time the parameter set was saved will be lost!
- This controller command has an effect on the settings of the parameters of the operating system, application and module.

Note!

- When the device is switched on, all parameters are automatically loaded from the memory module to the main memory of the controller.
  - When the DIP switches are active (DIP switches S1\1 = "ON"), the controller operates with the settings made via the DIP switches and displays them in the corresponding codes.
- The controller has a parameter set.
  - Up to 16 freely selectable parameters can be switched over via the basic Parameter change-over function. (📖 172)

How to load the parameter set 1 from the memory module:

1. If the controller is enabled, it must be inhibited, e.g. by executing the "Enable/ Inhibit controller" device command (C00002/16 = "0: Off / ready").
2. Execute the "Load parameter set 1" device command:
   C00002/2 = "1: On / start"

   The load process may take a couple of seconds. After the device command has been called in C00002/2, a dynamic status information ("Work in progress" → "Off / Ready") is returned.

4.1.3 Save parameter settings

If parameter settings are changed in the controller, those changes will be lost after mains switching of the controller unless the settings have been saved explicitly.

You have several options to avoid data loss by saving the parameter sets in the memory module:

- ▶ Automatic saving of parameter changes
- ▶ Manual saving of parameter settings

Note!

How to prevent a data loss:

- Do not switch off the supply voltage during the saving process.
- Only unplug the memory module if the device is switched off.

Automatic saving of parameter changes

Stop!

Activating this function is not permissible if parameters are changed very frequently (e.g. in case of cyclic writing of parameters via a bus system).

The maximum service life of the memory module amounts to one million writing cycles. Make sure that this value will not be reached.

When you select "1: active" in C00141/1, automatic saving is activated and every parameter change is saved automatically in the memory module. Thus, manual saving of parameter sets is not required anymore.

Manual saving of parameter settings

- ▶ The C00002/7 = "1: On / start" device command saves the current parameter settings safe against mains failure to the memory module of the controller.
- ▶ The C00002/11 = "1: On / start" device command saves the current parameter settings of all parameter sets safe against mains failure to the memory module of the controller.

4.1.4 Importing EPM data

The C00002/12 = "1: On / start" device command activates the automatic import of parameters from the memory module after the error message "PS04: Par.set incompatible".

- The C00002/12 = "0: Off / ready" device command deactivates this function again.

4.1.5 Enable/Inhibit controller

The C00002/16 = "1: On / start" device command enables the controller, provided that no other source of a controller inhibit is active.

The C00002/16 = "0:Off / finished" device command serves to inhibit the drive controller, i.e. the power output stages in the drive controller are inhibited and the speed/current controller of the motor control is reset.

- The motor becomes torqueless and coasts down.
- When the controller is inhibited, the status output *bCInhActive* of the LS_DriveInterface system block is set to TRUE.
- When the controller inhibit request is reset, the drive synchronises to the actual speed. For this purpose,
  - If the flying restart circuit is activated in C00990, the flying restart function parameterised in C00991 is used for the synchronisation to the rotary or standing drive. Flying restart function (100)
  - In the case of an operation with feedback, the actual speed is read out by the encoder system.

Tip!

- The controller can also be enabled or inhibited via the and *toolbar* icons.
- C00158 provides a bit coded representation of all active sources/triggers of a controller inhibit.

4.1.6 Activate/Deactivate quick stop

The C00002/17 = "1: On / start" device command activates the quick stop function, i.e. the motor control is separated from the setpoint selection, and within the deceleration time parameterised in C00105 the motor is brought to a standstill (n_{ist} = 0).

Parameter	Info	Lenze setting	
		Value	Unit
C00105	Deceleration time - quick stop	2.000	s

- The motor is kept at a standstill during closed-loop operation.
- A pulse inhibit (CINH) is set if the auto-DCB function has been activated via C00019.

The C00002/17 = "0: Off / ready" device command deactivates the quick stop again, provided that no other source of a quick stop is active.

Tip!

C00159 displays a bit code of active sources/causes for the quick stop.

4.1.7 Reset error

The C00002/19 = "1: On / start" device command acknowledges an existing error message if the error cause has been eliminated and thus the error is not pending anymore.

- After resetting the current error, further errors may be pending which must be reset as well.
- The status-determining error is displayed in C00168.
- The current error is displayed in C00170.

Tip!

An error message can also be acknowledged by activating the **Reset error** button in the **Diagnostics** tab.

In the Lenze setting, switching RFR causes also causes an error acknowledgement (see configuration parameter C00701/2).

Detailed information on error messages can be found in the chapter entitled "Diagnostics & error management". (📖 193)

4.1.8 Delete logbook

The C00002/21 = "1: On / start" device command deletes all logbook entries.

Tip!

Click the **Logbook** button in the **Diagnostics** tab to display the logbook in the »Engineer«.

In the *Logbook* dialog box, it is also possible to delete all logbook entries by clicking the **Delete** button.

Detailed information on the logbook can be found in the chapter entitled "Diagnostics & error management". (📖 193)

4.1.9 Identify motor parameter

The C00002/23 = "1: On / start" device command performs automatic identification of the motor parameters.

- The device command is only executed when the drive controller is in the "SwitchedON" state.
- In order to identify the motor parameters, the controller must be enabled after this device command.
  - After that it changes to the "MotorIdent" device state.
  - After the execution of the identification, it changes back to the "SwitchedON" device state.

Tip!

Detailed information on automatic identification of motor parameters can be found in the "Automatic motor data identification" subchapter on motor control (MCTRL). (📖 59)

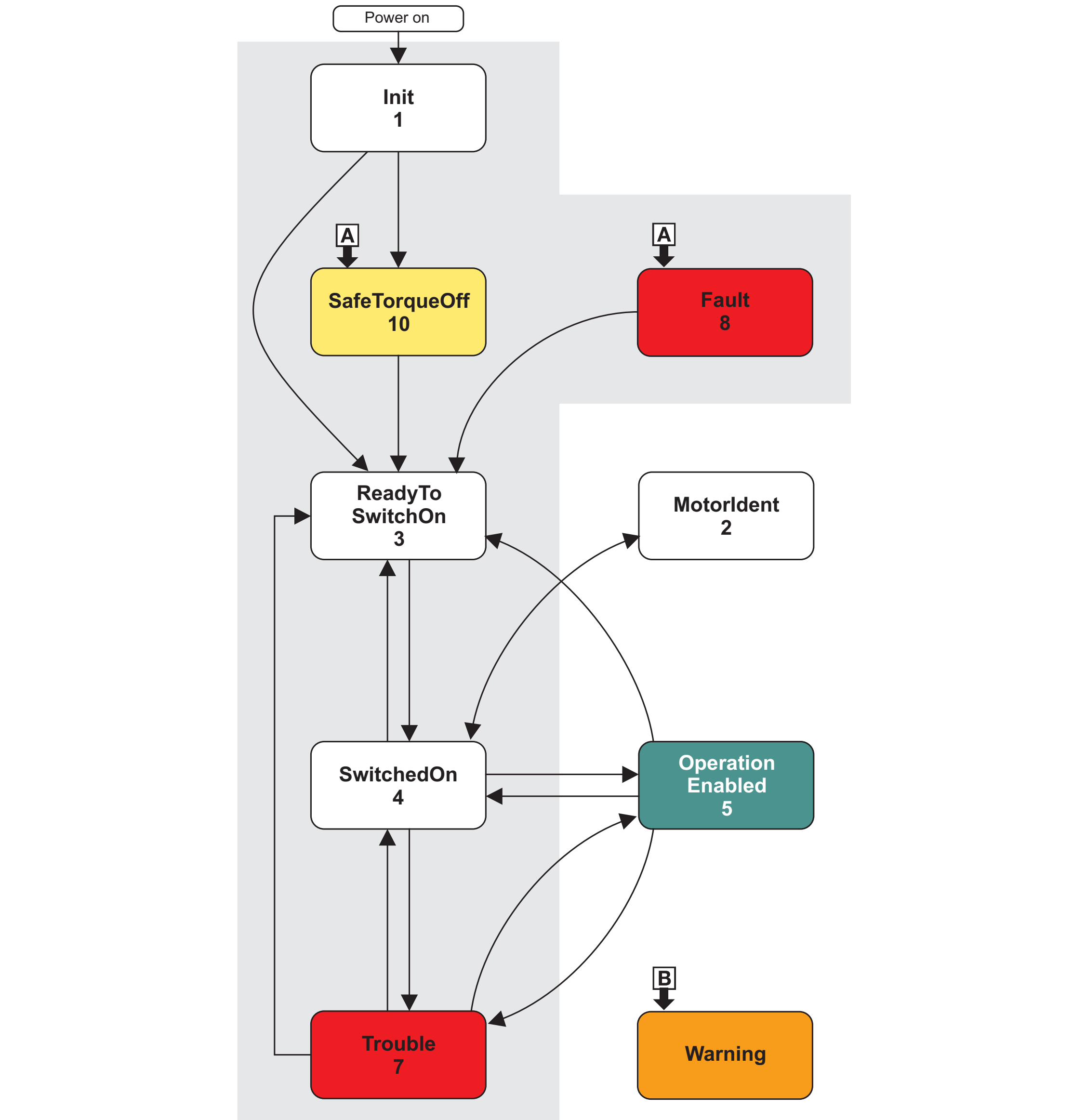
4.1.10 CAN reset node

The C00002/26 = "1: On / start" device command reinitialises the CAN interface of the "CAN" communication unit, which is required after e.g. changing the data transfer rate, the node address, or identifiers.

Detailed information on the "CAN" communication unit can be found in the corresponding online help and in the communication manual (KHB).

4.2 Device state machine and device states

The behaviour of the controller is mainly determined by the current device status within the device state machine. Which device status is active and which device status is next depends on certain control signals (e.g. for controller inhibit and quick stop) and status parameters.



Pulse inhibit (grey field)

A Can be reached from all states.

B "Warning" contradicts the definition of a device state. In fact, it is a message which is to call attention to the device state the warning exists for.
"Warning" can occur in parallel to other device states.

[4-1] Device state machine

- The arrows between the device states mark possible state changes.
- The digits stand for the state ID (see table below).

- The change from one state to another is done in a 1 ms cycle. If, at the same time, several state change requests exist, the state with the higher priority is processed first (see the following table).
- C00137 displays the current device state.
- C00150 (status word) provides a bit coded representation of the current device state via bits 8 ... 11 (see table below).

ID	Device state (Display in C00137)	Priority	Status bits (Display in C00150)				Meaning
			Bit 11	Bit 10	Bit 9	Bit 8	
0	- (reserved)	-	0	0	0	0	-
1	Init	-	0	0	0	1	Initialisation is active
2	MotorIdent	-	0	0	1	0	Motor parameter identification is active
3	ReadyToSwitchON	Prio 4	0	0	1	1	Device is ready to start
4	SwitchedON	Prio 3	0	1	0	0	Device is switched on
5	OperationEnabled	Prio 1	0	1	0	1	Operation
6	- (reserved)	-	0	1	1	0	-
7	Trouble	Prio 2	0	1	1	1	Trouble is active
8	Fault	Prio 6	1	0	0	0	Fault is active
9	- (reserved)	-	1	0	0	1	-
10	SafeTorqueOff	Prio 5	1	0	1	0	Safe torque off is active
11	- (reserved)	-	1	0	1	1	-
...	...	...	...				...
15	- (reserved)	-	1	1	1	1	-

[4-1] Device statuses, priorities, and meaning of the status bits in the status word

4.2.1 Init

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
Off	Off	Init	0	0	0	1

In the "Init" device status

- is the controller directly after the supply voltage is switched on.
- the operating system is initialised.
- all device components (power section, communication unit, etc) are identified.
- the parameters are read out of the memory module.
- the settings of the DIP switches are read in and parameters are overwritten.
- it is checked whether the DC-bus voltage is within the tolerance zone and the precharge relay is closed.
- the inverter is inhibited, i.e., there is no voltage output at the motor terminals.
- the communication via fieldbus or diagnostic interface does not work yet.
- the application is not yet processed.
- the monitoring mode is not yet active.
- the controller cannot be parameterised yet and no device commands can be carried out yet.

Note!

If the initialisation is completed, it changes automatically to the "ReadyToSwitchON" device state.

4.2.2 MotorIdent

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
(green, on)	Off	MotorIdent	0	0	1	0

In the "MotorIdent" device state

- is the controller when being in the "SwitchedON" state and having activated the "Identify motor parameter" device command and being enabled.
- the application remains active.
- all system interfaces (IO, bus systems, etc.) remain active.
- error monitoring remains active
- the inverter is controlled independently of the setpoint sources.

Stop!

During motor parameter identification, the controller does not respond to setpoint changes or control processes, (e.g. speed setpoints, quick stop, torque limitations).

After the motor parameter identification is completed, the state changes back to "SwitchedON".

Tip!

Detailed information on motor parameter identification can be found in the "Automatic motor data identification" subchapter on motor control. (📖 59)

4.2.3 SafeTorqueOff

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
(green, flashing)	Off	SafeTorqueOff	1	0	1	0

In the "SafeTorqueOff" device state

- the controller can only be if the used communication unit has the safety option and at least one of the two channels SIA/SIB of the safe input is set to LOW level.
- the next transaction to the "ReadyToSwitchON" state takes place.

Detailed and important information on the integrated safety system can be found in the hardware manual!

4.2.4 ReadyToSwitchON

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
	Off	ReadyToSwitchON	0	0	1	1

In the "ReadyToSwitchOn" device state

- is the controller after the initialisation has been completed successfully.
- is the controller even after cancelling "Trouble", "Fault" or "SafeTorqueOff".
- I/O signalare evaluated.
- the monitoring modes are active.
- the controller can be parameterised.
- the application is basically executable.
- prevents in the Lenze setting the auto-start option " Inhibit at power-on" activated in C00142 " from changing to the "SwitchedON" state.

Danger!

If the "Inhibit at power-on" auto-start option has been deactivated in C00142, the "ReadyToSwitchOn" state switches directly to the SwitchedON" state after mains connection.

▸ Auto-start option "Inhibit at power-on" (📖 50)

4.2.5 SwitchedON

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
	Off	SwitchedON	0	1	0	0

In the "SwitchedOn" device state

- is the controller if the user has inhibited the controller (and no error is pending).
- I/O signalare evaluated.
- the monitoring modes are active.
- the controller can be parameterised.
- the application is basically executable.
- it can be changed to the "OperationEnabled" state by deactivating the controller inhibit.

Tip!

C00158 provides a bit coded representation of all active sources/triggers of a controller inhibit.

Depending on certain conditions, a state change takes place based on the "SwitchedOn" device state:

Change condition	Changeover to the device state
Control bit "EnableOperation" in control word *wDriveControl* = "1" **AND** terminal RFR = HIGH level (controller enable)	OperationEnabled
Control bit "SwitchOn" = "0".	ReadyToSwitchON
Motor parameter identification requested.	MotorIdent
Undervoltage in the DC bus.	Trouble/Fault (depending onC00600/1)
Error with error response "Trouble" occurs.	Trouble

Related topics:

- wDriveControl control word (📖 160)

4.2.6 OperationEnabled

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
(green)	Off	OperationEnabled	0	1	0	1

In the "OperationEnabled" state

- is the controller if the controller inhibit is deactivated and no trouble ("Trouble") and fault ("Fault") are existent.
- the operation is enabled and the motor follows the setpoint defined by the active application (with sensorless vector control only after magnetisation has been completed).

Depending on certain conditions, a state change takes place based on the "OperationEnabled" device state.

Change condition	Changeover to the device state
Control bit "EnableOperation" in control word *wDriveControl* = "0" **OR** terminal RFR = LOW level (controller inhibit).	SwitchedON
Control bit "SwitchOn" = "0".	ReadyToSwitchON
Undervoltage in the DC bus.	Trouble/Fault (depending onC00600/1)
Error with error response "Trouble" occurs.	Trouble

Related topics:

- wDriveControl control word (📖 160)

4.2.7 Trouble

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
Off		Trouble	0	1	1	1

In the "Trouble" device state

- is the controller if monitoring has caused a "Trouble" error response.
- the motor has no torque (is coasting) due to the inhibit of the inverter.

Note!

The "Trouble" device state is automatically abandoned if the error cause has been removed.

If in C00142 the "Inhibit at trouble" auto-start option has been activated, an explicit deactivation of the controller inhibit is required for leaving the state.

Depending on certain conditions a state change takes place based on the "Trouble" device state.

Change condition	Changeover to the device state
The error cause is no longer active.	ReadyToSwitchON
Control bit "EnableOperation" in control word *wDriveControl* = "1" **AND** terminal RFR = HIGH level (controller enable) **AND** the message has been cancelled.	OperationEnabled
Control bit "EnableOperation" in control word *wDriveControl* = "0" **OR** terminal RFR = LOW level (controller inhibit) **AND** the message has been cancelled.	SwitchedON

Related topics:

- wDriveControl control word (📖 160)
- Basics on error handling in the controller (📖 193)
- Error messages of the operating system (📖 204)

4.2.8 Fault

LED DRIVE READY	LED DRIVE ERROR	Display in C00137	Display in status word 1 (C00150)			
			Bit 11	Bit 10	Bit 9	Bit 8
Off		Fault	1	0	0	0

In the "Fault" device state

- is the controller if monitoring has caused a "Fault" error response.
- the motor has no torque (is coasting) due to the inhibit of the inverter.

The error must explicitly be reset ("acknowledged") in order to exit the device state, e.g. by the device command "Reset error" or via the control bit "ResetFault" in the control word *wDriveControl*.

Note!

If an undervoltage in the DC bus of the drive controller occurs (error message "LU"), the device changes to the "Trouble" state.

An additional error of higher priority leads the device into the "Fault" state.

According to the Device state machine, the device changes to the "ReadyToSwitchON" state after acknowledging the error although the undervoltage is still available!

If in C00142 the "Inhibit at fault" auto-start option has been activated, an explicit deactivation of the controller inhibit is required for leaving the state.

Related topics:

- wDriveControl control word (🕮 160)
- Basics on error handling in the controller (🕮 193)
- Error messages of the operating system (🕮 204)

4.3 Auto-start option "Inhibit at power-on"

prevents in the Lenze setting the auto-start option "Inhibit at power-on" activated in C00142 " from changing to the "SwitchedON" state.

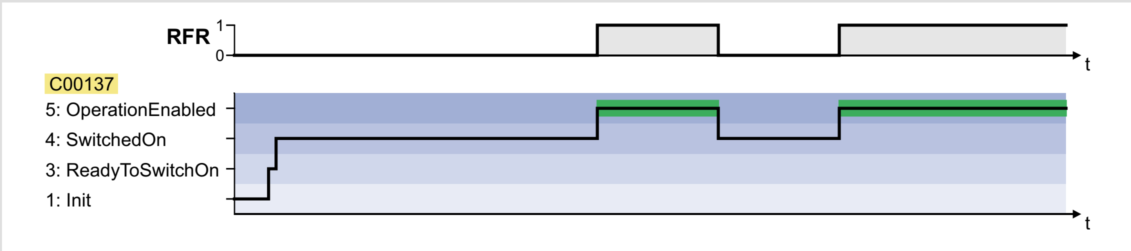
Danger!

When the auto-start option "Inhibit at power-on" is deactivated, the motor can directly start after power-on if the controller is enabled!

The following three cases describe the controller behaviour as a function of controller enable and set auto-start option. Here, we assume that no fault and trouble exist in the controller after power-on and the control bit "EnableOperation" in the control word *wDriveControl* is set to "1".

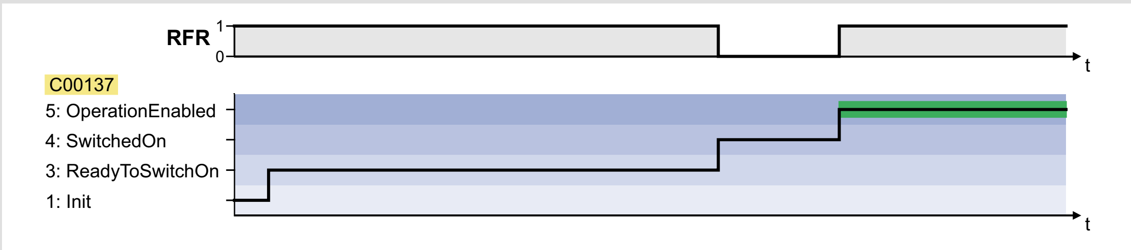
Case 1: No controller enable at power-on

If there is no controller enable at power-on, the controller remains in the "SwitchedON" state. Only with controller enable it is changed to the "OperationEnabled" state, independent of the setting of the auto-start option:



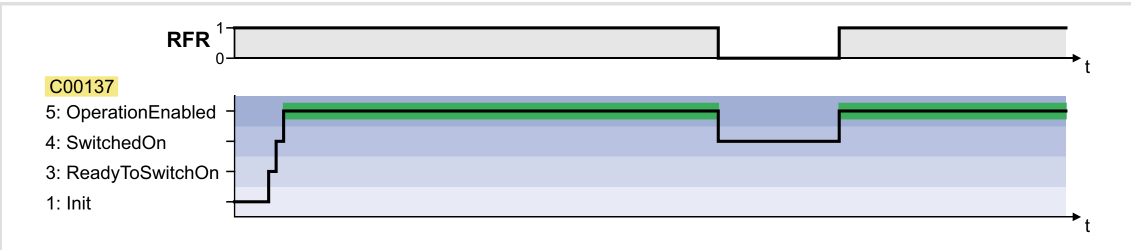
Case 2: Controller enable at power-on and "Inhibit at power-on" activated

If the controller is enabled at power-on and the auto-start option "Inhibit at power-on" is active, the controller remains in the "ReadyToSwitchON" state. In order to change to the "SwitchedON" state, the controller enable must first be deactivated. When the controller enable is then activated, it is changed to the "OperationEnabled" state:



Case 3: Controller enable at power-on and "Inhibit at power-on" deactivated

If in C00142 the auto-start option "inhibit at power-on" is deactivated (bit 0 = 0) and the controller is enabled, the "ReadyToSwitchON" state switches directly to the "SwitchedON" state and afterwards to the "OperationEnabled" state after power-on:



5 Motor control (MCTRL)

This chapter provides information on the parameter setting of the controller's internal motor control.

Topics:

5.1 Special features of the 8400 motec

In contrast to other Lenze inverters, the 8400 motec controller has a reduced DC-bus capacity. This causes some special features which the user must consider.

The closed design of the 8400 motec controller and the heat input of the motor increase the internal temperature. However, the use of film capacitors in the DC bus ensures a high service life.

The used capacitors have a lower capacity. This causes the following:

- Less energy can be stored in the DC bus.
- The DC-bus voltage increases faster during braking operation.
- The DC-bus voltage has a higher voltage ripple.
- The medium DC-bus voltage is slightly reduced.
- The controller cannot be connected to the 1-phase mains.

The voltage ripple in the DC bus must not be transmitted to the motor. Otherwise a varying torque would be caused. The compensation of the voltage ripple causes the maximum motor voltage to only reach 88 % of the mains voltage (see also display of the motor voltage in C00052).

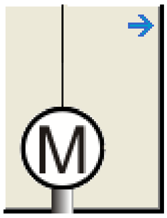
The reduced energy absorption of the DC bus may cause special measures to be taken for braking loads. This can concern e.g. the use of an external brake resistor or the choice of a larger deceleration time.

5.2 Motor selection/Motor data

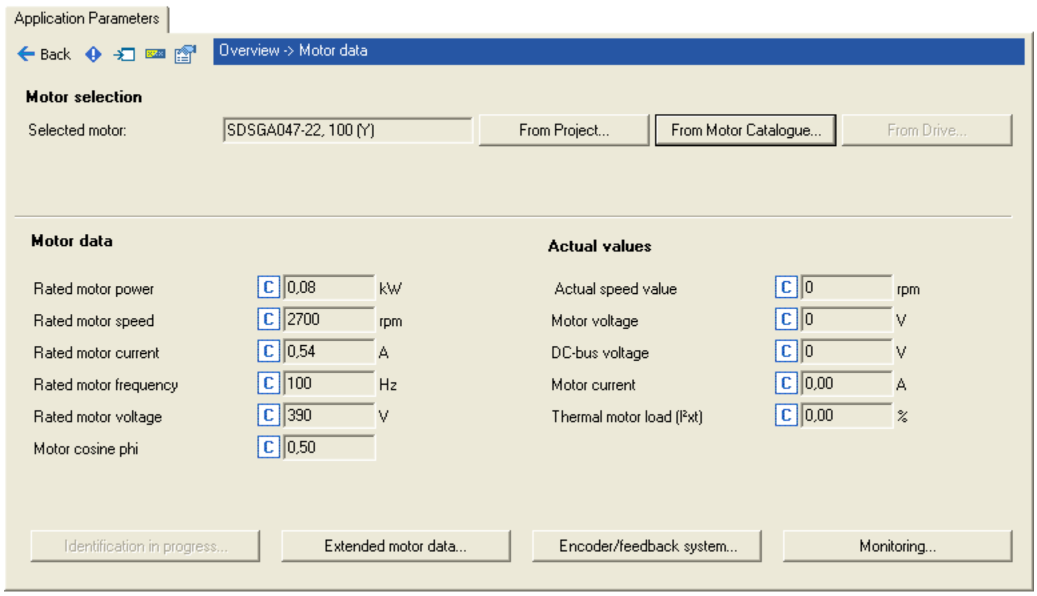
The motor data term comprises all parameters that only depend on the motor and that only characterise the electrical behaviour of the machine. The motor data are independent of the application in which the controller and the motor are used.

Proceed as follows to open the dialog for parameterising the motor data:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Go to the *Overview* dialog level and click the following button:



Parameterisation dialog in the »Engineer«



- Via the **From motor catalogue** ... button, the motor catalogue can be opened to select another motor. ▸ Selecting a motor from the motor catalogue in the »Engineer« (📖 57)
- Via the **From drive**... button, the motor data set in the controller can be copied to the »Engineer« when an online connection has been established.
- When an online connection has been established to the controller, the **Identification in progress...** button serves to automatically identify different motor data. ▸ Automatic motor data identification (📖 59)
- The **Encoder/feedback system...** serves to get to the settings for the encoder/feedback system, if available. ▸ Encoder/feedback system (📖 107)

Note!

Sensorless vector control in particular requires the motor data parameters to be set. The motor data comprise the data of the motor nameplate and the data of the motor equivalent circuit.

If the motor has been selected via the motor catalogue of the »Engineer« or the motor data have been adapted offline using the »Engineer«, all motor data must then be copied to the controller and saved power-failure-proof to the memory module (device command: C00002/11) when an online connection has been established.

Motor data

In the parameterisation dialog, the data of the motor nameplate for the selected motor are displayed under "Motor data".

Parameter	Info
C00081	Rated motor power
C00087	Rated motor speed
C00088	Rated motor current
C00089	Rated motor frequency
C00090	Rated motor voltage
C00091	Motor cos φ

Actual values

When an online connection to the controller has been established, the following actual values are displayed in the parameterisation dialog under "Actual values":

Parameter	Info
C00051	Actual speed value
C00052	Motor voltage
C00053	DC-bus voltage
C00054	Motor current
C00066	Thermal motor load (I2xt)

Highlighted in grey = display parameter

Adapting motor data manually

If a third party manufacturer's motor is used, the displayed motor data can exactly be adapted to the real motor by clicking the **From project**... button and selecting the "Own motor settings" entry from the **Motor selection** dialog box afterwards. For this purpose, the data of the motor nameplate and the equivalent circuit diagram must be available.

Tip!

For a better concentricity factor, we recommend to perform motor parameter identification of the third party manufacturer's motor first. The motor parameters can be manually adapted afterwards.

Improving the concentricity factor includes

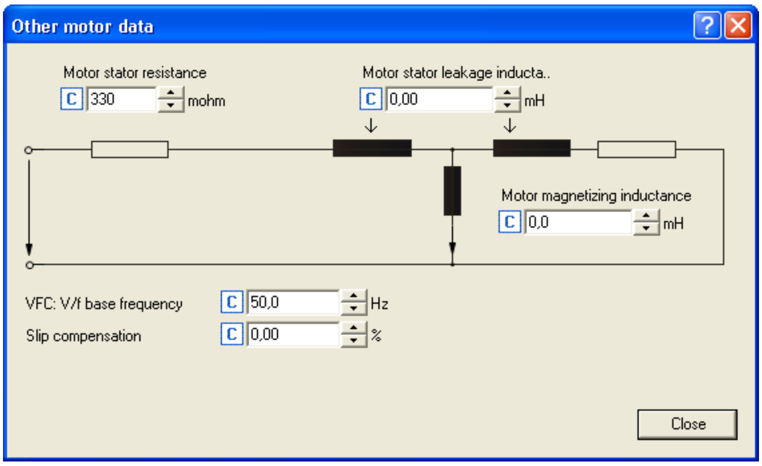
- the adjustment of the inverter error characteristic to the drive system and
- the knowledge of the motor cable resistance.

Both factors are determined in the course of motor parameter identification.

▸ Automatic motor data identification (📖 59)

Other motor data

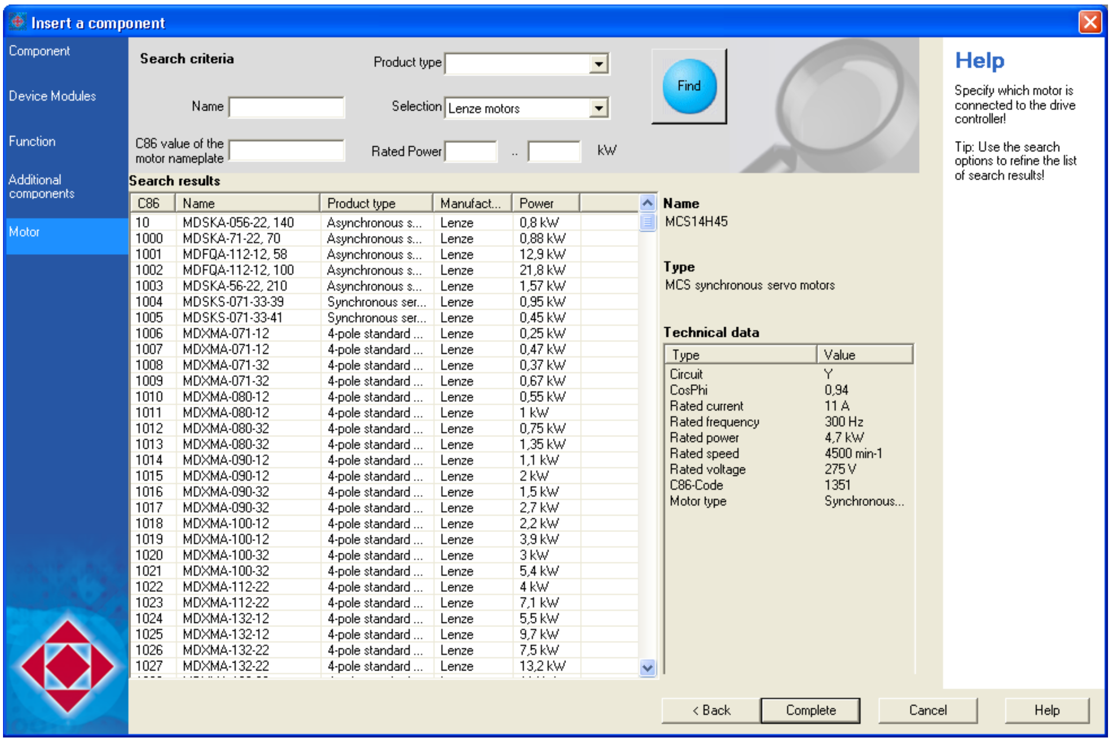
Click the **Other motor data...** button and go to the *Other motor data* dialog box including the motor equivalent circuit:



Parameter	Info
C00084	Motor stator resistance
C00085	Motor stator leakage inductance
C00092	Motor magnetising inductance
C00015	VFCplus: V/f base frequency
C00021	Slip compensation

5.2.1 Selecting a motor from the motor catalogue in the »Engineer«

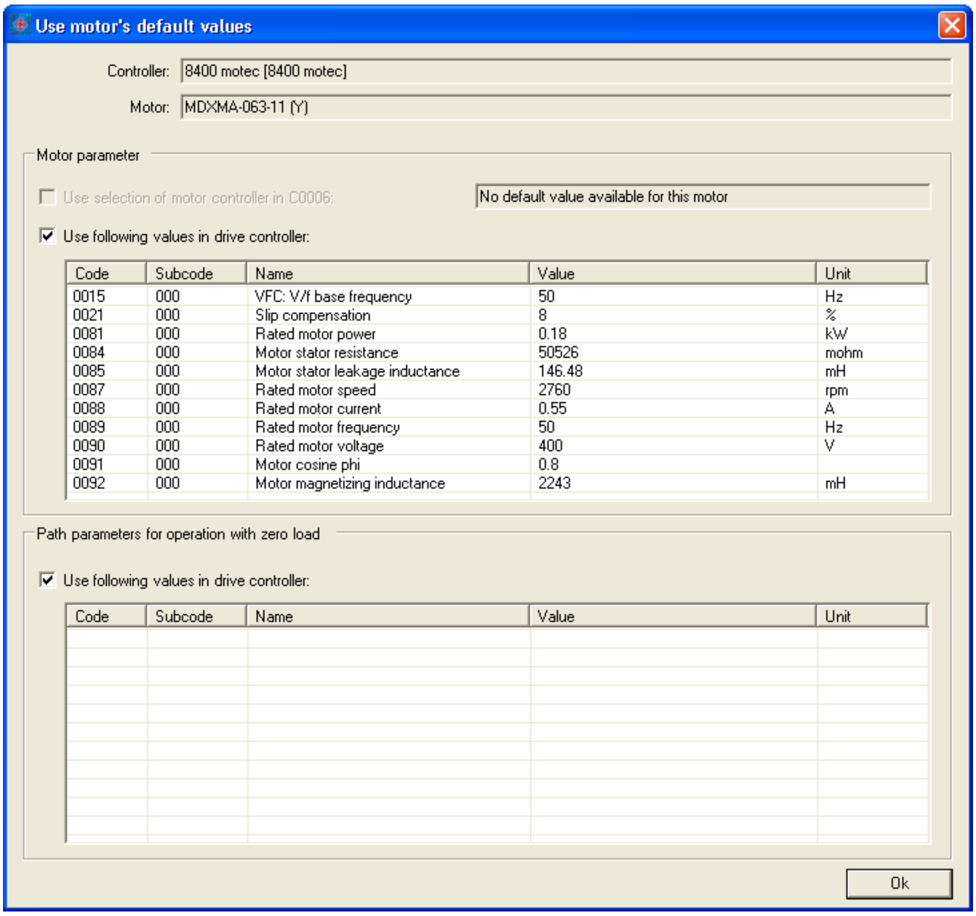
If a checkmark is set in the **Motor** control field in the "Other components" dialog when the controller is inserted into the project, the motor for the controller can be selected from the motor catalogue in another dialog:



- ▶ Alternatively, the motor can be inserted into the project at a later time via the **Insert a component** command.
- ▶ Go to the **Application parameters** tab in the *Overview* ➞ *Motor data* dialog level and click the **From motor catalogue...** button to also reach the motor catalogue for the selection of another motor.

Accepting the default values of the motor

If a motor is selected from the motor catalogue at a later time, the *Use motor's default values* dialog box is displayed afterwards which includes all motor data of the selected motor. Please select here which of the default values are to be copied to the controller:



Tip!

If a third party manufacturer's motor is used, select a Lenze motor from the motor catalogue first which is similar in terms of current, voltage and speed rating. Adapt the preselected motor data exactly to the real motor afterwards.

5.2.2 Automatic motor data identification

Via the "Identify motor parameters" device command (C00002/23), the inverter characteristic, the influences of the motor cable, and the motor parameters listed in the table below can be identified automatically:

Parameter	Info
C00015	V/f base frequency
C00016	V_{min} boost
C00021	Slip compensation
C00084	Motor stator resistance
C00085	Motor stator leakage inductance
C00092	Motor magnetising inductance
C00095	Motor magnetising current

Danger!

During motor parameter identification, the motor is energised via the outputs U, V and W of the controller!

Stop!

If motor parameter identification is aborted, unstable drive behaviour may be the result!

Note!

- We strongly recommend motor parameter identification before the initial commissioning of the sensorless vector control (SLVC).
- The motor parameter identification must be carried out when the motor is cold!
- The load machine may remain connected. Holding brakes, if present, may remain in the braking position.
- With an idling motor, a small angular offset may occur at the motor shaft.
- The amplitude of the rated motor current (C00088) is injected to identify the stator resistance. If the rated motor current amounts to less than 60 % of the rated inverter current, at least 60 % of the rated inverter current will be injected to ensure sufficient motor parameter identification accuracy.

How to carry out automatic motor parameter identification:

1. Inhibit the controller if it is enabled, e.g. via the C00002/16 device command or a LOW signal at the RFR terminal.
2. Wait until the drive is at standstill.
3. Transfer the nameplate data to the following codes:
   - C00081: Rated motor power
   - C00087: Rated motor speed
   - C00088: Rated motor current (according to the connection method Y/Δ)
   - C00089: Rated motor frequency (according to the connection method Y/Δ)
   - C00090: Rated motor voltage (according to the connection method Y/Δ)
   - C00091: Motor cos φ
4. Start motor parameter identification via the C00002/23 device command.
5. Enable the controller again.
   - Motor parameter identification starts.
   - The motor parameter identification takes approx. 30 s.
   - The identification is completed if the "0: Off / ready" message is displayed in C00002/23.
6. Inhibit controller again.

Note!

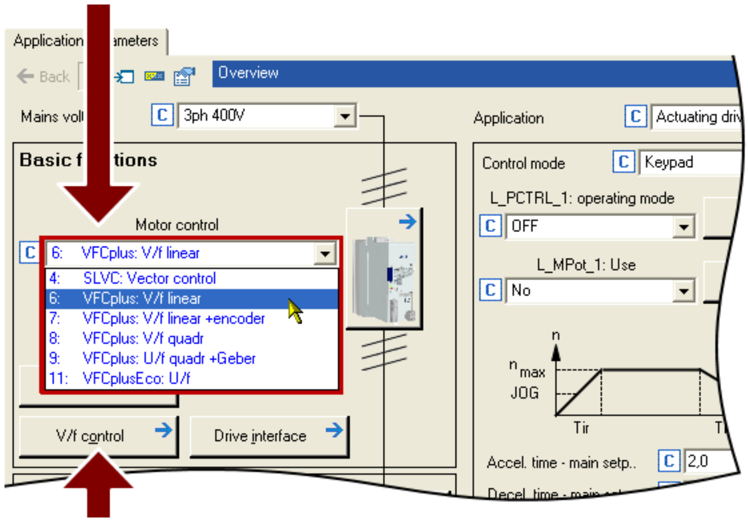
Motor parameter identification may be aborted by the controller if a special motor (e.g. mid-frequency motor) is used or if there is a large deviation between inverter and motor power.

Another cause for the abort of the motor parameter identification could be the implausibility of the entered nameplate data, e.g. the entry P = 0 kW for the motor power.

5.3 Selecting the control mode

The 8400 motec controller supports various modes for motor control (open loop or closed loop).

- V/f characteristic control (VFCplus) with linear characteristic is preset.
- The control mode can be selected in the »Engineer« on the **Application parameter** tab via the **Motor control** (C00006) list field:



- A click on the **Motor control...** button leads you to the parameterisation dialog of the selected motor control. (The button is labelled according to the selected motor control.)

Tip!

In order to make the selection of the motor control easier, we provide a selection help with recommendations and alternatives for standard applications in the subchapter entitled "Selection help". (📖 63)

The following section briefly describe the control modes. A reference to more details can be found at the end of each section.

V/f characteristic control (VFCplus)

The V/f characteristic control (VFCplus) is a motor control mode for standard frequency inverter applications based on a simple and robust control process which is suitable for the operation of machines with linear or square-law load torque characteristic (e.g. fans). Furthermore, this motor control mode is also suitable for special motors. Due to the low parameterisation effort, commissioning of such applications is fast and easy.

The V_{min}-boost (C00016) and slip compensation (C00021) required for optimising the drive behaviour are dimensioned for machines with power adaptations to the inverter in the Lenze setting.

▸ V/f characteristic control (VFCplus) (📖 66)

V/f characteristic control - energy-saving (VFCplusEco)

In contrast to the V/f characteristic control mode (VFCplus), this motor control mode uses a cosφ control in partial load operational range to automatically reduce the power loss in the machine (energy optimisation).

The motor data required for the cosφ control and the V_{min} boost (C00016) and slip compensation (C00021) required for optimising the drive behaviour are dimensioned for machines with power adaptations to the inverter in the Lenze setting.

The required motor data (motor rotor resistance, motor stator resistance, motor stator leakage inductance and mutual motor inductance) only affect the extent of energy optimisation but not the stability.

In case of applications with dynamically very high sudden load variations from the unloaded operation, this motor control mode should not be used since a motor stalling cannot be excluded.

Energy optimisation for dynamic applications is not possible with this motor control mode.

▸ V/f characteristic control - energy-saving (VFCplusEco) (📖 77)

V/f control (VFCplus + encoder)

From version 02.00.00

The V/f control can be selected for operating asynchronous motors with speed feedback. With this motor control, a slip regulator can be additionally parameterised which adjusts the actual speed value dynamically to the speed setpoint.

▸ V/f control (VFCplus + encoder) (📖 86)

Sensorless vector control (SLVC)

Sensorless (field-oriented) vector control is based on a decoupled, separate control for the torque-producing and the field-producing current component. In addition, the actual speed is reconstructed by means of a motor model so that a speed sensor is not required.

In comparison to the V/f characteristic control without feedback, the following can be achieved by means of sensorless vector control SLVC:

- A higher maximum torque throughout the entire speed range
- A higher speed accuracy
- A higher concentricity factor
- A higher level of efficiency
- The implementation of torque-actuated operation with speed limitation
- The limitation of the maximum torque in motor and generator mode for speed-actuated operation

Tip!

If a high torque without feedback is to be provided at small speeds, we recommend the "Sensorless vector control" motor control mode.

▸ Sensorless vector control (SLVC) (📖 93)

5.3.1 Selection help

To ease the selection the motor control, the following table contains recommendations and alternatives to standard applications.

Application	Motor control (C00006) blue = with speed feedback grey = alternative	
With constant load	6	VFCplus: V/f linear
	7	VFCplus: V/f linear + encoder
	4	SLVC: Vector control
	11	VFCplusEco: V/f energy-saving
With extremely alternating loads	6	VFCplus: V/f linear
	7	VFCplus: V/f linear + encoder
	4	SLVC: Vector control
With high starting duty	4	SLVC: Vector control
	7	VFCplus: V/f linear + encoder
	6	VFCplus: V/f linear
With speed control (speed feedback)	7	VFCplus: V/f linear + encoder
With high dynamic performance e.g. for positioning and infeed drives	7	VFCplus: V/f linear + encoder
Torque limitation	4	SLVC: Vector control
With torque limitation (power control)	6	VFCplus: V/f linear
	7	VFCplus: V/f linear + encoder
	4	SLVC: Vector control
Three-phase reluctance motor/sliding rotor motor/motor with permanently assigned frequency/voltage characteristic	6	VFCplus: V/f linear
Pump and fan drives with quadratic load characteristic	11	VFCplusEco: V/f energy-saving
	8	VFCplus: V/f quadr
	4	SLVC: Vector control
horizontal materials handling technology	11	VFCplusEco: V/f energy-saving
	9	VFCplus: V/f quadr + encoder
	8	VFCplus: V/f quadr
	4	SLVC: Vector control
Simple hoists	6	VFCplus: V/f linear
	7	VFCplus: V/f linear + encoder
Winder/unwinder with dancer position control	7	VFCplus: V/f linear + encoder

5.4 Defining current and speed limits

Limitation of the speed setpoint

Parameterising the reference speed in C00011 means that the drive must rotate at the set speed if a speed setpoint of 100% is specified.

All speed setpoint selections are provided in % and always refer to the reference speed set in C00011.

Tip!

For reasons of achievable resolution and the accuracy involved, the reference speed should be geared to the speed range required for the respective application.

Lenze recommendation: Reference speed (C00011) = 1500 ... 3000 rpm

Irrespective of the selected motor control, there are more limitation options:

Parameter	Info	Lenze setting	
		Value	Unit
C00909/1	Max. positive speed	120	%
C00909/2	Max. negative speed	120	%
C00910/1	Max. positive output frequency	300	Hz
C00910/2	Max. negative output frequency	300	Hz

Current limitation in motor and generator mode

In the various motor control modes, the controller is provided with functions which determine the dynamic behaviour under load and counteract exceedance of the maximum current in motor or generator mode.

Parameter	Info	Lenze setting	
		Value	Unit
C00022	Imax in motor mode	47.00	A
C00023	Imax in generator mode • 100 % ≡ Imax in motor mode (C00022)	100	%

The current limits must be selected depending on

- the permissible maximum current of the motor → recommendation: $I(Mot)_N$ < 1.5 ... 2.0
- the permissible maximum current of the inverter
- the torque in motor/generator mode required for the application

Note!

Highly dynamic applications
(High accelerations or short and big overloads)

The overcurrent disconnection may respond (fault message OC1) if the setting of the maximum current in motor mode in C00022 approximately corresponds to the maximum permissible value of the respective inverter.

Remedies:

- Increasing the acceleration and deceleration time (C00012 und C00013)
- Reduction of the maximum current in motor mode (C00022)
- Reduction of the maximum current in generator mode (C00023)
- Adaptation of the indirect peak current limitation (procedure depends on the selected motor control mode, see below)
- Reduction of the reset time of the current limiting controller (C00074)

Influencing the torque in motor/generator mode

The torque in motor and generator mode can be limited via the *nTorqueMotLimit_a* and *nTorqueGenLimit_a* process signal inputs.

- If V/f characteristic control (VFCplus) is selected, limitation is indirectly performed via a so-called I_{max} controller.
- If sensorless vector control (SLVC) is selected, the limitation has a direct effect on the torque-producing current component.

How to adapt the peak current limitation:

V/f characteristic control (VFCplus):

- Reduce the slip compensation with C00021.

Sensorless vector control (SLVC):

- Reduce the slip compensation with C00021.
- Reduce the limitation of the torque in motor mode via the *nTorqueMotLimit_a* process signal and the limitation of the torque in generator mode via the *nTorqueGenLimit_a* process signal.

5.5 V/f characteristic control (VFCplus)

In case of the V/f characteristic control (VFCplus), the motor voltage of the inverter is determined by means of a linear or quadratic characteristic depending on the field frequency or motor speed to be generated. The voltage follows a preselected characteristic.

Stop!

- The following must be observed when operating drives with quadratic V/f characteristic:
  - Please always check whether the corresponding drive is suitable for operation with a quadratic V/f characteristic!
  - If your pump drive or fan drive is not suitable for operation with a quadratic V/f characteristic, you must use either use the V/f characteristic control function with a linear V/f characteristic or the sensorless vector control (SLVC).
- For adjustment, observe the thermal performance of the connected asynchronous motor at low output frequencies.
  - Usually, standard asynchronous motors with insulation class B can be operated for a short time with their rated current in the frequency range 0 Hz ≤ f ≤ 25 Hz.
  - Contact the motor manufacturer to get the exact setting values for the max. permissible motor current of self-ventilated motors in the lower speed range.
  - If you select the quadratic V/f characteristic, we recommend to set a lower V_{min}.

Note!

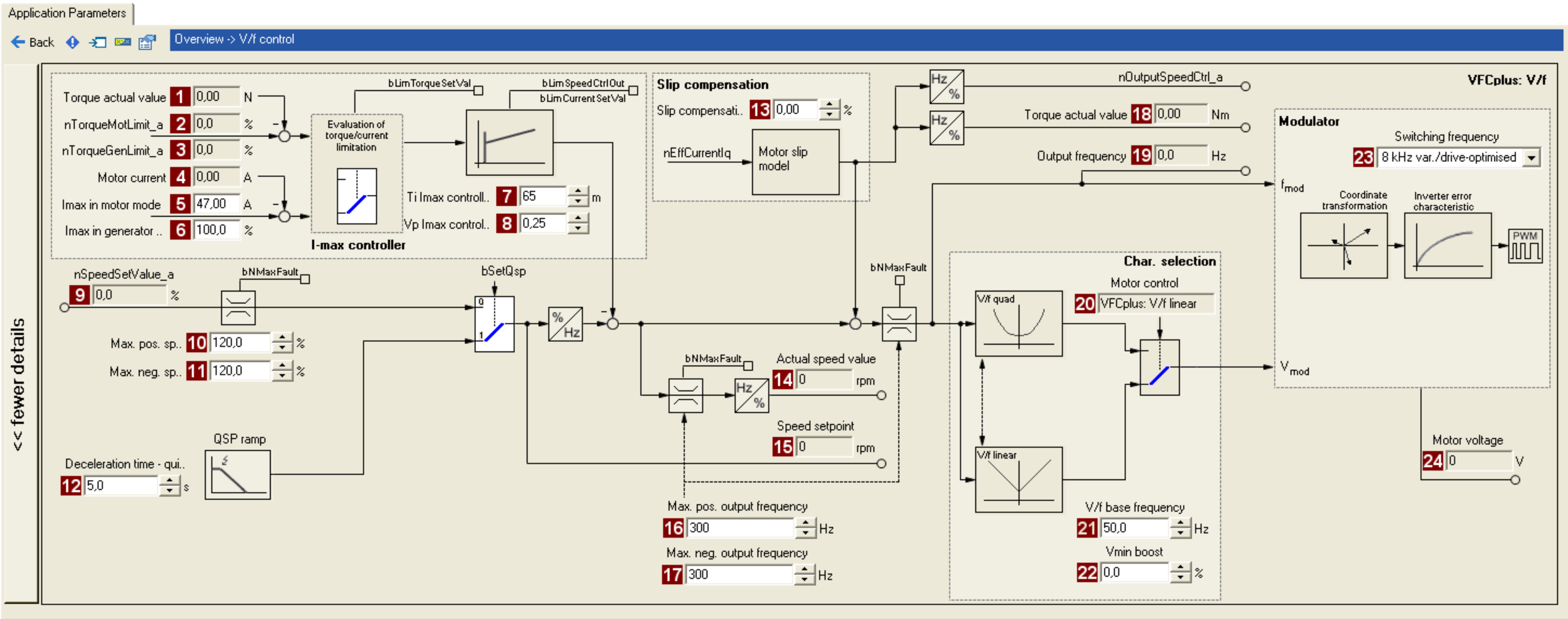
When the auto DCB threshold (C00019) is set > 0 rpm, there is no torque at the motor shaft in the lower speed range!

▶ Automatic DC-injection braking (Auto-DCB) (📖 103)

5.5.1 Parameterisation dialog/signal flow

Proceed as follows to open the dialog for parameterising the motor control:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Select the motor control from the *Overview* dialog level in the **Motor control** list field:
   - "6: VFCplus: V/f linear" for linear characteristic or
   - "8: VFCplus: V/f quadr" for square-law characteristic
4. Click the **Motor control V/f** button to change to the *Overview* → *Motor control V/f* dialog box.
   - This dialog level only shows a simplified signal flow with the most important parameters.
   - When you click the **>>More details** button in the left-most position, a signal flow with more details/parameters is displayed.



Parameter		Info
1	C00056/2	Actual torque
2	C00830/4	Limitation of torque in motor mode
3	C00830/5	Limitation of torque in generator mode
4	C00054	Motor current
5	C00022	Imax in motor mode
6	C00023	Imax in generator mode
7	C00074	Ti Imax controller
8	C00073	Vp Imax controller
9	C00830/3	Speed setpoint
10	C00909/1	Max. pos. speed
11	C00909/2	Max. neg. speed
12	C00105	Deceleration time - quick stop

Parameter		Info
13	C00021	Slip compensation
14	C00051	Actual speed value
15	C00050	Speed setpoint
16	C00910/1	Max. pos. output frequency
17	C00910/2	Max. neg. output frequency

Parameter		Info
18	C00056/2	Actual torque
19	C00058	Output frequency
20	C00006	Motor control
21	C00015	V/f base frequency
22	C00016	Vmin boost
23	C00018	Switching frequency
24	C00052	Motor voltage

5.5.2 Basic settings

The "Initial commissioning steps" listed in the table below are sufficient for a simple characteristic control.

- Detailed information on the individual steps can be found in the following subchapters.

Initial commissioning steps	
1.	Defining the V/f characteristic shape.
2.	Defining current limits (Imax controller). (📖 70)

Tip!

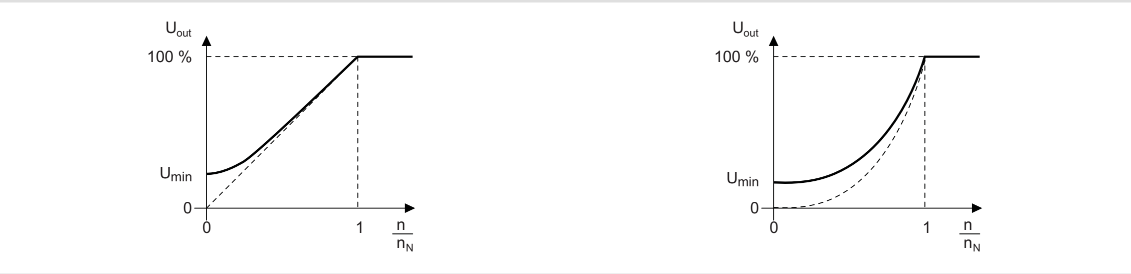
Information on the optimisation of the control mode and the adaptation to the real application is provided in the "Optimise control behaviour" chapter. (📖 71)

Parameterisable additional functions are described correspondingly in the "Parameterisable additional functions" chapter. (📖 98)

5.5.2.1 Defining the V/f characteristic shape

In principle, three different characteristic shapes can be stipulated:

1. **Linear V/f characteristic**:
   For drives for a constant, speed-independent load torque.
2. **Quadratic V/f characteristic**:
   For drives with a load torque curve which is quadratic or in relation to speed. Quadratic V/f characteristics are preferred in the case of centrifugal pumps and fan drives.



[5-1] Principle of a linear and quadratic V/f characteristic

The V/f characteristic shape is defined by selecting the corresponding motor control mode in C00006:

- C00006 = "6: VFCplus: V/f linear" for linear characteristic
- C00006 = "8: VFCplus: V/f quadr" for quadratic characteristic

5.5.2.2 Defining current limits (Imax controller)

The V/f characteristic control (VFCplus) and the V/f control (VFCplus + encoder) operating modes are provided with a current limitation control which is decisive for the dynamic behaviour under load and counteracts exceedance of the maximum current in motor or generator mode. This current limitation control is called I_{max} control.

- The efficiency (motor current) measured by the I_{max} control is compared with the current limit value for motor load set in C00022 and the current limit value for generator load set in C00023.
- If the current limit values are exceeded, the controller changes its dynamic behaviour.

Motor overload during acceleration

The controller prolongs the acceleration ramp to keep the current on or below the current limit.

Generator overload during deceleration

The controller prolongs the deceleration ramp to keep the current on or below the current limit.

Increasing load with constant speed

- If the motor current limit value is reached:
  - The controller reduces the effective speed setpoint until a stable working point is set or an effective speed setpoint of 0 rpm is reached.
  - If the load is reduced, the controller increases the effective speed setpoint until the setpoint speed is reached or the load reaches the current limit value again.
- When the generator current limit value is reached:
  - The controller increases the effective speed setpoint until a stable working point is set or the maximally permissible speed (C00909) or output frequency is reached (C000910).
  - If the load is reduced, the controller reduces the effective speed setpoint until the setpoint speed is reached or the load reaches the current limit value again.
- If a sudden load is built up at the motor shaft (e.g. drive is blocked), the overcurrent disconnection may respond (fault message OC1 or OC11).

5.5.3 Optimise control behaviour

The V/f characteristic control (VFCplus) is generally ready for operation. It can be adapted subsequently by adapting the characteristic and/or the drive behaviour.

Adapting characteristic

For the linear and quadratic characteristic, it is also possible to match its curve to different load profiles or motors by adapting the V/f base frequency (C00015) and the V_{min} boost (C00016).

- Adapting the V/f base frequency (📖 72)
- Adapting the Vmin boost (📖 73)

Adapting drive behaviour

- Limitation of the maximum current by a current limitation controller (e.g. to prevent the motor from stalling or to limit to the maximally permissible motor current).
  Optimising the Imax controller (📖 74)
- Adaptation of the field frequency by a load-dependent slip compensation (improved speed accuracy for systems without feedback)

5.5.3.1 Adapting the V/f base frequency

The V/f base frequency (C00015) determines the slope of the V/f characteristic and has considerable influence on the current, torque, and power performance of the motor.

- The setting in C00015 applies to all permitted mains voltages.
- Mains fluctuations or fluctuations of the DC-bus voltage (operation in generator mode) do not need to be considered when the V/f base frequency is set. They are automatically compensated for by the internal mains voltage compensation of the device.
- Depending on the setting in C00015, it may be required to adapt the reference speed (C00011) to traverse the entire speed range of the motor.
- As a typical value, the V/f base frequency (C00015) is set to the value of the rated motor frequency (C00089) for standard applications and corresponds to the data on the motor nameplate.
- Reference voltage for the V/f base frequency is the rated motor voltage (C00090) according to the motor nameplate.

Note!

87-Hz operation

4-pole asynchronous motors which are designed for a rated frequency of f = 50 Hz in star connection can be operated in delta connection when being constantly excited up to f = 87 Hz.

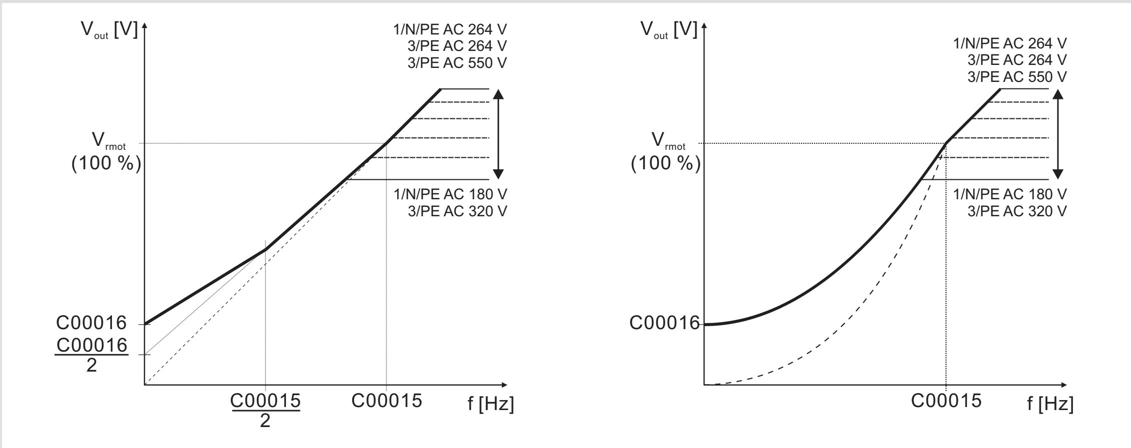
- Advantages:
  - Higher speed-setting range
  - 73% higher power output in case of standard motors
- Motor current and motor power increase by the factor $\sqrt{3}$.
- The field weakening range starts above 87 Hz.
- Generally, this process can also be used with motors which have different numbers of pole pairs. In case of 2-pole asynchronous motors, the mechanical limit speed must be maintained.

5.5.3.2 Adapting the Vmin boost

The V_{min} boost (C00016) of the motor voltage

- serves to select a load independent magnetising current which is required for asynchronous motors.
- has an effect on output frequencies below the V/f base frequency (C00015).
- optimises the torque behaviour of the motor.

The general linear and quadratic V/f characteristics are shown in the illustrations below. The illustrations show the impacts of the parameters used to adapt the characteristic shape.



[5-2] Representation of the linear V/f characteristic (on the left) and quadratic V/f characteristic (on the right)

To set the V_{min} boost, proceed as follows:

1. Operate motor in idle state at approx. 6 % of the rated motor speed.
2. Increase V_{min} boost (C00016) until the following motor current is reached:

   Motor in short-time operation up to 0.5 n_N
   - for self-ventilated motors: $I_{Motor} \approx I_{N\ Motor}$
   - for forced ventilated motors: $I_{Motor} \approx I_{N\ Motor}$

   Motor in continuous operation up to 0.5 n_N
   - for self-ventilated motors: $I_{Motor} \approx 0.8\ I_{N\ Motor}$
   - for forced ventilated motors: $I_{Motor} \approx I_{N\ Motor}$

Note!

V_{min} boost is automatically calculated by the motor parameter identification using the data specified on the motor nameplate so that a no-load current of approx. 0.8 $I_{rated\ motor}$ results at the slip frequency of the machine.

V/f control (VFCplus + encoder)

If V/f control (VFCplus + encoder) is selected, we recommend a decidedly lower V_{min} boost:

- In this case, select a V_{min} boost which ensures that approx. 50 % of the rated motor current flows at slip frequency when the motor is idling.

5.5.3.3 Optimising the Imax controller

Using the Lenze setting of the current limitation controller, the drive is stable:

Parameter	Info	Lenze setting	
		Value	Unit
C00073	VFC: Vp Imax controller	0.25	
C00074	VFC: Ti Imax controller	65	ms

Most applications do not require optimisation.

The setting of the current limitation controller must be adapted if

- power control including great moments of inertia is performed.
  - Recommendation: Increase of the reset time Ti (C00074) of the I_{max} controller.
- vibrations occur in the V/f control (VFCplus + encoder) mode during the intervention of the current limitation controller.
  - Recommendation: Increase of the reset time Ti (C00074) of the I_{max} controller.
- overcurrent errors occur due to load impulses or too high acceleration ramps.
  - Recommendation: Reduction of the gain Vp (C00073) and reset time Ti (C00074) of the I_{max} controller

5.5.3.4 Torque limitation

The previous chapter, "Optimising the Imax controller", describes how the drive can be protected from overload. During commissioning, these settings are carried out once and remain unchanged afterwards. However, it is often necessary to limit the torque to a lower value for plant or process reasons.

▶ To avoid overload in the drive train, the torque in motor mode can be limited via the *nTorqueMotLimit_a* process input signal, and the torque in generator mode can be limited via the *nTorqueGenLimit_a* process input signal:

Identifier DIS code | data type	**Information/possible settings**
nTorqueMotLimit_a C00830/4 | INT	Torque limitation in motor mode • Scaling: 16384 ≡ 100 % M_{max} (C00057) • Setting range: 0 ... +199.99 %
nTorqueGenLimit_a C00830/5 | INT	Torque limitation in generator mode • Scaling: 16384 ≡ 100 % M_{max} (C00057) • Setting range: -199.99 ... 0 %

Note!

- The actual torque (C00056/2) is directly calculated from the current slip speed of the machine. This requires correct entry of the motor data. ▸ Motor selection/Motor data (📖 54)
- To avoid instabilities during operation with active slip compensation, the torque limit values are internally processed as absolute values.
- If slip compensation is deactivated (C00021 = 0), indirect torque limitation (differential signal between apparent motor current and *nTorqueMotLimit_a* or *nTorqueGenLimit_a*). Above the no-load current of the motor, the accuracy of the indirect torque limitation is limited.

V/f characteristic control (VFC)

The accuracy of the torque limitation is limited because the actual torque (C00056/2) is only calculated from the slip speed measured indirectly via the motor current.

V/f control (VFC + encoder)

The slip speed of the motor is available at the slip controller output. This leads to a high accuracy for the actual torque (C00056/2) and the torque limitation.

5.5.4 Remedies for undesired drive behaviour

Drive behaviour	Remedy
Inadequately smooth running at low speeds, especially in the case of operation with a long motor cable	▸ Automatic motor data identification (📖 59)
Problems in case of high starting duty (great mass inertia)	▸ Adapting the Vmin boost (📖 73)
Drive does not follow the speed setpoint.	The current controller intervenes in the set field frequency to limit the controller output current to the maximum current (C0022, C0023). Therefore: • Prolong acceleration/deceleration times: C00012: Acceleration time - main setpoint C00013: Deceleration time - main setpoint • Consider a sufficient magnetising time of the motor. Depending on the motor power, the magnetising time amounts to 0.1 ... 0.2 s. • Increase the maximally permissible current: C00022: Imax in motor mode C00023: Imax in generator mode)
For operation without speed feedback (C00006 = 6): Insufficient speed constancy at high load (setpoint and motor speed are not proportional anymore)	• Increase slip compensation (C00021). Important: Unstable drive due to overcompensation! • With cyclic load impulses (e. g. centrifugal pump), a smooth motor characteristic is achieved by smaller values in C00021 (possibly negative values). Note: The slip compensation is only active for operation without speed feedback.
"Clamp operation active" error message (OC11): Controller cannot follow dynamic processes, i.e. too short acceleration/deceleration times in terms of load ratios.	• Increase the gain of the I_{max} controller (C00073) • Reduce the reset time of the I_{max} controller (C00074) • Prolong the acceleration time (C00012) • Prolong the deceleration time (C00013)
Motor stalling in the field weakening range (adaptation especially required for small machines)	• If motor power < inverter power: Set C00022 to $I_{max} = 2\ I_{rated\ motor}$ • Reduce dynamic performance of setpoint generation

5.6 V/f characteristic control - energy-saving (VFCplusEco)

With the energy-saving V/f characteristic control mode (VFCplusEco), the motor voltage of the inverter is detected by means of a linear characteristic depending on the field frequency to be created or the motor speed. Moreover, a cosφ control and the resulting voltage reduction causes the motor to be always operated in the optimum efficiency range (reduction of copper losses in the asynchronous machine).

- Hence, these are the advantages of this motor control mode:
  - Good robustness
  - Easy parameter setting
  - High energy efficiency (lower heating of the motor in partial load operational range)
  - Same speed accuracy and maximum torques as with VFCplus
- Predestinated application areas of this motor control mode are materials handling technology and pump and fan systems.
- This motor control mode serves to improve efficiency of standard asynchronous machines with efficiency class IE1 (standard IEC 60034-30 2008) in the range 0 ... $M_{efficiency\_max}$ between 0 ... 20 % (Ø 5 ... 10 %).
  - Description of $M_{efficiency\_max}$: Indicates the torque [%] of M_{rated_motor}, where the motor has the max. efficiency.)
- In case of asynchronous machines with a higher energy efficiency class (IE2 and IE3), the absolute energy saving of the motor control mode is lower due to improved efficiency of the machine. However, energy saving is still achieved in a higher load range.
- $M_{efficiency\_max}$ is performance-related and listed in the following table for some power values of the energy efficiency class IE1 and IE2:

	$M_{Efficiency\_max}$ (related to M_{rated_motor})	
Power	**IE1**	**IE2**
0.25 kW	75 %	
0.75 kW	65 %	75 %
2.2 kW	55 %	85 %
7.5 kW	30 %	45 %
22 kW	23 %	
45 kW	21 %	

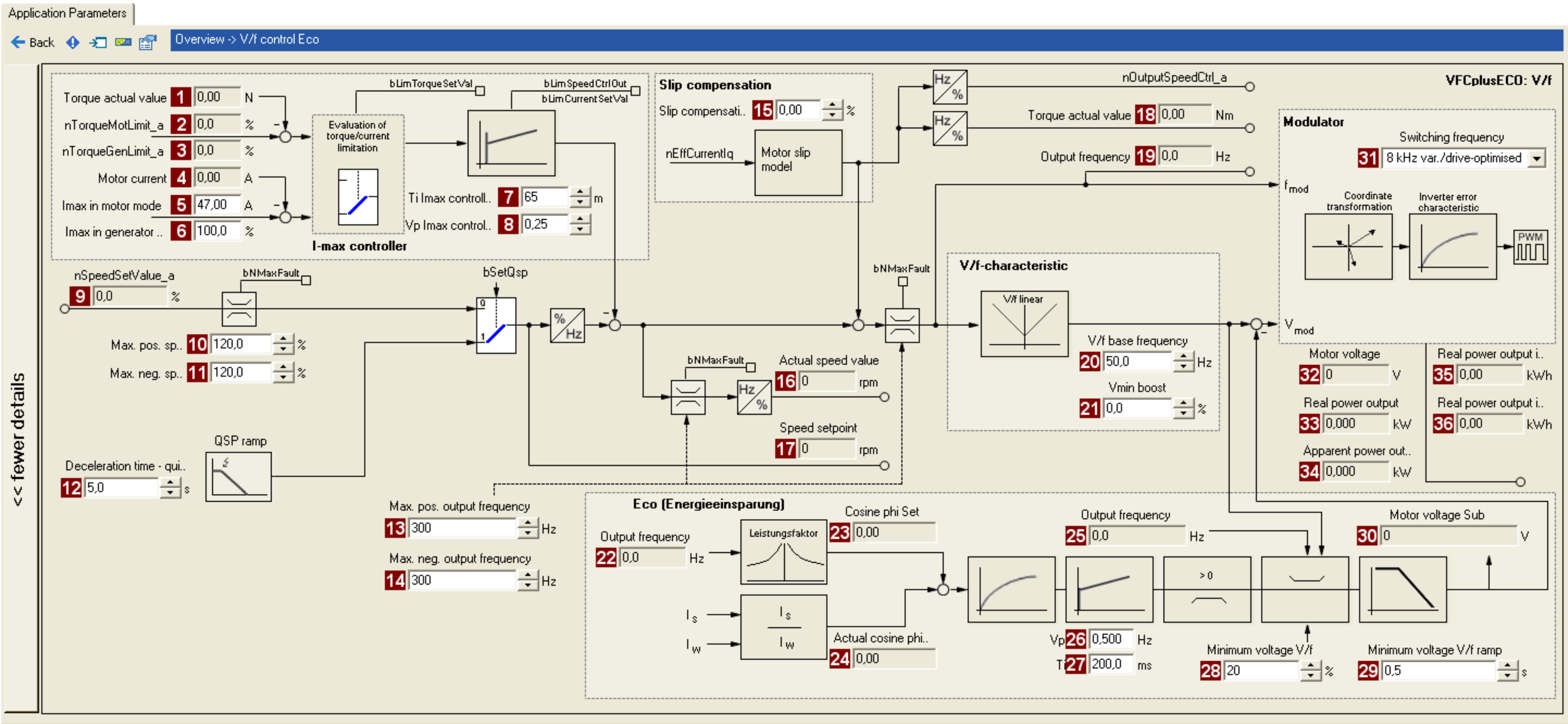
Stop!

- For adjustment, observe the thermal performance of the connected asynchronous motor at low output frequencies.
  – Usually, standard asynchronous motors with insulation class B can be operated for a short time with their rated current in the frequency range 0 Hz ... 25 Hz.
  – Contact the motor manufacturer to get the exact setting values for the max. permissible motor current of self-ventilated motors in the lower speed range.
- The nameplate data of the motor (at least rated speed and rated frequency) must be entered if, instead of a standard motor, an asynchronous motor is used with the following values:
  – rated frequency ≠ 50 Hz (star) or
  – rated frequency ≠ 87 Hz (delta) or
  – number of pole pairs ≠ 2

5.6.1 Parameterisation dialog/signal flow

Proceed as follows to open the dialog for parameterising the motor control:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Select the motor control"11: VFCplusEco: V/f energy-saving" from the *Overview* dialog box in the **Motor control** 11list field:
4. Click the **Motor control V/f Eco** button to change to the *Overview* → *Motor control V/f* dialog box.
   - This dialog level only shows a simplified signal flow with the most important parameters.
   - When you click the **>>More details** button in the left-most position, a signal flow with more details/parameters is displayed.

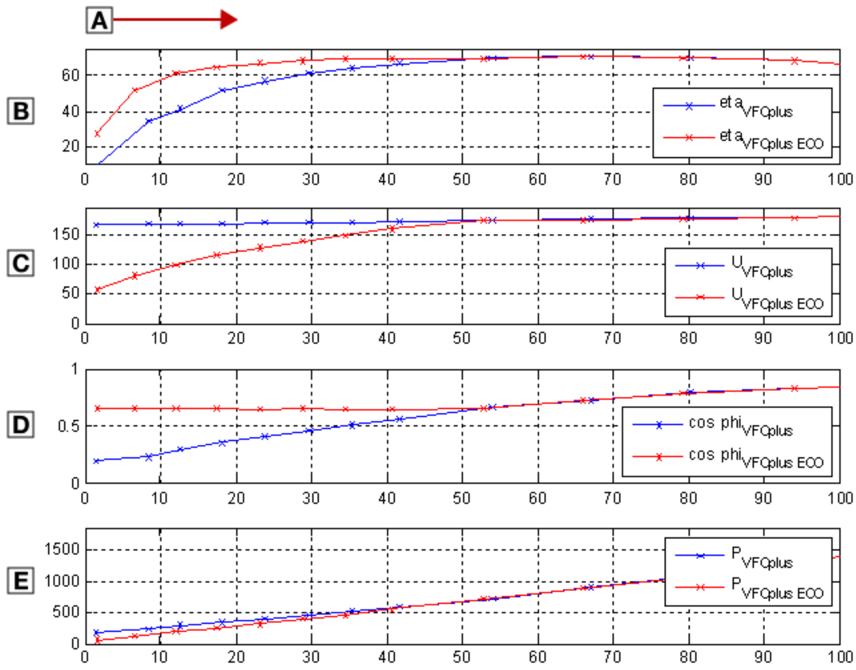


Parameter		Info	Parameter		Info	Parameter		Info
1	C00056/2	Actual torque	13	C00910/1	Max. pos. output frequency	25	C00058	Output frequency
2	C00830/4	Limitation of torque in motor mode	14	C00910/2	Max. neg. output frequency	26	C00975	VFC-ECO: Vp
3	C00830/5	Limitation of torque in generator mode	15	C00021	Slip compensation	27	C00976	VFC-ECO: Ti
4	C00054	Motor current	16	C00051	Actual speed value	28	C00977	VFC-ECO: Minimum voltage V/f
5	C00022	Imax in motor mode	17	C00050	Speed setpoint	29	C00982	VFC-ECO: Motor voltage Sub ramp
6	C00023	Imax in generator mode	18	C00056/2	Actual torque	30	C00978	VFC-ECO: Motor voltage Sub
7	C00074	Ti Imax controller	19	C00058	Output frequency	31	C00018	Switching frequency
8	C00073	Vp Imax controller	20	C00015	V/f base frequency	32	C00052	Motor voltage
9	C00830/3	Speed setpoint	21	C00016	Vmin boost	33	C00980/1	Active output power
10	C00909/1	Max. pos. speed	22	C00058	Output frequency	34	C00980/2	Apparent output power
11	C00909/2	Max. neg. speed	23	C00979/2	Cosine phi set	35	C00981/1	Output energy in motor mode
12	C00105	Deceleration time - quick stop	24	C00979/1	Cosine phi act	36	C00981/2	Output energy in generator mode

5.6.2 Comparison of VFCplusEco - VFCplus

The following characteristics show the impact of the energy-saving V/f characteristic control (VFCplusEco) compared to the standard V/f characteristic control (VFCplus).

- The characteristics were recorded with a standard asynchronous machine 2.2 kW with energy efficiency class IE1 at speed = 600 rpm.



A scaled torque in [%]
B efficiency in [%]
C motor voltage in [V]
D power factor
E electrical power in [W]

[5-3] Comparison of VFCplusEco - VFCplus

5.6.3 Basic settings

The "Initial commissioning steps" listed in the table below are sufficient for the V/f characteristic control - energy-saving (VFCplusECo).

▶ Detailed information on the individual steps can be found in the following subchapters.

Initial commissioning steps		
1.	Determine the motor control: C00006 = "11: VFCplusEco: V/f energy-saving"	
2.	The required motor data are pre-initialised depending on the device and thus, they do not need to be entered directly.In order to achieve a high energy optimisation, these motor data can be entered (see the following section).	
	Set the motor selection/motor data • When selecting and parameterising the motor, the motor nameplate data and the equivalent circuit diagram data are relevant. Detailed information can be found in the "Motor selection/Motor data" chapter. (54) Depending on the motor manufacturer, proceed as follows:	
	Lenze motor: Selecting a motor from the motor catalogue in the »Engineer« - or - 1. Set the motor nameplate data 2. Automatic motor data identification	**Third party manufacturer's motor:** 1. Set the motor nameplate data 2. Automatic motor data identification or set known equivalent circuit diagram manually: C00084: Motor stator resistance C00085: Motor stator leakage inductance C00092: Motor magnetising inductance
3.	Defining current limits (Imax controller). (70)	

Tip!

Information on the optimisation of the control mode and the adaptation to the real application is provided in the "Optimise control behaviour" chapter. (82)

Parameterisable additional functions are described correspondingly in the "Parameterisable additional functions" chapter. (98)

5.6.4 Optimise control behaviour

The V/f characteristic control - energy-saving (VFCplus) is generally ready for operation. It can be adapted subsequently by adapting the characteristic and/or the drive behaviour.

Adapting characteristic

For the linear characteristic as part of the V/f characteristic control - energy-saving (VFCplusEco), it is also possible (like in case of the standard V/f characteristic control) to match its curve to different load profiles or motors by adapting the V/f base frequency (C00015) and the V_{min} boost (C00016).

> **Note!**
>
> For an adaption of the V_{min} boost, the V/f characteristic control - energy-saving (VFCplusEco) must not be set. For this purpose, set the V/f characteristic control (VFCplus).

▸ Adapting the V/f base frequency (📖 72)

▸ Adapting the Vmin boost (📖 73)

Adapting drive behaviour

- Limitation of the maximum current by a current limitation controller (e.g. to prevent the motor from stalling or to limit to the maximally permissible motor current).
  ▸ Optimising the Imax controller (📖 74)
- Adaptation of the field frequency by a load-dependent slip compensation (improved speed accuracy for systems without feedback).
- Improving the behaviour at high dynamic load changes. (📖 83)
- Adapting the slope limitation for lowering the Eco function. (📖 83)
- Optimising the cos/phi controller. (📖 84)

Torque limitation

Limit the torque to a lower value. ▸ Torque limitation (📖 75)

5.6.4.1 Improving the behaviour at high dynamic load changes

Due to the voltage reduction executed via the cosφ control, the motor may stall in the Lenze setting in case of high dynamic load changes (dynamic load impulse from 0 to more than 50 % rated motor torque).

An adaptation of the minimum voltage V/f (C00977) improves the stability in case of load impulses.

- In the Lenze setting, the minimum voltage V/f is set to 20 % for the highest energy optimisation. With this setting, a dynamic load impulse from 0 to approx. 50 % rated motor torque can be applied without the motor stalling.
- An increase of the minimum voltage V/f to 70 % permits to apply a dynamic load impulse from 0 to 100 % rated motor torque without the motor stalling. This reduces the energy optimisation to be achieved by approx. 75 %.
- A further increase of the stability at still higher dynamic load impulses can be achieved by a further increase of the minimum voltage V/f, but means a further loss in energy optimisation.

Note!

The energy optimisation can be switched off by setting the minimum voltage V/f (C00977) to 100 %. Then, the behaviour corresponds to the V/f characteristic control (VFCplus) with linear characteristic.

In case of applications with very high dynamic sudden load variations from the unloaded operation, this motor control mode should not be used or the energy optimisation should be switched off, since a motor stalling cannot be excluded.

5.6.4.2 Adapting the slope limitation for lowering the Eco function

The ramp set in C00982 for voltage reduction serves as slope limitation in order to prevent that voltage is suddenly applied to the motor when the Eco function is deactivated. Otherwise, the overvoltage limitation (Imax, Clamp) would be activated.

- This ramp is, depending on the device, pre-initialised to approx. the triple rotor time constant. An adapation of this parameter is not required.

When the Eco function is switched off, a quick reaction (high dynamic performance) is required, but with a low current overshoot and a small torque jump. Thus, the Lenze setting of C00982 is a compromise regarding the switch-off of the Eco function (motor voltage sub=0).

- To increase the dynamics when switching off the Eco function:
  Reduce → setting in C00982.
  (Current compensation actions increase when the Eco function is switched off.)
- In order to reduce current compensation actions when switching off the Eco function:
  Increase → setting in C00982.
  (The dynamics when switching off the eco function is reduced)

5.6.4.3 Optimising the cos/phi controller

With the Lenze setting, the cosφ controller is set such that usually no adaptation is required for all power ratings and application cases.

Behaviour	Remedy/recommendation
The cosφ actual value (C00979/1) varies greatly.	Reduce gain Vp (C00975) and reset time Ti (C00976).
The cosφ actual value (C00979/1) is permanently lower than the cosφ setpoint (C00979/2).	Increase gain Vp (C00975) and reset time Ti (C00976).

5.6.5 Remedies for undesired drive behaviour

Drive behaviour	Remedy
Inadequately smooth running at low speeds, especially in the case of operation with a long motor cable	▶ Automatic motor data identification (📖 59) Reduce the influence of the Eco function by increasing the minimum voltage V/f (C00977).
Problems in case of high starting duty (great mass inertia)	1. Set motor control VFCplus with linear characteristic (C00006 = 6). 2. Adapting the Vmin boost. (📖 73) 3. Again set motor control VFCplusEco (C00006 = 11).
Drive does not follow the speed setpoint	The current controller intervenes in the set field frequency to limit the controller output current to the maximum current (C0022, C0023). Therefore: • Prolong acceleration/deceleration times: C00012: Acceleration time - main setpoint C00013: Deceleration time - main setpoint • Consider a sufficient magnetising time of the motor. Depending on the motor power, the magnetising time amounts to 0.1 ... 0.2 s. • Increase the maximally permissible current: C00022: Imax motorisch C00023: Imax generatorisch • Make adaptations for the Eco function: – Improving the behaviour at high dynamic load changes. (📖 83) – Adapting the slope limitation for lowering the Eco function. (📖 83) – Optimising the cos/phi controller. (📖 84)
Insufficient speed constancy at high load (setpoint and motor speed are not proportional anymore)	• Increase slip compensation (C00021). Important: Unstable drive due to overcompensation! • With cyclic load impulses (e. g. centrifugal pump), a smooth motor characteristic is achieved by smaller values in C00021 (possibly negative values). Note: The slip compensation is only active for operation without speed feedback.
"Clamp operation active" error message (OC11): Controller cannot follow dynamic processes, i.e. too short acceleration/deceleration times in terms of load ratios.	• Increase the gain of the I_{max} controller (C00073) • Reduce the reset time of the I_{max} controller (C00074) • Prolong the acceleration time (C00012) • Prolong the deceleration time (C00013) • Make adaptations for the Eco function: – Improving the behaviour at high dynamic load changes. (📖 83) – Adapting the slope limitation for lowering the Eco function. (📖 83)
Motor stalling in the field weakening range (adaptation especially required for small machines)	• If motor power < inverter power: Set C00022 to $I_{max} = 2\ I_{rated\ motor}$ • Reduce dynamic performance of setpoint generation • Make adaptations for the Eco function: – Improving the behaviour at high dynamic load changes. (📖 83) – Adapting the slope limitation for lowering the Eco function. (📖 83)
Speed variations in no-load operation for speeds > 1/3 rated speed.	Minimise speed oscillations with oscillation damping (C00234).

5.7 V/f control (VFCplus + encoder)

This function extension is available from version 02.00.00!

The previously described V/f characteristic control (VFCplus) can be operated with a feedback of speed. This bears the following advantages:

- Stationary accuracy of speed
- Low parameterisation effort compared to sensorless vector control (SLVC)
- Improved dynamics compared to V/f characteristic control without feedback or to sensorless vector control (SLVC).
- Suitability for group drives

The descriptions in chapter "V/f characteristic control (VFCplus)" also apply for the V/f control. (📖 66)

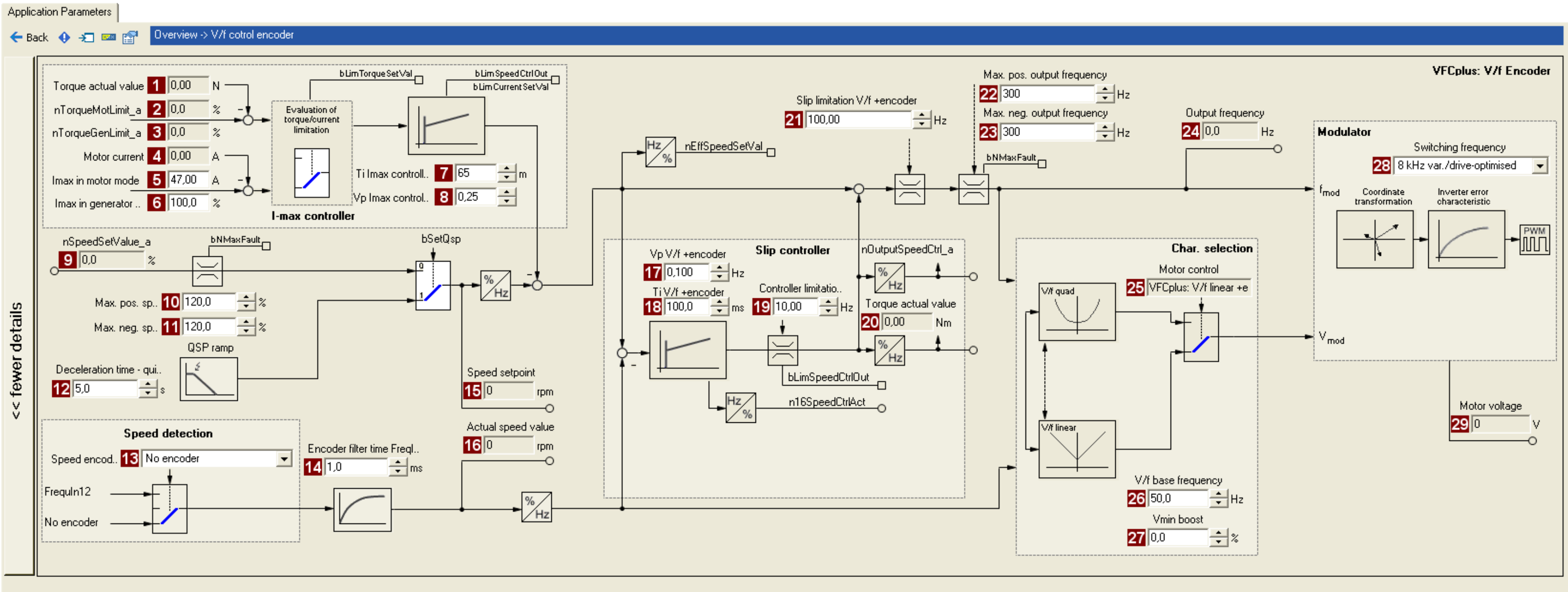
Note!

- The speed feedback mandatory for this motor control type can be fed in at the digital input terminals (DI1/DI2) via an HTL encoder.
  - In order that the HTL encoder can be evaluated correctly, the digital input terminals (DI1/DI2) must be configured as frequency inputs. ▶ Configuring DI1 and DI2 as frequency inputs (📖 134)
- Make sure that the maximum input frequency of 10 kHz is not exceeded when the motor control with speed feedback is used.
- As the slip is calculated in the feedback V/f operation and injected through the slip regulator, the slip compensation (C00021) is deactivated with V/f control.

5.7.1 Parameterisation dialog/signal flow

Proceed as follows to open the dialog for parameterising the motor control:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Select the motor control from the *Overview* dialog level in the **Motor control** (C00006) list field:
   - "7: VFCplus: V/f linear +encoder" for linear characteristic or
   - "9: VFCplus: V/f quadr +encoder" for square-law characteristic
4. Click the **Motor control V/f encoder** button to change to the *Overview* → *Motor control V/f* dialog box.
   - This dialog level only shows a simplified signal flow with the most important parameters.
   - When you click the **>>More details** button in the left-most position, a signal flow with more details/parameters is displayed, as shown in the following subchapter.



	Parameter	Info
1	C00056/2	Actual torque
2	C00830/29	Limitation of torque in motor mode
3	C00830/28	Limitation of torque in generator mode
4	C00054	Motor current
5	C00022	Imax in motor mode
6	C00023	Imax in generator mode
7	C00074	Ti Imax controller
8	C00073	Vp Imax controller
9	C00830/22	Speed setpoint
10	C00909/1	Max. pos. speed
11	C00909/2	Max. neg. speed
12	C00105	Deceleration time - quick stop
13	C00495	Speed sensor selection
14	C00497/1	Encoder filter time FreqIn12

	Parameter	Info
15	C00050	Speed setpoint
16	C00051	Actual speed value
17	C00972	Vp Vf+encoder
18	C00973	Ti Vf+encoder
19	C00971/1	Controller limitation Vf+encoder
20	C00056/2	Actual torque
21	C00971/2	Slip limitation Vf+encoder
22	C00910/1	Max. pos. output frequency
23	C00910/2	Max. neg. output frequency

	Parameter	Info
24	C00058	Output frequency
25	C00006	Motor control
26	C00015	V/f base frequency
27	C00016	Vmin boost
28	C00018	Switching frequency
29	C00052	Motor voltage

More relevant parameters for Encoder/feedback system:

	Parameter	Info
	C00115/1	Fct. DI1/2 10kHz
	C00420/1	Number of encoder increments
	C00425/1	Encoder scanning time
	C00496	Encoder evaluation method

5.7.2 Basic settings

In order to protect the drive system, carry out the commissioning of the V/f control and the slip regulator in several steps.

▶ Detailed information on the single steps can be found in the following subchapters or in the corresponding subchapters for V/f characteristic control.

Initial commissioning steps	
1.	Define V/f characteristic: • C00006 = 7: Linear characteristic • C00006 = 9: Square-law characteristic
2.	Defining current limits (Imax controller). (📖 70)
3.	Parameterise encoder/feedback system. ▸ Encoder/feedback system (📖 107)
4.	If special motors with a rated frequency other than 50 Hz or with a number of pole pairs ≠ 2 are used, set the motor parameters according to the motor nameplate. ▸ Motor selection/Motor data (📖 54)
5.	Define speed setpoint (e.g. 20 % of the rated speed) and enable controller.
6.	Check whether the actual speed value (C00051) ≈ speed setpoint (C00050) and then inhibit the controller again. • In case of sign reversal between actual value and setpoint, check the terminals of the encoder (e.g. swap track A or B of the encoder or reverse actual speed value). • In case the actual value differs considerably from the setpoint (factor 2), set the motor parameters according to motor nameplate. Then repeat step 5.
7.	For protecting the drive, reduce slip regulator limitation in C00971/1. • e.g. reduction to half the slip frequency (≈ 2 Hz)
8.	Define speed setpoint (e.g. 20 % of the rated speed) and enable controller.
9.	In case of a semi-stable operational performance, reduce the reset time (C00972) or the proportional gain (C00973) of the slip regulator until a stable operation has been achieved. ▸ Parameterising the slip regulator (📖 90)
10.	In a final step, increase the slip regulator limitation again in C00971/1. • e.g. increase to double the slip frequency

Tip!

Information on the optimisation of the control mode and the adaptation to the real application is provided in the "Optimise control behaviour" chapter for the V/f characteristic control (VFCplus). (📖 71)

Parameterisable additional functions are described correspondingly in the "Parameterisable additional functions" chapter. (📖 98)

5.7.2.1 Parameterising the slip regulator

The slip regulator is designed as a PI controller. In order to improve the response to setpoint changes, the setpoint speed or setpoint frequency is added to the output (correcting variable) of the slip regulator as feedforward control value.

- In contrast to the conventional speed controller, the slip regulator only regulates the slip.
- In the Lenze setting, the slip regulator features a configuration with a good robustness and moderate dynamics.

Parameter	Info	Lenze setting	
		Value	Unit
C00971/1	VFC: Controller limitation V/f +encoder	10.00	Hz
C00971/2	VFC: Slip limitation V/f +encoder	100.00	Hz
C00972	VFC: Vp V/f +encoder	0.100	Hz/Hz
C00973	VFC: Ti V/f +encoder	100.0	ms

Slip regulator gain Vp

The setting range of the slip regulator gain Vp (C00972) which leads to a stable operational performance, mainly depends on the resolution of the speed sensor. There is a direct relationship between encoder resolution and gain:

- The higher the encoder resolution, the higher the gain can be set.

The following table gives maximum and recommended slip regulator gains for encoder with standard encoder increments:

Encoder increment [Increments/revolution]	Slip regulator gain Vp	
	Maximum	Recommended
8	0.09	0.06
64	0.52	0.31
100	0.79	0.47
120	0.94	0.57
128	1.00	0.60
256	1.29	0.77
386	1.63	0.98
512	1.97	1.18
640	2.31	1.38
768	2.65	1.59
896	2.99	1.79
1014	3.33	2.00
1536	4.69	2.81
2048	6.05	3.63
3072	8.77	5.26
4096	11.49	6.90

[5-1] Slip regulator gain Vp with regard to the encoder increment

How to adapt the slip regulator gain to the operating conditions:

1. Adapt the slip regulator gain (C00972) to the encoder increment according to table [5-1].
2. Set controller limitation (C00971/1) to half the slip frequency (≈ 2 Hz).
3. Select speed setpoint (e.g. 20 % of the rated speed).
4. Enable controller.
5. Increase slip regulator gain (C00972) until the drive becomes semi-stable.
   - This can be recognised by motor noises or "humming" of the motor or by a noise on the actual speed signal.
6. Reduce slip regulator gain (C00972) until the drive runs stable again (not motor "humming").
7. Reduce slip regulator gain (C00972) to approx. half the value.
   - With low encoder resolutions, another reduction of the slip regulator gain for low speeds may be necessary (speed setpoint ≈ 0).
   - It is recommended to check as a final step the behaviour at setpoint speed = 0 and further reduce the slip regulator gain in case of irregular running.
8. Increase controller limitation (C00971/1) again (e.g. to double the slip frequency).

Slip regulator time constant Ti

How to set the slip regulator time constant:

1. Set controller limitation (C00971/1) to half the slip frequency (≈ 2 Hz).
2. Select speed setpoint (e.g. 20 % of the rated speed).
3. Enable controller.
4. Reduce slip regulator time constant (C00973) until the drive becomes semi-stable.
   - This can be recognised by engine noises or motor "oscillating" or by oscillation on the actual speed signal.
5. Increase slip regulator time constant (C00973) until the drive runs stable again (no motor "oscillation").
6. Increase slip regulator time constant (C00973) to approx. double the value.
7. Increase controller limitation (C00971/1) again (e.g. to double the slip frequency).

Controller limitation

The max. influence of the slip regulator is limited via the controller limitation (C00971/1).

- The controller can be limited depending on the application.
- It is recommended to limit the maximum influence to double the rated slip of the motor.
- The rated slip is calculated as follows:

$$f_{Slip_{Rated}}[Hz] = f_{Rated}[Hz] - \left(\frac{n_{Motor_{Rated}}[rpm]}{60} \cdot p_{\text{Number of pole pairs}}\right)$$

[5-4] Calculation of the rated slip

Note!

The setting C00971/1 = 0 Hz deactivates the slip regulator. In this case, the structure of the V/f control corresponds to the structure of the V/f characteristic control without feedback.

Slip limitation

In addition to limiting the slip regulator, the field frequency to be injected can also be limited by another limiting element, the slip limitation (C00971/2).

- A slip limitation to, for instance, double the rated slip of the motor prevents the motor from stalling in very dynamic processes.
- Motor stalling is caused by:
  - High overcurrent at very steep speed ramps
  - very quick load-related speed variations, e.g. sudden stopping of the drive when travelling against a limit stop or a standing load.

5.8 Sensorless vector control (SLVC)

Sensorless vector control (SLVC) is based on an improved motor current control according to a field-oriented Lenze control process.

Stop!

- The connected motor must not be more than two power classes smaller than the motor assigned to the controller.
- Operation of the sensorless vector control (SLVC) is only permissible for one single drive!
- Operation of the sensorless vector control (SLVC) is not permissible for hoists!
- The Lenze setting permits the operation of a power-adapted motor. Optimal operation is only possible if either:
  - the motor is selected via the Lenze motor catalogue
  - the motor nameplate data are entered and motor parameter identification is carried out afterwards
    - or -
  - the nameplate data and equivalent circuit data of the motor (motor leakage inductance and mutual motor inductance, slip compensation and motor stator resistance) are entered manually.
- When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the selected connection type.
  - In this context, also observe the instructions in the chapter entitled "Adapting the V/f base frequency" relating to V/f characteristic control. (📖 72)

Note!

Optimal operation of the sensorless vector control (SLVC) can be achieved from a minimum speed of approx. 0.5-fold slip speed. At lower speed values below the 0.5-fold slip speed, the maximum torque is reduced.

The maximum field frequency with this motor control mode is 650 Hz.

In comparison to the V/f characteristic control without feedback, the following can be achieved by means of sensorless vector control SLVC:

- ▶ A higher maximum torque throughout the entire speed range
- ▶ A higher speed accuracy
- ▶ A higher concentricity factor
- ▶ A higher level of efficiency
- ▶ The limitation of the maximum torque in motor and generator mode for speed-actuated operation

5.8.1 Parameterisation dialog

Proceed as follows to open the dialog for parameterising the motor control:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Select the motor control "4: SLVC: Vector control" from the *Overview* dialog level in the **Motor control** list field:
4. Click the **Motor control vector** button to change to the *Overview* ➞ *Motor control vector* dialog box.
   - This dialog level lists shows all relevant parameters in a parameter list.

Short overview of the relevant parameters:

Parameter	Info
C00006	Selection of the motor control ➞ "4: SLVC: Vector control"
C00011	Reference speed
C00018	Switching frequency
C00021	Slip compensation
C00022	Imax in motor mode
C00023	Imax in generator mode
C00050	Speed setpoint
C00057	Maximum torque
C00058	Output frequency
C00081	Rated motor power
C00084	Motor stator resistance
C00085	Motor stator leakage inductance
C00087	Rated motor speed
C00088	Rated motor current
C00089	Rated motor frequency
C00090	Rated motor voltage
C00091	Motor cosine phi
C00092	Motor magnetising inductance
C00095	Motor magnetising current
C00097	Rated motor torque
C00105	Deceleration time - quick stop
C00909/1	Max. pos. speed
C00909/2	Max. neg. speed
C00910/1	Max. pos. output frequency
C00910/2	Max. neg. output frequency
Highlighted in grey = display parameter	

5.8.2 Speed control with torque limitation

A speed setpoint is selected and the drive system is operated in a speed-controlled manner.

The operational performance can be adapted in the following ways:

- Overload limitation in the drive train
  - The torque is limited via the torque setpoint.
  - The torque setpoint is identical to the value at the output of the speed controller, *nOutputSpeedCtrl*.
  - To avoid overload in the drive train, the torque in motor mode can be limited via the *nTorqueMotLimit_a* process input signal, and the torque in generator mode can be limited via the *nTorqueGenLimit_a* process input signal:

Identifier DIS code | data type	Information/possible settings
nTorqueMotLimit_a C00830/4 | INT	Torque limitation in motor mode • Scaling: 16384 ≡ 100 % M_{max} (C00057) • Setting range: 0 ... +199.99 %
nTorqueGenLimit_a C00830/5 | INT	Torque limitation in generator mode • Scaling: 16384 ≡ 100 % M_{max} (C00057) • Setting range: -199.99 ... 0 %

Note!

To avoid instabilities during operation, the torque limit values are internally processed as absolute values.

- Motor current limitation
  - A cross current setpoint is calculated from the torque setpoint which is limited depending on the magnetising current, the max. current in motor mode (C00022), and the max. current in generator mode (C00023).
  - Here, the total current injected into the motor does not exceed the max. currents in motor and generator mode.
- Slip compensation (📖 105)
  - Using a slip model, the slip of the machine is reconstructed.
  - The slip compensation (C00021) acts as the influencing parameter.

5.8.3 Basic settings

The following "Initial commissioning steps" must be performed to commission the sensorless vector control:

Initial commissioning steps		
1.	Set the motor selection/motor data • When selecting and parameterising the motor, the motor nameplate data and the equivalent circuit diagram data are relevant. Detailed information can be found in the "Motor selection/Motor data" chapter. (📖 54) Depending on the motor manufacturer, proceed as follows:	
	Lenze motor: Selecting a motor from the motor catalogue in the »Engineer« - or - 1. Set the motor nameplate data 2. Automatic motor data identification	**Third party manufacturer's motor:** 1. Set the motor nameplate data 2. Automatic motor data identification or set known equivalent circuit diagram manually: C00084: Motor stator resistance C00085: Motor stator leakage inductance C00092: Motor magnetising inductance
2.	Determine the motor control: C00006 = "4: SLVC: Vector control"	
3.	Set the slip compensation (C00021). ▶ Slip compensation (📖 105)	

Tip!

We recommend to use the flying restart function for connecting/synchronising the inverter to an already rotating drive system. ▶ Flying restart function (📖 100)

Parameterisable additional functions are described correspondingly in the "Parameterisable additional functions" chapter. (📖 98)

5.8.4 Optimise control behaviour

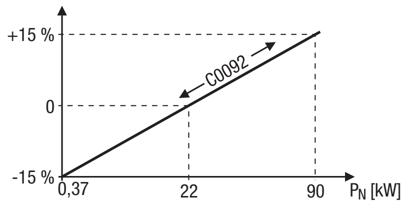
5.8.4.1 Optimising the starting performance after a controller enable

After the controller is enabled, a time delay is cause during the start due to the magnetisation of the motor. If this delay cannot be tolerated for specific applications, the motor must always be operated in an energised condition.

Procedure without setting a controller inhibit

1. Deactivate the auto-DCB function with C00019 = 0.
2. Do not activate the controller inhibit. Instead, stop the drive by selecting a setpoint of 0 or by activating the quick stop function.

5.8.5 Remedies for undesired drive behaviour

Drive behaviour	Remedy
Deviation between no-load current and magnetising current or bad speed or torque accuracy.	Adapt the motor magnetising inductance (C00092) for no-load operation. • If the no-load current is greater than the magnetising current (C00095) at 0.5-fold rated motor speed, the magnetising inductance must be reduced until the no-load current and the magnetising current have the same values. • Otherwise, the magnetising inductance must be increased. Tendency of the correction of C00092:  PN: Rated motor power
Insufficient speed constancy at high load: Setpoint and motor speed are not proportional anymore. **Caution:** Overcompensation of the settings mentioned under " Remedy" may result in unstable behaviour!	Via the slip compensation (C00021), the speed stability under high loads can be affected: • If $n_{act} > n_{slip}$, reduce the value in C00021 • If $n_{act} < n_{slip}$, increase the value in C00021
Unstable control with higher speeds.	• Check the setting of the magnetising inductance (C00092) by comparing the current consumption in no-load operation with the rated magnetising current (C00095). • Optimise oscillation damping (C00234).
"Short circuit" (OC1) error messages at short acceleration time (C00012) in proportion to the load (controller cannot follow the dynamic processes).	Increase the acceleration (C00012)/deceleration (C00013) time.
Mechanical resonance at certain speeds.	The L_NSet_1 function block masks out those speed ranges that include resonance.
Speed variations in no-load operation for speeds > 1/3 rated speed.	Minimise speed oscillations with oscillation damping (C00234).
Drive runs unstable.	Check set motor data (nameplate data and equivalent circuit diagram data). ▸ Motor selection/Motor data (📖 54)
Setpoint speed and actual speed differ strongly.	

5.9 Parameterisable additional functions

5.9.1 Selection of switching frequency

The switching frequency of the inverter that can be selected in C00018 influences the smooth running performance and the noise generation in the connected motor as well as the power losses in the controller.

The lower the switching frequency the higher the concentricity factor, the smaller the losses, and the higher the noise generation.

Stop!

If operated at a switching frequency of 16 kHz, the output current of the controller must not exceed the current limit values specified in the technical data!

▸ Defining current and speed limits (📖 64)

Note!

- Operate mid-frequency motors only at a switching frequency of 8 kHz or 16 kHz (var./drive-opt.).
- If operated at a switching frequency of 16 kHz, the Ixt evaluation (C00064) is considered including the required derating to 67 % of the rated device current at switching frequencies of 4 and 8 kHz.

Settable switching frequencies

Selection in C00018		Info
2	8 kHz var./drive-optimised	• "var.": Adaptation of the switching frequency depending on the current • "drive-opt.": drive-optimised modulation ("sine/delta modulation") • "fixed": fixed switching frequencies
3	16 kHz var./drive-optimised	
6	4 kHz constant/drive-optimised	
7	8 kHz constant/drive-optimised	
8	16 kHz constant/drive-optimised	
23	16 kHz var/8 kHz min	

Tip!

The Lenze setting C00018 = 2 (8 kHz var./drive-opt.) is the optimal value for standard applications.

Lowering the switching frequency due to high heatsink temperatures

Exceeding the maximally permissible heatsink temperature would lead to an inhibited drive due to the "Overtemperature" error and a torquelessly coasting motor. Therefore, if the Lenze setting is selected, the switching frequency is reduced to the next frequency below when the heatsink temperature has risen to 5 °C below the maximally permissible temperature. After the heatsink has cooled down, the controller automatically switches to the next frequency above until the set switching frequency is reached.

Switching frequency reduction due to high heatsink temperature can be deactivated via C00144. If the switching frequency reduction is deactivated, the "OH1: Heatsink overtemperature" error message will be issued when the maximally permissible heatsink temperature is reached. An "Fault" response is the result and the motor is coasting.

Parameter	Info	Lenze setting
C00144	Switching frequency reduction (temp.)	1: On

Lowering of the switching frequency depending on the output current

"Variable" switching frequencies can be selected for the controller in C00018, where the controller automatically lowers the switching frequency depending on the controller output current. The modulation mode will not be changed. The changeover thresholds are included in the "Rated data" chapter of the Hardware Manual.

When a "fixed" switching frequency is selected, no switching frequency changeover takes place. In case of fixed frequencies, the controller output current is limited to the permissible value of the corresponding switching frequency. In case of larger load impulses, the overcurrent interruption may be activated, to which the controller responds with "Fault".

Limiting the maximum output frequency

The maximum output frequency (C00910) of the controller is not limited depending on the switching frequency. Therefore, adapt the maximum output frequency according to our recommendation:

$$\text{Maximum output frequency} \leq \frac{1}{8}\text{Switching frequency}$$

- ▶ In the Lenze setting, the output frequency is limited to the maximum value of 300 Hz.

Carry out further measures:

- ▶ If required, deactivate the switching frequency changeover by the heatsink temperature via C00144.
- ▶ If required, ensure that the changeover threshold of the controller output current to the next switching frequency below will not be exceeded. If required, select a constant switching frequency in C00018.

Display of the current switching frequency

The current switching frequency applied in the controller is displayed in C00725.

Operation at an ambient temperature of 45°C

The controller is designed so that operation at an ambient temperature of 45° C without derating is permissible at a switching frequency of 4 kHz.

5.9.2 Flying restart function

The flying restart circuit uses a simple model of an asynchronous motor which requires knowledge of the motor stator resistance RS and the rated motor current.

Note!

- For a correct functioning of the flying restart circuit, we recommend to perform a parameter identification first. ▸ Automatic motor data identification (📖 59)
- The flying restart function works safely and reliably for drives with great centrifugal masses.
- Do not use the flying restart function if several motors with different centrifugal masses are connected to a controller.
- After the controller is enabled, the motor can start for a short time or reverse when machines with low friction and low mass inertia are used.
- The flying restart function serves to identify max. field frequencies up to ±200 Hz.
- When power-adapted standard asynchronous motors are used (rated motor power approximately corresponds to the rated inverter power), a motor parameter identification is not required.

Tip!

In association with the flying restart function, we recommend to read the information provided in this documentation on the following topic:
▸ Automatic DC-injection braking (Auto-DCB) (📖 103)

General information

This function serves to activate a mode which is used to "catch" a coasting motor during operation without speed feedback. This means that the synchronicity between controller and motor is to be adjusted in such a way that a jerk-free transition to the rotating machines is achieved in the instant of connection.

The drive controller determines the synchronicity by identifying the synchronous field frequency.

Duration

The "catching" process is completed after approx. 1 ... 2 seconds. The duration is influenced by the starting value. If the field frequency is not known, we recommend the preset starting value of 10 Hz.

Short overview of the relevant parameters:

Parameter	Info	Lenze setting	
		Value	Unit
C00990	Flying restart fct.: Activation	Off	
C00991	Flying restart fct.: Process	-n...+n | Last output frequency	
C00992	Flying restart: Start frequency	10	Hz
C00994	Flying restart fct.: Current	25.00	%

How to parameterise the flying restart function:

1. Activate the flying restart circuit by selecting "1: On" in C00990.
   - Every time the controller is enabled, a synchronisation to the rotating or standing drive is carried out.

   When the Lenze setting is used, most applications do not require additional controller settings.

   If additional settings are necessary, proceed as follows:
2. Define the process and hence the speed range/rotational frequency range in C00991 which is to be examined by the flying restart circuit.
   - We recommend the Lenze setting "5: -n...+n | Last output frequency"
3. Adjust starting frequency in C00992 if required.

   The preset starting frequency which defines the starting point of the flying restart function is optimised for standard motors.
   - We recommend to define a starting frequency of approximately 20 % of the rated motor frequency to enable a safe and fast connection to standing drive systems.
4. Set the flying restart current in C00994.

   We recommend setting a flying restart current of 10 % ... 25 % of the rated motor current.
   - During a flying restart process, a current is injected into the motor to identify the speed.
   - Reducing the current causes a reduction of the motor torque during the flying restart process. A short-time starting action or reversing of the motor is prevented with low flying restart currents.
   - An increase of the current improves the robustness of the flying restart function.

5.9.3 DC-injection braking

Danger!

Holding braking is not possible when this braking mode is used!

- For low-wear control of a holding brake, use the basic function "Holding brake control". (📖 177)

DC-injection braking allows the drive to be quickly braked to a standstill without the need to use an external brake resistor.

- The braking current is set in C00036.
- The maximum braking torque to be generated by the DC braking current is approx. 20 ... 30 % of the rated motor torque. It is lower than that for braking in generator mode with an external brake resistor.
- Automatic DC-injection braking (Auto-DCB) improves the starting performance of the motor when operated without speed feedback.

Tip!

DC-injection braking has the advantage that it is possible to influence the braking time by changing the motor current or the braking torque..

Short overview of the relevant parameters:

Parameter	Info	Lenze setting	
		Value	Unit
C00019	Auto-DCB: Threshold • Operating threshold for activating DC-injection braking	3	rpm
C00036	DCB: Current • Braking current in [%] based on I_{max} (C00022)	50	%
C00106	Auto-DCB: Hold time	0.5	s
C00107	DCB: Hold time	999.0	s
C00701/4	LA_NCtrl: bSetDCBrake • Selection of the signal source for activating DC-injection braking	Dependent on the selected control mode	

Method

DC-injection braking can be carried out in two ways with different types of activation:

- Manual DC-injection braking (DCB) (📖 103)
- Automatic DC-injection braking (Auto-DCB) (📖 103)

5.9.3.1 Manual DC-injection braking (DCB)

DC-injection braking can be manually activated via the *bSetDCBrake* process input.

- For HIGH-active inputs, DC-injection braking is active as long as the signal is at HIGH level.
- After the hold time (C00107) has expired, the controller sets the pulse inhibit (CINH).

Tip!

- In the preset "Terminals 0" control mode, DC-injection braking can be manually activated via the digital input DI3.
- In the preset "Terminals 11" control mode, DC-injection braking can be manually activated via the digital input DI2.

5.9.3.2 Automatic DC-injection braking (Auto-DCB)

"Automatic DC-injection braking" (referred to in the following as "Auto-DCB") can be used if there is a requirement that the drive be isolated from the supply at $n \approx 0$.

Note!

Deactivate automatic DC-injection braking when a holding brake is used!

- For this purpose, go to C00019 and set the Auto-DCB threshold to "0".
- Background: Controller inhibit is already activated by the Holding brake control. (📖 177)

Function

For understanding the auto-DCB function, it is necessary to distinguish between three different types of operation:

A. The drive has been enabled and, in the course of operation, the speed setpoint falls below the Auto-DCB threshold.
   – In case of operation without speed feedback, a braking current (C00036) is injected. After the auto-DCB hold time (C00106) has expired, the motor is deenergised via the auto-DCB function, i.e. a controller inhibit (CINH) is set.

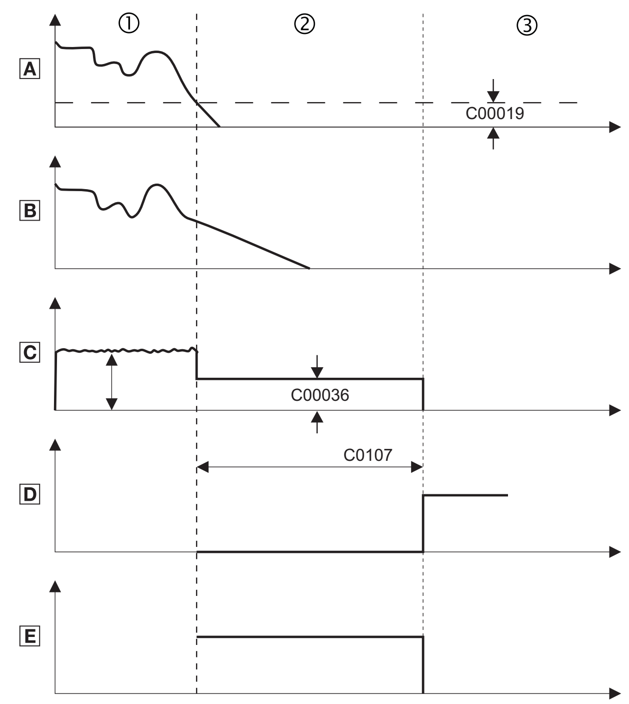
B. When the controller is enabled, the drive is at standstill (n = 0).
   If the enabled drive is to start, the speed setpoint passed via the acceleration ramp must exceed the auto-DCB threshold (C00019). Below this threshold, the motor will not be energised.

C. When the controller is enabled, the motor (still) rotates at a speed which is above the auto DCB threshold. If the speed setpoint reached via the acceleration ramp exceeds the auto DCB threshold (C00019), the motor will be energised and the drive will be "caught". ▶ Flying restart function (📖 100)

How to set the automatic DC-injection braking

1. Set a hold time in C00106 > 0 s.
   - Automatic DC-injection braking is active for the time set.
   - In case of operation without speed feedback, the braking current set in C00036 is injected.
   - After the set hold time has expired, the controller sets a pulse inhibit.
2. Set the operating threshold in C00019.
   - The operating threshold can serve to set a dead band in the setpoint. If DC-injection braking is not to be active then, C00106 must be set to a value of "0".

Explanation of the automatic DC-injection braking function by means of an example



A Speed setpoint
B Actual speed value of the motor
C Output current of the controller
D Pulse inhibit
E DC-injection braking is active

① The motor rotates at a specified speed. The current adjusts itself to the load, see C.

② The DC braking current set in C00036 is injected.

③ After the hold time (C00106) has expired, a pulse inhibit is set.

[5-5] Example 1: Signal characteristic for automatic DC-injection braking of a drive without speed feedback

5.9.4 Slip compensation

Under load, the speed of an asynchronous machine decreases. This load-dependent speed drop is called slip. The slip can partly be compensated for by the setting in C00021.

Parameter	Info	Lenze setting	
		Value	Unit
C00021	Slip compensation	0.00	%

- The setting of C00021 can be done automatically in the course of motor parameter identification. Automatic motor data identification (59)
- The setting must be made manually if the motor parameter identification cannot be called up.

How to set the slip compensation manually:

1. Calculate the slip compensation according to motor nameplate data:

$$s = \frac{n_{rsyn} - n_r}{n_{rsyn}} \cdot 100\%$$

$$n_{rsyn} = \frac{f_r \cdot 60}{p}$$

s	Slip constant (C00021) [%]
n_{rsyn}	Synchronous motor speed [rpm]
n_r	Rated motor speed according to the motor nameplate [rpm]
f_r	Rated motor frequency according to the motor nameplate [Hz]
p	Number of motor pole pairs (1, 2, 3 ...)

2. Transfer the calculated slip constant s to C00021.
3. Correct the setting in C00021 while the drive is running until the load-dependent speed drop does not occur anymore between idling and maximum load of the motor in the desired speed range.

Tip!

The following guide value applies to a correctly set slip compensation:

- Deviation from the rated motor speed ≤ 1% for the speed range of 10 % ... 100 % of the rated motor speed and loads ≤ rated motor torque.
- Greater deviations are possible in the field weakening range.
- If C00021 is set too high, the drive may get unstable.
- Negative slip (C00021 < 0) with V/f characteristic control results in "smoother" drive behaviour at heavy load impulses or applications requiring a significant speed drop under load.

5.9.5 Oscillation damping

Mechanical oscillations are undesirable effects in every process and they may have an adverse effect on the single system components and/or the production output.

Mechanical oscillations in the form of speed oscillations are suppressed by the oscillation damping function.

Parameter	Info	Lenze setting	
		Value	Unit
C00234	Oscillation damping influence	5.00	%

Oscillation damping is successfully used with

- unloaded motors (no-load oscillations)
- motors whose rated power deviates from the rated power of the controller.
  - e.g. during operation at high switching frequency including the power derating involved.
- operation with higher-pole motors
- operation with special motors
- compensation of resonance in the drive
  - At an output frequency of approx. 20 ... 40 Hz, some asynchronous motors can show resonance which causes current and speed variations and thus destabilise the running operation.

How to eliminate speed oscillations:

1. Approach the area where the speed oscillations occur.
2. Reduce the speed oscillations by changing C00234 step by step.
3. These can be indicators for smooth running:
   - Constant motor current characteristic
   - Reduction of the mechanical oscillations in the bearing seat

Related topics:

- L_NLim_1 FB: Blocking frequency function (321)

5.10 Encoder/feedback system

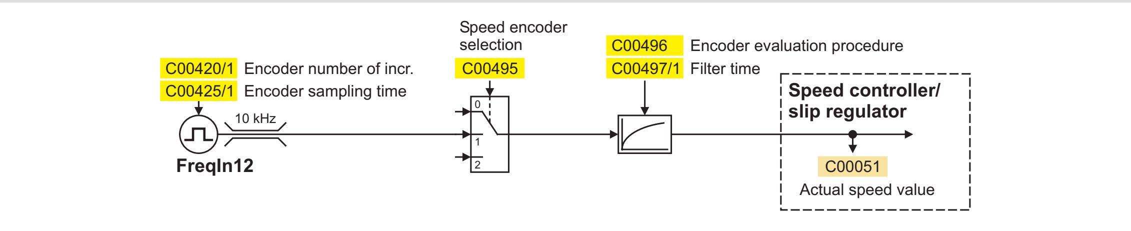
This function extension is available from version 02.00.00!

The speed feedback mandatory for the V/f control (VFCplus + encoder) can be fed in at the digital input terminals (DI1/DI2) via an HTL encoder.

- In order that the HTL encoder can be evaluated correctly, the digital input terminals (DI1/DI2) must be configured as frequency inputs. ▶ Configuring DI1 and DI2 as frequency inputs (📖 134)
- The actual speed value (C00051) is also calculated when motor control without encoder feedback has been selected if an encoder is connected and "1: Encoder signal FreqIn12" has been selected in C00495.

Danger!

- For (open circuit) monitoring of the encoder, it is recommended to set the "Fault" response (Lenze setting) in C00586 for safety reasons!
- In order to prevent interference injections when using an encoder, only use shielded motor and encoder cables.
- Make sure that the maximum input frequency of 10 kHz at the frequency inputs is not exceeded when the V/f control (VFCplus + encoder) is used.
- When evaluating a single-track encoder, make sure that the sign has been selected correctly. Otherwise, there is a risk that the motor may overspeed.



[5-6] Signal flow encoder interface

Note!

When the encoder signal is used as actual speed value:
Number of encoder pulses / revolution ≤ **8192 !** (see the following example)

Example for DI1/DI2 (according to the previous note):

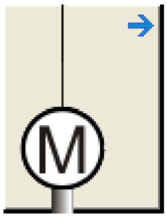
- Encoder increment: 512 pulses / motor revolution
- Reference speed (C00011): 1500 rpm
- Speed setpoint: 100 %

$$\text{Input frequency} = \frac{1500\ \text{rpm}}{60\ \text{s}} \times 512\ \text{pulses} = 12800\ \text{pulses/s} = 12.8\ \text{kHz}$$

- Result: The speed or the number of increments is too high!

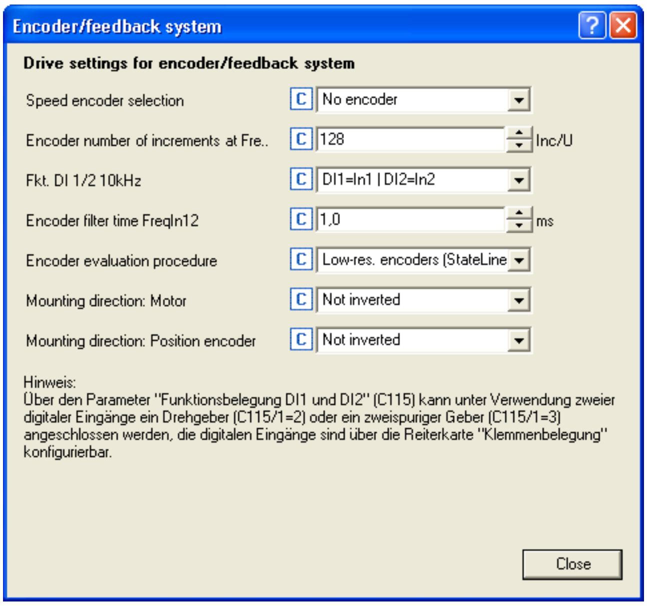
How to open the parameterisation dialog of the encoder/feedback system:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Go to the *Overview* dialog level and click the following button:



4. Go to the *Overview* → *Motor data* dialog box and click the **Encoder/feedback system...**.

Parameterisation dialog in the »Engineer«



Short overview of the relevant parameters:

Parameter	Info	Lenze setting	
		Value	Unit
C00495	Speed sensor selection • Source of the feedback signal for speed control.	No encoder	
C00420/1	Number of encoder increments at FreqIn12 • When the digital inputs DI1 and DI2 are used as frequency input.	128	Inc/rev.
C00115/1	Fct. DI 1/2 10kHz • Function of the digital inputs DI1 and DI2	DI1=In1 | DI2=In2	
C00497/1	Encoder filter time FreqIn12 • When the digital inputs DI1 and DI2 are used as frequency input.	1.0	ms
C00496	▸ Encoder evaluation method (📖 110)	Low-resolution encoder	
C01206/1	Mounting direction: Motor	Not inverted	
C01206/2	Mounting direction: Position encoder	Not inverted	

General procedure

1. Configuring DI1 and DI2 as frequency inputs. (📖 134)
2. Set encoder increments in C00420/1.
3. Select "1: Encoder signal FreqIn12In" in C00495/1.
4. Adapt the filter time of the speed measurement in C00497/1.

5.10.1 Encoder evaluation method

Depending on the used encoder, the following table shows which evaluation procedure should be set in C00496:

Selection in C00496	Encoder evaluation method
1: Low-resolution encoder (Lenze setting)	High-precision procedure for low-resolution encoders (<=128 lines) • Precise procedure for detecting the speed with self-regulating scanning time (0.5 ... 500 ms) for low-resolution encoders in the range of 4 .... 128 lines. • Evaluation with automatically minimised scanning time for optimum dynamics. • Procedure is also suitable for encoders with bad signal quality, e.g. for encoders with very faulty scanning ratio and phase offset. • One condition for the procedure is an equidistant period length per encoder increment. • EMC-compliant wiring (e.g. shielding or the motor an encoder cable) is required!
3: Edge-counting procedure	Easy edge-counting procedure with adjustable scanning time (C00425) • Determination of the speed with the help of the measured edge of tracks A and B per scanning interval. • Integrated correction algorithm for EMC interferences. • Limited suitability for systems with unshielded encoder cable and/or motor cable. • Limited suitability for encoders with bad signal quality, i.e. very faulty scanning ratio or phase offset.

Tip!

We recommend the use of the preset procedure for low-resolution encoders (C00496 = 1).

Low speeds during evaluation procedure for low-resolution encoders

When the evaluation procedure for low-resolution encoders (C00496 = 1) is used, the minimally measurable speed depends on the number of increments of the encoder.

The quantisation error

- is independent of the encoder increment,
- exclusively depends on the encoder quality (encoder error),
- amounts to at least 0.5 rpm.

In order to realise a maximum dynamics by means of internal arithmetic operations, the scanning time is automatically maintained to the minimally required value.

Number of encoder increments C00420/1	Minimum speed [rpm]
8	16
16	8
32	4
64	2
128	1
256	0.5

Low speeds during edge-counting procedure

When the edge-counting procedure (C00496 = 3) is used, the minimally measurable speed and the quantisation error of the speed measurement depend on the scanning time to be set in C00425/1 and the encoder resolution.

According to accuracy and dynamics requirement, select the suitable scanning time and set it in C00425/1:

Encoder resolution (Number of increments)	Scanning time [ms]									
	1	2	5	10	20	50	100	200	500	1000
8	1875	938	375	188	93.8	37.5	18.8	9.4	3.8	1.9
16	938	469	188	94	46.9	18.8	9.4	4.7	1.9	0.9
32	469	234	94	46.9	23.4	9.4	4.7	2.3	0.9	0.5
64	234	117	46.9	23.4	11.7	4.7	2.3	1.2	0.5	0.2
128	117	58.6	23.4	11.7	5.9	2.3	1.2	0.6	0.2	0.12
256	58.6	29.3	11.7	5.9	2.9	1.2	0.6	0.3	0.12	0.06

All data in [1/min]

5.11 Braking operation/braking energy management

When electric motors are braked, the kinetic energy of the drive train is fed back into the DC circuit regeneratively. This energy leads to an increase in the DC bus voltage. In order to avoid overvoltage in the DC bus, several different strategies can be used:

- Use of a brake resistor
- Stopping of the deceleration when the brake chopper threshold is exceeded (HlgStop)
- Use of the "inverter motor brake" function (from version 02.00.00)
- Overmagnetising the motor (from version 02.00.00)
- Combination of the above named options

Stop!

If the connected brake resistor

- has a lower brake resistance value than the required brake resistor, the brake chopper may be destroyed!
- has a too low thermal power dissipation, the brake resistor may be destroyed!

C00574 serves to parameterise the error response of the brake resistor monitoring. ▸ Brake resistor monitoring (I2xt) (📖 126)

Short overview of the relevant parameters:

Parameter	Info	Lenze setting Value	Unit
Basic settings			
C00173	Mains voltage	3ph 400 V	
C00174	Reduced brake chopper threshold	0	V
C00175	Reaktion brake resistor control	Brake resistor	
Brake resistor			
C00129	Value brake resistor (dependent on the device power, see subchapter "Settings for internal brake resistor")	220.0	Ohm
C00130	Rated power brake resistor	15	W
C00131	Heat capacity brake resistor	0.3	kWs
C00133	Brake resistor utilisation	-	%
C00572	Brake resistor overload threshold	100	%
C00574	Response to brake resistor overtemperature	Fault	
Inverter motor brake (variant 1)			
C00987	Inverter motor brake: nAdd	80	rpm
Inverter motor brake (variant 2)			
C00984	Inverter motor brake: Motor flux Add	20.0	%

Highlighted in grey = display parameter

5.11.1 Settings for internal brake resistor E84DZEWxxxx

E84DGDVB...	Brake resistor	Resistance value R_B (C00129) [Ω]	Rated power P_D (C00130) [W]	Thermal capacity Q_B (C00131) [kWs]
3714 5514 7514 1124 1524	E84DZEW220R	220.0	15	0.3
2224 3024	E84DZEW100R	100.0	15	0.3
4024 5524 7524	E84DZEW47R0	47.0	15	0.3

5.11.2 Voltage limits for braking operation

In case of the 8400 motec controller, the brake chopper is exclusively switched on via a hardware circuit.

For the braking methods C00175 = 2 / 4, the brake chopper threshold adjustable via C00173 and C00174 is used in order to trigger the corresponding software response before the brake chopper threshold on the hardware side is reached.

- The braking method C00175 = 6 increases the motor magnetisation every time the motor is decelerated. There is no reference to the DC-bus voltage.
- The brake chopper threshold is preset as follows via the selected mains voltage (C00173):

C00173	Mains voltage	Brake chopper threshold
0	3-phase 400 V AC	677 V DC
1	3-phase 440 V AC	735 V DC
2	3-phase 480 V AC	775 V DC

- This brake chopper threshold can be reduced by 0 ... 150 V by means of C00174.

STOP

Stop!

For the braking method C00175 = 2 / 4, the following applies:

The brake chopper threshold resulting from C00173 and C00174 must not exceed the stabilised DC-bus voltage, since otherwise, deceleration cannot take place!

Example:

A 400 V device has a maximum mains voltage of 420 V AC.

- Maximum stationary DC-bus voltage: 420 V AC * 1.414 = 594 V DC
- This means that C00174 can be set to a maximum of 83 V DC (677 V DC - 594 V DC).

5.11.3 Response to an increase of the DC-bus voltage

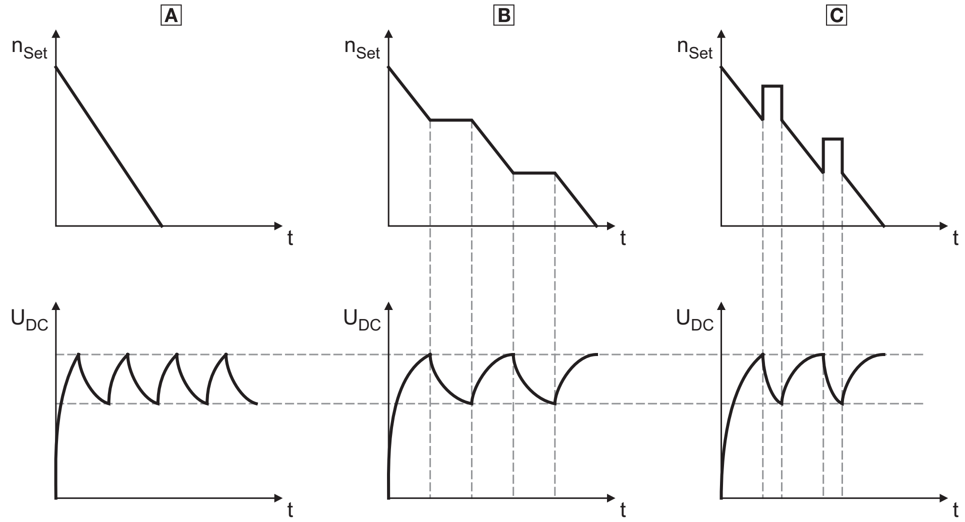
If the brake chopper threshold resulting from C00173 and C00174 is exceeded in the DC bus, the reaction selected in C00175 takes place (use of the brake resistor and/or stop of the ramp function generator and/or stop of the deceleration).

- Optimum following of the actual speed value until the speed setpoint is reached (e.g. the motor is stopped rapidly) is always achieved with the help of a brake resistor.
- Stopping the deceleration enables a smoother braking with lower dynamics and torque oscillation.
- From version 02.00.00, C00175 = 4 provides for the inverter motor brake. This function enables a quick braking without using a brake resistor. Depending on the procedure, torque oscillations may occur.

STOP **Stop!**

- Both braking methods "Stop of deceleration" and "Inverter motor brake" can only be used for speed-controlled applications without the influence of a position controller!
- When the "Inverter motor brake" function is used, the Motor load monitoring (I2xt) is not adapted. If it is braked too frequently, there is a risk of the motor being thermally overloaded or the motor overload monitoring does not work properly!
- The "inverter motor brake" function
  - must not be used with vertical conveyors (hoists) or active loads!
  - is not available with sensorless vector control.

The way in which the different brake procedures work is demonstrated schematically in the following illustration:



A Use of the brake resistor (C00175 = "0: Brake resistor")
B Stop of deceleration (C00175 = "1: HlgStop")
C Inverter motor brake (C00175 = "3: FU_MotBrk + HlgStop)

[5-7] Graph of the effective speed setpoint and the DC bus voltage during braking

Tip!

If it is possible to dispense with exact adherence to the deceleration ramp in simple applications, selection of a braking method without an external brake resistor enables costs to be reduced due to the avoidance of having to use a brake resistor .

- For the delay time, select a value as high as possible if you are not using an external brake resistor, and use the S-shaped ramp if possible.

The "inverter motor brake" function serves to implement an effective braking torque of 10 ... 20 % of the rated motor torque.

5.11.3.1 Inverter motor brake

This function extension is available from version 02.00.00!

With this alternative brake procedure to be selected in C00175, energy of the regenerative energy is converted in the motor by a dynamic acceleration/deceleration in connection with the ramping down of the ramp function generator.

Stop!

- This braking procedure only works with speed-controlled applications without intervention of a position controller!
- When the "Inverter motor brake" function is used, the Motor load monitoring (I2xt) is not adapted. If it is braked too frequently, there is a risk of the motor being thermally overloaded or the motor overload monitoring does not work properly!
- The "inverter motor brake" function must not be used with vertical conveyors (hoists) or active loads!

Tip!

If no brake resistor is used, the DC injection brake can also be used for braking in addition to the "inverter motor brake" and "stop of deceleration" function. ▸ DC-injection braking (📖 102)

For applications with high mass inertia and long braking times (> 2 s), we recommend to use the DC injection brake.

- The DC injection brake allows for an oscillation-reduced braking process. The duration of the braking process is generally longer than with the "inverter motor brake" function with an optimum setting. Moreover, the function is only recommended for a braking to a standstill.

In the following cases we recommend to use the "inverter motor brake" function:

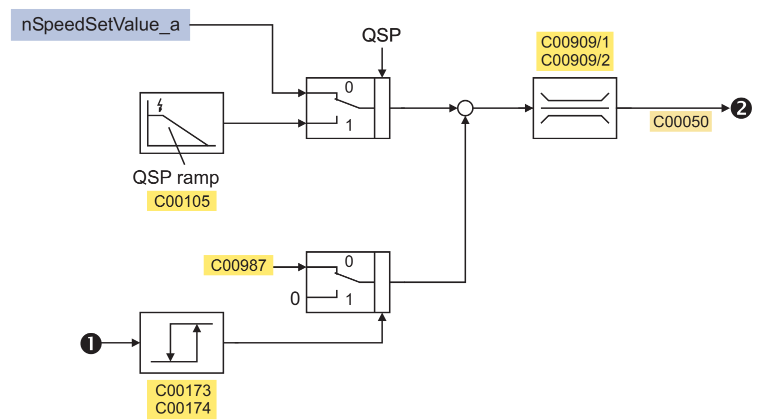
- For all applications where it is not braked to a standstill (e.g. braking to a lower speed setpoint) or where the braking process can be interrupted by defining a new speed setpoint.
- For applications with low mass inertias and a short braking time (< 1 s).
- For all applications where a quick braking is to be achieved.

Operating mode of the inverter motor brake

During the deceleration, the speed encoder is stopped. The speed set in C00987 is added to the speed setpoint by means of a hysteresis-2-point DC-bus voltage controller. Here, the sign of the current actual speed is considered. Moreover, the speed controller is stopped during overvoltage.

If the DC-bus voltage falls below a defined DC-bus voltage potential of the hysteresis controller, the applied additive speed is cancelled and the speed encoder is enabled again.

The alternating acceleration and braking resulting from this circuit cause the energy to be thermally converted in the motor.



❶ DC-bus voltage
❷ Speed setpoint for motor control

[5-8] Signal flow of the "inverter motor brake" function

- ▶ In case of an asynchronous motor the additive speed setpoint (C00987) is to amount to the 1 ... 4-fold slip of the machine:

$$C00987\,[\text{rpm}] = 1 \ldots 4 \cdot (n_{\text{Sync}}[\text{rpm}] - n_{\text{Rated}}[\text{rpm}])$$

$$n_{\text{Sync}}[\text{rpm}] = \frac{f_{\text{Rated}}\text{Hz} \cdot 60}{p}$$

p = number of pole pairs
n_{rated} = rated motor speed
f_{rated} = rated motor frequency
n_{Sync} = synchronous motor speed

[5-9] Formula for calculating the additive speed setpoint for an asynchronous motor

Note!

When the "inverter motor brake" function is used, torque oscillations take place which can have a negative effect on the service life of the mechanical drive train (e.g. gearbox).

- The amount of oscillations depends on the drive train (mass inertia, natural frequencies, etc.) and the setting of the function.
- We recommend to optimise the "inverter motor brake" function for an oscillation-reduced operation as described in the following. Usually, no torque oscillations occur with this setting which may affect the service life of the gearbox.
- The settings for implementing a maximum acceleration ramp are only recommended if the inverter motor brake is rarely is used (e.g. with quick stop).

How to set the "inverter motor brake" function for an oscillation-reduced operation:

For V/f characteristic open-loop control/closed-loop control (VFCplus):

- Set reduced brake chopper threshold (C00174) to approx. 70 V.
- Set additive speed (C00987) to rated slip speed.
- Adapt the deceleration ramp in order that the deceleration time is slightly below (10 ... 30 %) the deceleration time to be implemented with the inverter motor brake.

How to set the "inverter motor brake" function for a maximum acceleration ramp:

For V/f characteristic open-loop control/closed-loop control (VFCplus):

- Set reduced brake chopper threshold (C00174) to approx. 70 V.
- Set additive speed (C00987) to 1.5 ... 2.5 times the rated slip speed.
- Adapt the deceleration ramp in order that the deceleration time is slightly below (10 ... 30 %) the deceleration time to be implemented with the inverter motor brake.

For sensorless vector control (SLVC):

- Set reduced brake chopper threshold (C00174) to approx. 70 V.
- Set additive speed (C00987) to 2 ... 4-fold rated slip speed.
- Adapt the deceleration ramp in order that the deceleration time is slightly below (10 ... 30 %) the deceleration time to be implemented with the inverter motor brake.

5.11.3.2 Degradation of braking energy by motor overmagnetisation

This function extension is available from version 02.00.00!

The braking procedure "6: Brake resistor + MotorFluxAdd" to be selected in C00175 causes the motor to be overmagnetised by the percentage value set in C00984 every time the speed is reduced. The overmagnetisation causes the motor current to increase which leads to further losses in the motor (and in the controller). Hence, the arising braking energy can be dissipated faster via the motor losses.

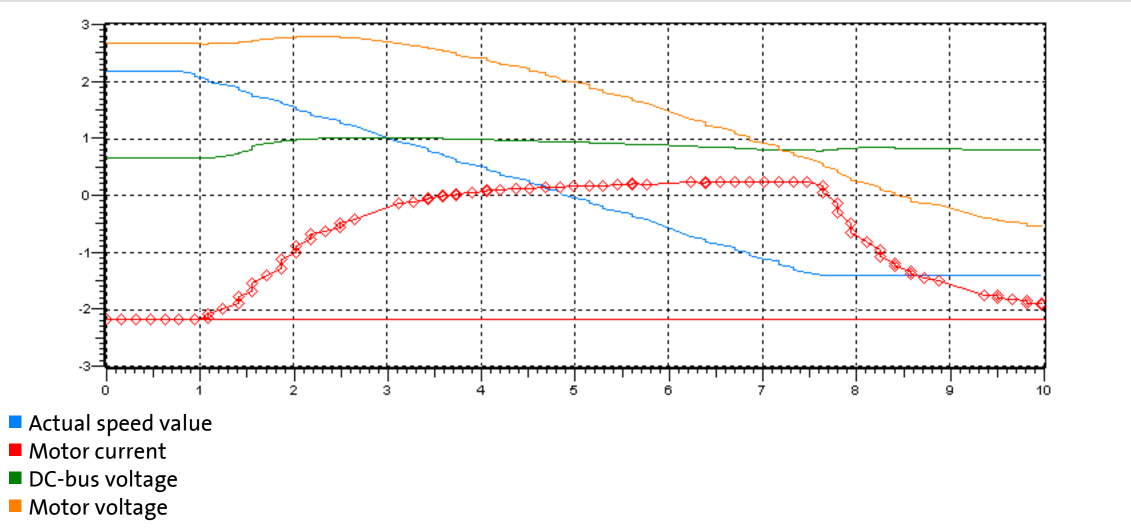
Especially with smaller motors and their lower efficiency, the braking procedure allows for a quicker braking than if no brake resistor was used and the brake ramp stopped time and again.

Note!

The overmagnetisation may be selected only that high in C00984 that the maximum inverter current will not be exceeded!

In case of high speeds, the controller may already output the maximum motor voltage (C00090) and hence no increase of the motor voltage/motor magnetisation may be possible.

Example oscillogram



[5-10] Example oscillogram

5.12 Power and energy display

Independent of the motor control mode selected in C00006, the current output power and the output energy supplied over the total operating time can be queried via the following display parameters:

Parameter	Info	Lenze setting	
		Value	Unit
C00980/1	Active output power	-	kW
C00980/2	Apparent output power	-	kW
C00981/1	Output energy in motor mode • The value is saved in the device by switching off the mains and cannot be reset.	-	kWh
C00981/2	Output energy in generator mode • The value is saved in the device by switching off the mains and cannot be reset.	-	kWh
Highlighted in grey = display parameter			

These display parameters serve to execute an energy analysis in the respective application. From this, decisions can be derived whether a measurement for energy optimisation is economical.

- Hence, the following questions can be answered:
  - Is it worth to use a regenerative module or should the energy be dissipated via a brake resistor?
  - Is it worth to use a DC-bus connection between the devices? (Not possible with 8400 motec.)
  - Does the application permit other parameter settings which contribute to energy saving (e.g. lower speed, other ramp times, and speed/torque profiles)?
  - What is the advantage of the V/f characteristic control - energy-saving (VFCplusEco) compared to the other control modes?

5.13 Monitoring

Many monitoring functions that are integrated into the controller can detect errors and thus protect the device/motor from damage or overload.

- Detailed information on the individual monitoring functions can be found in the following subchapters.

Parameter	Monitoring	Response (Lenze setting)
C00565	Mains phase failure monitoring	Warning
C00574	Brake resistor monitoring (I2xt)	Fault
C00585	Motor temperature monitoring (PTC)	Fault
C00586	Encoder open-circuit monitoring	Fault
C00600/1	Undervoltage in the DC bus	Fault
C00601/1	Overvoltage in the DC bus • The response to overvoltage is always "Fault". • The response only takes place after the deceleration time set in C00601/1 has elapsed (if the overvoltage is still present then).	Fault
C00604	Device overload monitoring (Ixt)	Warning
C00606	Motor load monitoring (I2xt)	Warning

Parameterisable responses

If a monitoring function trips, the response set via the corresponding parameter is carried out. The following responses can be selected:

- "No response": Response/monitoring is deactivated.
- "Fault": Change of the operating status by a pulse inhibit of the power output stage.
- "Warning": Operating status of the controller remains unchanged. Only a message is entered into the logbook of the controller.

Related topics:

- Device state machine and device states (📖 41)
- Diagnostics & error management (📖 193)
- Error messages of the operating system (📖 204)

5.13.1 Device overload monitoring (Ixt)

C00064/1...3 displays the device utilisation (ixt) in [%] in different time intervals:

Parameter	Info
C00064/1	Device utilisation (Ixt) • Maximum value of pulse utilisation (C00064/2) and permanent utilisation (C00064/3).
C00064/2	Device utilisation (Ixt) 15s • Pulse utilisation over the last 15 seconds (only for loads >160 %).
C00064/3	Device utilisation (Ixt) 3 min • Permanent utilisation over the last 3 minutes.
Highlighted in grey = display parameter	

- If the device utilisation reaches the warning threshold set in C00123 (Lenze setting: 100 %):
  - The error response set in C00604 will be carried out (Lenze setting: "Warning").
  - The "OC5: Ixt overload" error message will be entered into the logbook.
- A setting of C00604 = "0: No Reaction" deactivates the monitoring.
- If the device utilisation reaches the permanent shutdown limit 110 %:
  - The error response "Fault" will be carried out.
  - The "OC9: Ixt overload shutdown limit" error message will be entered into the logbook.

5.13.2 Motor load monitoring (I2xt)

The Inverter Drives 8400 are provided with a simple, sensorless, thermal I^2xt motor monitoring of self-ventilated standard motors which is based on a mathematical model.

- C00066 displays the calculated motor load in [%].
- If the calculated motor load reaches the switch-off threshold set in C00120:
  - The error response set in C00606 will be carried out (Lenze setting: "Warning").
  - The "OC6: I2xt motor overload" error message will be entered into the logbook.
- A setting of C00606 = "0: No Reaction" deactivates the monitoring.

Stop!

The I^2xt motor monitoring does not present full motor protection! As the motor utilisation calculated in the thermal motor model is lost after mains switching, for instance the following operating states cannot be measured correctly:

- Restarting (after mains switching) of a motor that is already very hot.
- Change of the cooling conditions (e.g. cooling air flow interrupted or too warm).

A full motor protection requires additional measures as e.g. the evaluation of temperature sensors that are located directly in the winding or the use of thermal contacts.

Adjustment of the motor utilisation meter

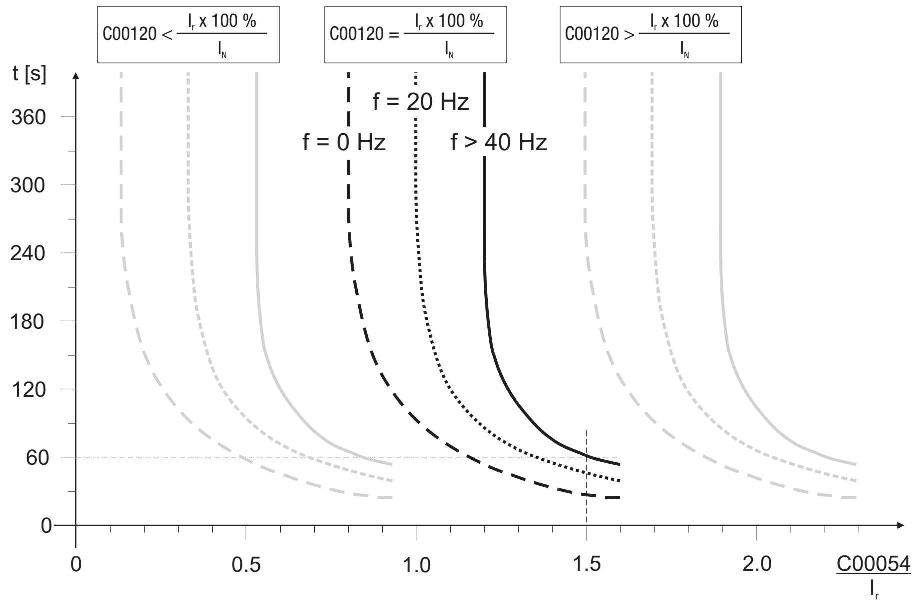
The motor utilisation meter for indicating the motor load in C00066 begins to count when the apparent motor current (C00054) is greater than the set overload threshold (C00120).

The overload threshold (C00120) is to be set as follows:

$$C00120 = \frac{I_r}{I_N} \cdot 100\%$$

I_r : Rated motor current (see nameplate of motor)
I_N: Rated controller current at a switching frequency of f = 8 kHz

- If you reduce C00120 starting from the calculated value, the motor utilisation meter will already be counted up before the rated overload threshold is reached.
- If you increase C00120 starting from the calculated value, the motor utilisation meter will not be counted up until the rated overload threshold is reached.



f: Output frequency
t: Release time
I_N: Rated current of drive controller at a switching frequency of f = 8 kHz
I_r : Rated motor current (see nameplate of motor)
C00054: Apparent motor current
C00120: Motor overload threshold

[5-11] Tripping characteristic of the I^2xt monitoring

Example:

C00120 = I_r /I_N x 100 %

C00054 = 150 % rated motor current

- After approx. 60 seconds, C00066 has reached the final value (100 %) at output frequencies f > 40 Hz.
- The controller outputs the "OC6: I2xt overload motor" error message and triggers the response set in C00606 (default setting: "Warning").

Tip!

- If forced ventilated motors are used, a premature response of the overload threshold can be avoided by deactivating this function if necessary (C00606 = "0: No Reaction").
- The current limits set in C00022 and C00023 influence the I^2xt calculation only in an indirect way. However, the operation of the motor at maximum possible load can be averted. ▶ Defining current and speed limits (📖 64)

5.13.3 Motor temperature monitoring (PTC)

For detecting and monitoring of the motor temperature, a PTC thermistor (DIN 44081/ DIN 44082) or a thermal contact (NC contact) can be connected to the terminals T1 and T2.

Stop!

- The controller can only evaluate one PTC thermistor!
  Do not connect several PTC thermistors in series or parallel.
- To achieve full motor protection, an additional temperature monitoring with separate evaluation must be installed.

Note!

- In the Lenze setting (C00585 = "1: Fault"), motor temperature monitoring is activated!
- Lenze three-phase AC motors are provided with a thermal contact on delivery.

- If 1.6 kΩ < R < 4 kΩ at the terminals T1 and T2, the monitoring will respond, see functional test below.
- If the monitoring responds:
  - The error response set in C00585 will be carried out (Lenze setting: "Fault").
  - The "OH3: Motor temperature (X106) tripped" error message will be entered into the logbook.
- A setting of C00585 = "0: No Reaction" deactivates the monitoring.

Tip!

We recommend to always activate the PTC input when using motors which are equipped with PTC thermistors or thermostats. This prevents the motor from being destroyed by overheating.

Functional test

Connect a fixed resistor to the PTC input:

- R > 4 kΩ : Fault message must be activated.
- R < 1 kΩ : Fault message must not be activated.

5.13.4 Brake resistor monitoring (I2xt)

Due to the converted braking power, the brake resistor is thermally stressed and can even be thermally destroyed by excessive braking power.

The monitoring of the I^2xt utilisation of the controller serves to protect the brake resistor. It acts in proportion to the converted braking power.

Danger!

In the Lenze setting (C00574 = "1: Fault"), the response of the monitoring function stops the braking operation.

In particular for applications such as hoists, check if a stopping of the braking operation due to the setting of C00574 = "1: Fault" is permissible.

Stop!

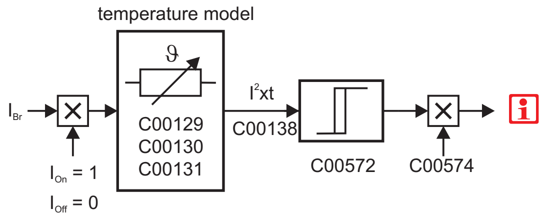
Implement appropriate protective measures against thermal overload of the brake resistor!

Examples:

- Parameterisation of an error response in C00574 and evaluation of the parameterised error message within the application or the machine control system.
- Interruption of the mains supply by means of the temperature contact at the brake resistor and a simultaneous activation of the mechanical brake.
- Evaluating the temperature contact at the brake resistor by the motor PTC input of the controller.

- If the I^2xt utilisation reaches the switch-off threshold set in C00572:
  - The error response set in C00574 will take place.
  - The "OC12: I2xt brake resistor overload" error message is entered into the logbook.
- If the system is dimensioned correctly, the monitoring should not be activated. If individual pieces of rated data of the actually connected brake resistor are not known, they have to be identified.
- If the DC-bus voltage exceeds the overvoltage threshold due to a braking energy that is too high, the monitoring for overvoltage in the DC bus is activated ("OU: DC-bus overvoltage" error message).

Temperature model



Error message: "OC12: I2xt overload brake resistor"

[5-12] Signal flow for monitoring the brake resistor

The monitoring function calculates the braking current I_{Br} from the current DC-bus voltage U_{DC_act} and the brake resistance parameterised in C00129:

$$I_{Br} = \frac{U_{DC\_act}}{C00129}$$

Note!

The monitoring function can also be triggered due to a value entered in C00129 although a brake resistor is not even connected.

- During the calculation, the thermal utilisation of the brake resistor on the basis of the following parameters is taken into consideration:
  - Resistance value (C00129)
  - Continuous power (C00130)
  - Thermal capacity (C00131)
- In the Lenze setting these parameters are preset with the corresponding power-adapted Lenze brake resistor.
- C00133 indicates the calculated utilisation of the brake resistor in [%].
  - A utilisation of 100 % corresponds to the continuous power of the brake resistor depending on the maximally permissible temperature limit.

Related topics:

▶ Braking operation/braking energy management (📖 112)

5.13.5 Mains phase failure monitoring

Stop!

Under load, the mains input of a three-phase controller can be destroyed if the device is only supplied by two phases (e.g. if a mains phase fails).

The drive controller has a simple mains-phase failure detection function with which a mains phase failure can be detected under load.

- In the case of power-adapted machines, approx. 50 % of the rated motor power must be exceeded so that a main-phase failure can be detected.
- If the mains phase failure monitoring is tripped:
  - The error response set in C00565 will be carried out (Lenze setting: "Warning").
  - The "Su02: Mains voltage switched-off" error message is entered into the logbook.

Note!

The failure of a mains phase can also generate an error message "LU: DC-bus undervoltage". This error cannot be parameterised by C00565.

5.13.6 Encoder open-circuit monitoring

This function extension is available from version 02.00.00!

Note!

In the Lenze setting (C00586 = "1: Fault), encoder open-circuit monitoring is activated.

When does the open-circuit monitoring respond?

Open-circuit monitoring responds if

- there is an open circuit in the encoder cable.
- during the starting phase of the motor, an extreme overload occurs (e.g. blocked motor shaft).
- the motor is reversed highly dynamically.

Which measured values cause open-circuit monitoring?

The following measured values checked for plausibility cause open-circuit monitoring:

1. If for a time > 0.2 s, the amount of deviation between the actual speed value and the speed setpoint is higher than f = 40 Hz.
2. If for a time > 0.2 s, the detected actual speed value is f = 0 Hz or n = 0 rpm and the I_{max} controller is active at the same time.
3. If for a time > 0.2 s, the injected frequency and the actual speed value have different signs and the I_{max} controller is active at the same time. This is usually the case if A/B tracks are mixed up.

Response to open circuit

- If open-circuit monitoring responds:
  - The error response set in C00586 will be carried out (Lenze setting: "Fault").
  - The "SD3: Open circuit feedback system" error message is entered into the logbook.
- A setting of C00586 = "0: No Reaction" deactivates the monitoring.

Related topics:

- Encoder/feedback system (📖 107)

6 I/O terminals

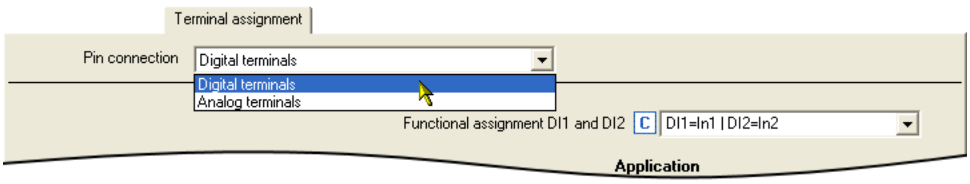
This chapter provides information on the function, possible parameter settings, and technical data of the input/output terminals of the controller.

Which input and output terminals are available depends on the communicaton unit used:

Communication unit		**Digital terminals**			**Relay output**	**Analog input**	**Safety**	**ext. 24 V**
		RFR	**DI**	**DO**				
NoBus		1	2	-	1	-	-	-
CANopen option	simple	1	5	1	-	-	-	-
	complete	1	5	1	1	1	1	-
AS-i option	simple	1	5	1	-	-	-	1
	complete	1	5	1	1	1	1	1
PROFIBUS option	simple	1	5	1	-	-	-	1
	complete	1	5	1	1	1	1	1

Detailed information on the respective "CAN" communication unit can be found in the corresponding online help and in the communication manual (KHB).

In the »Engineer«, the digital and analog input and output terminals are parameterised on the **Terminal assignment** tab. To do this, go to the **Control terminals** list field and select the terminals that you wish to parameterise:



You can find further information in the respective subchapter:

- Digital terminals (📖 131)
- Analog terminals (📖 137)

Note!

The input and output terminals of the controlelr are already functionally assigned in the default setting ("Lenze setting"). The preconfigured assignment depends on the control mode selected in C00007.

- Terminal assignment of the control modes (📖 167)

Tip!

How you can alter the preconfigured assignment of the input and output terminals is described in the chapter entitled "User-defined terminal assignment". (📖 139)

6.1 Digital terminals

Digital input terminals

Depending on the communication unit used, the controller has

- max. five parameterisable input terminals (DI1 ... DI5) for detecting digital signals.
- one RFR control input for controller enable.

Danger!

The RFR control input is connected as default with a bridge to +24 V, which means that the controller is enabled!

- This input can also be used for switching on/off the drive. For this purpose, the bridge must be replaced by cabling.

Digital output terminals

Depending on the communication unit used, the controller has

- a parameterisable output terminal (DO1) for outputting digital signals,
- a parameterisable relay switch contact (NO contact).

Note!

Initialisation behaviour:

- After mains switching up to the start of the application
  - the digital output remains set to FALSE.
  - the switch contact of the relay remains opened.

Exception handling:

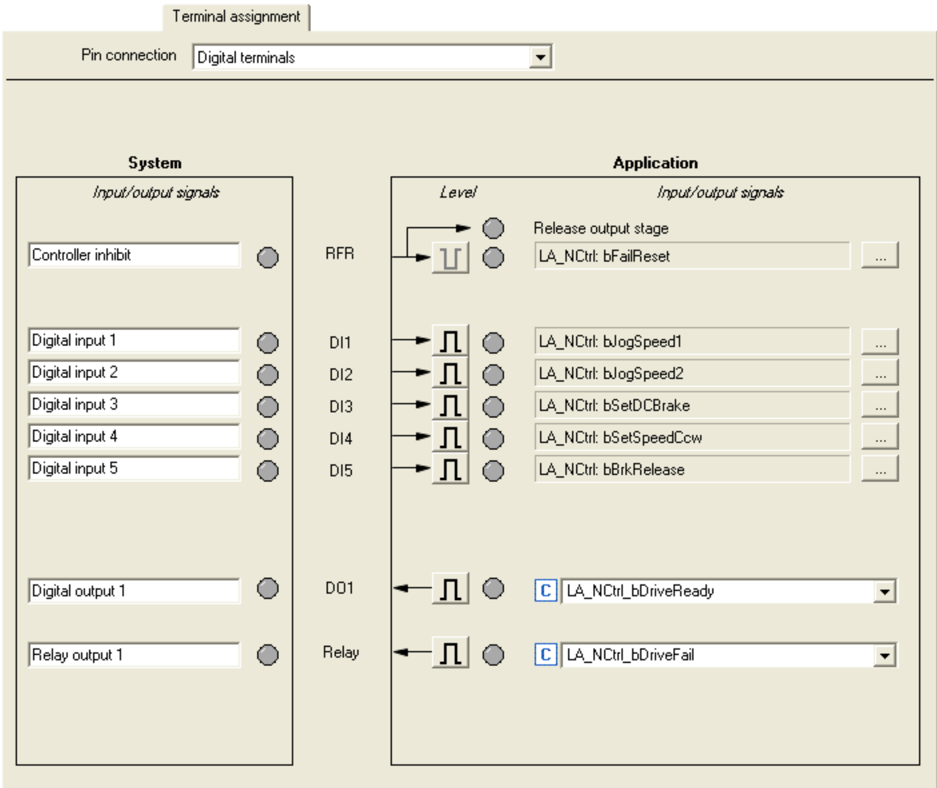
- In the event of a critical exception in the application (e.g. reset), the digital output is set to FALSE.

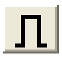
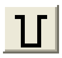
Switching cycle diagnostics of the relay:

- A reference for evaluating the wear limit can be obtained via the number of switching cycles of the relay displayed in C00177/2.

Parameterisation dialog in the »Engineer«

- The representation in the »Engineer« and the possible settings depend on the communication unit used.
- The following illustration displays exemplarily all optional terminals:



Button	Function
	Indicates the polarity of the input is HIGH active. The polarity can be changed from HIGH active to LOW active by clicking on this button.
	Indicates that the polarity of the input is LOW active. The polarity can be changed from LOW active to HIGH active by clicking on this button.
	Open the parameterising dialog for assigning application inputs to the digital input. ▶ Changing the terminal assignment with the »Engineer« (📖 141)

Short overview of parameters for the digital terminals:

Parameter	Info	Lenze setting Value	Unit
C00115/1 (from version 02.00.00)	Function assignment DI1 and DI2 Configuring DI1 and DI2 as frequency inputs	0: DI1=In1 / DI2=In2	
Digital inputs DI1 ... DI5			
C00114	DIx: Polarity	Bit coded	
C00443/1	DIx: Terminal level	-	
C00443/2	DIx: Output level (to the application)	-	
Digital output DO1 / relay output			
C00118	DOx: Inversion	Bit coded	
C00444/1	DOx: Input level (from the application)	-	
C00444/2	DOx: Terminal level	-	
Digital outputs - terminal configuration			
C00621/1	LS_DigitalOutput:bRelay	1001: LA_nCtrl_bDriveFail	
C00621/2	LS_DigitalOutput:bOut1	1000: LA_nCtrl_bDriveReady	
Highlighted in grey = display parameter			

Tip!

For debouncing digital inputs, two parameterisable delay elements (L_GP_DigitalDelay1 and L_GP_DigitalDelay2) are available.

Application example: Debouncing a digital input (341)

Related topics:

User-defined terminal assignment (139)

Electrical data (145)

6.1.1 Configuring DI1 and DI2 as frequency inputs

This function extension is available from version 02.00.00!

The internal processing function of the digital input terminals DI1 and DI2 can be reconfigured in C00115/1 if required. This serves to use these input terminals optionally as frequency inputs to implement the following functions:

- Detection of the input frequency
- Detection and processing of two unipolar input frequencies to one bipolar frequency
- Evaluation of the speed feedback for the V/f control (VFCplus + encoder)

C00115/1: Function assignment DI1 and DI2		Function assignment	
		DI1	DI2
0	**DI1=In1 / DI2=In2**	**Digital input**	**Digital input**
1	DI1=FreqIn12 / DI2=In2	Frequency input	Digital input
2	DI1&DI2=FreqIn (2-track)	Frequency input (2-track)	
3	(DI1/DI2=+-) = FreqIn12	Frequency input (speed)	Frequency input (direction)

Note!

- In the Lenze setting of C00115/1, the digital input terminals DI1 and DI2 are configured as "standard" digital inputs.
- The digital input terminals DI3 ... DI5 are generally designed as "standard" digital inputs.
- If the digital inputs are parameterised as frequency inputs, the corresponding output signals (*bIn1*/*bIn2*) at the LS_DigitalInput system block automatically takes the FALSE status.

General information on how to parameterise the speed feedback for the motor control can be found in the chapter entitled "Encoder/feedback system". (📖 107)

General information on using the input terminals as frequency inputs

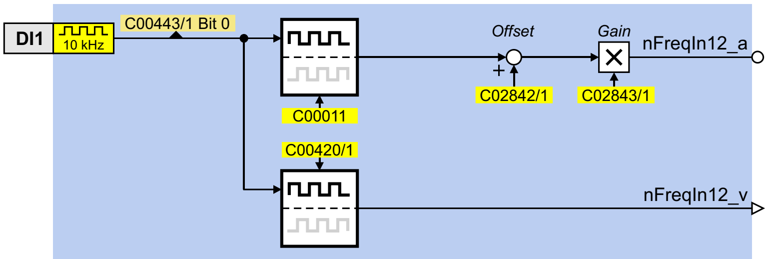
The frequency inputs serve to detect HTL encoders with any number of increments and single-track and two-track signals. Single-track signals can be evaluated with or without rotation signal.

Danger!

- For (open circuit) monitoring of the encoder, it is recommended to set the "Fault" response (Lenze setting) in C00586 for safety reasons!
- In order to prevent interference injections when using an encoder, only use shielded motor and encoder cables.
- Make sure that the maximum input frequency of 10 kHz at the frequency inputs is not exceeded when the V/f control (VFCplus + encoder) is used.
- When evaluating a single-track encoder, make sure that the sign has been selected correctly. Otherwise, there is a risk that the motor may overspeed.

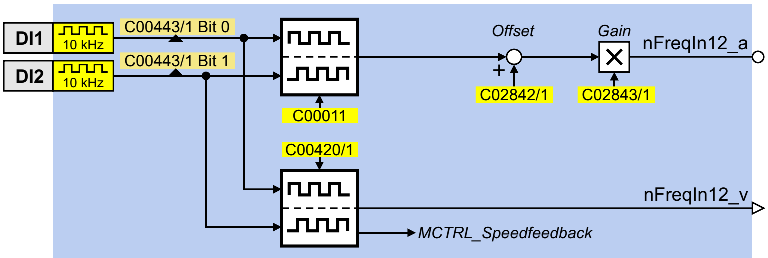
Function assignment 1: DI1=FreqIn / DI2=In

This setting in C00115/1 configures the input terminal DI1 as frequency input. The input terminal DI2 remains configured as "standard" digital input.



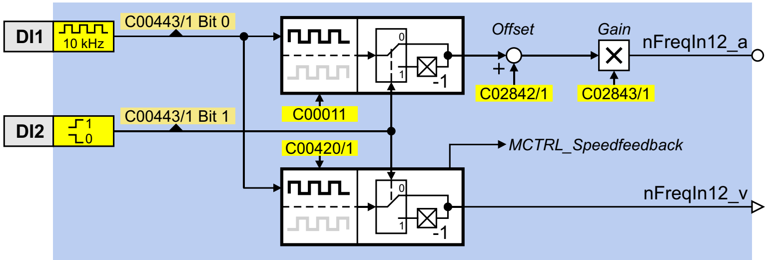
Function assignment 2: DI1&DI2=FreqIn (2-track)

This setting in C00115/1 serves to connect a two-track encoder to the terminals DI1/DI2.



Function assignment 3: DI1=FreqIn / DI2=direction

This setting in C00115/1 serves to connect a single-track encoder to the terminals DI1/DI2. Here, the rotational speed is evaluated via terminal DI1 and the direction of rotation of the encoder (LOW level ≡ CW rotation) is evaluated via terminal DI2.



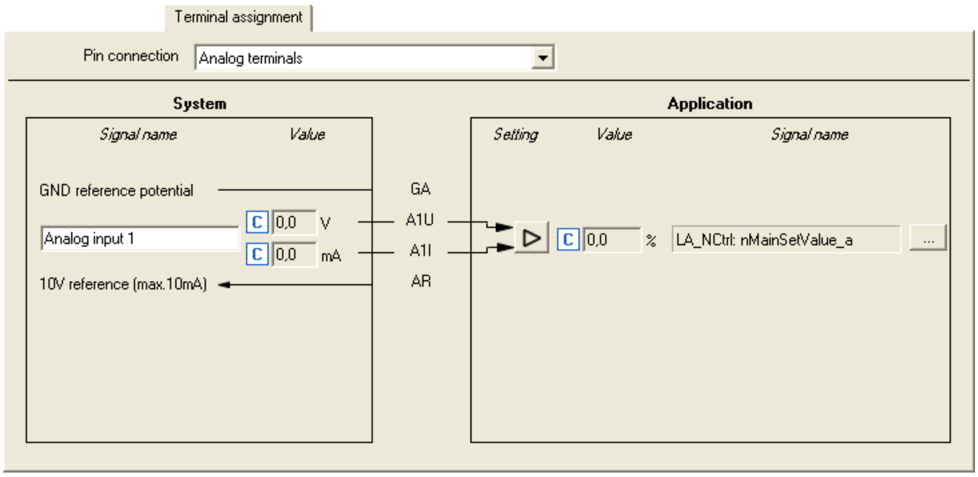
Short overview of the parameters for the frequency inputs:

Parameter	Info	Lenze setting Value	Unit
C00011	Appl.: Reference speed	1500	rpm
Frequency input DI1/DI2			
C00115/1	Fct. DI 1/2 10kHz	0: DI1=In1 / DI2=In2	
C00420/1	Number of encoder increments at FreqIn12	128	Incr./rev.
C02842/1	FreqIn12: Offset	0.00	%
C02843/1	FreqIn12: Gain	100.00	%
C00443/1	DIx: Terminal level	-	
C00445/1	FreqIn12_nOut_v	-	Incr/ms
C00446/1	FreqIn12_nOut_a	-	%
Highlighted in grey = display parameter			

6.2 Analog terminals

If a communication unit is available as complete version, an analog input can optionally be configured as voltage or current input.

Parameterisation dialog in the »Engineer«:



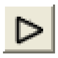
Button	Function
▷	Parameterising analog input (📖 138)
...	Open the parameterising dialog for assigning application inputs to the analog input. ▸ Changing the terminal assignment with the »Engineer« (📖 141)

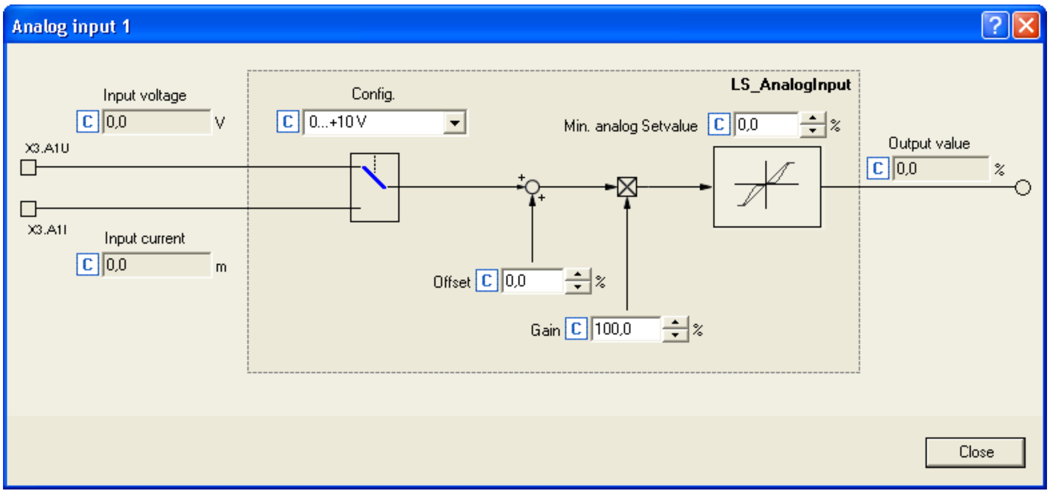
Related topics:

▸ User-defined terminal assignment (📖 139)

▸ Electrical data (📖 145)

6.2.1 Parameterising analog input

By clicking  on the **Terminal assignment** tab, you reach the parameterising dialog for the analog input:



Short overview of parameters for the analog input:

Parameter	Info	Lenze setting Value	Unit
C00034/1	AIN1: Config.	0: 0 ... +10 V	
C00026/1	AIN1: Offset	0.0	%
C00027/1	AIN1: Gain	100.0	%
C00010/1	AIN1: Minimum analog setpoint	0.0	%
C00598/1	Resp. to open circuit AIN1	1: Fault	
C00028/1	AIN1: Input voltage	-	V
C00029/1	AIN1: Input current	-	mA
C00033/1	AIN1: Output value (to application)	-	%
Highlighted in grey = display parameter			

Using terminal AU/AI as current input

In the Lenze setting, voltage signals in the range of 0 ... +10 V are evaluated via the analog input terminal AU/AI. If current signals are to evaluated instead, the selection "1: 0...20 mA" oder "2: 4...20 mA" is to be set in C00034.

Open-circuit monitoring

With a configuration as 4 ... 20 mA current loop, the error response set in C00598 takes place in the event of a wire breakage (Lenze setting: "1: Fault").

6.3 User-defined terminal assignment

In order to individually adapt the preconfigured assignment of the input/output terminals to your application, you can choose one of the following procedures:

A. In the »Engineer«:
   – Change the terminal assignment on the **Terminal assignment** tab.
   – Change the signal assignment on the **Application Parameters** tab, on the dialog level *Overview* ➞ *Signal flow*.

B. In the »Engineer« or with the keypad:
   – Change the parameters for signal configuration in the parameters list.

Note!

If you change the preconfigured assignment of the input/output terminals, the terminal assignment will be a user-defined one. In C00007, control mode "0: Interconnection changed" will be shown.

Tip!

First set a suitable Lenze configuration by selecting a corresponding control mode in C00007.

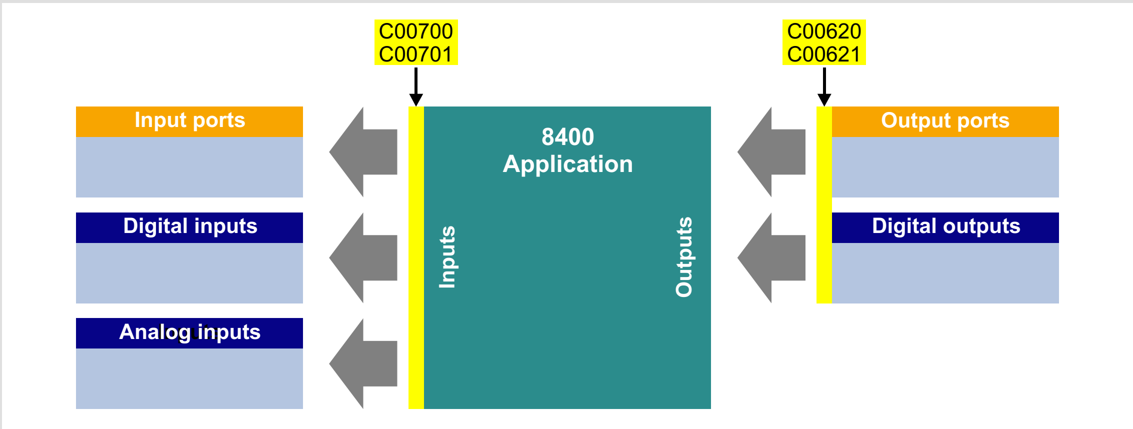
We recommend using the »Engineer« for the implementation of comprehensive user-defined drive solutions.

6.3.1 Source-destination principle

The I/O configuration of the input and output signals is carried out according to the source/destination principle:

- A connection always has a direction and therefore always has a source and a target.
- The input signals of the application are logically linked via configuration parameters to the output signals of system blocks which represent the device input terminals.
- The inputs of system blocks that represent the device output terminals are logically to output signals of the application via configuration parameters.

The following graphic illustrates the source/destination principle:



[6-1] Source-destination principle

Note the following:

- A device input terminal can be logically linked to several inputs of the application.
- Each input of the application can only be logically linked to one input signal.
- An output of the application can be logically linked to several device output terminals.

6.3.2 Changing the terminal assignment with the »Engineer«

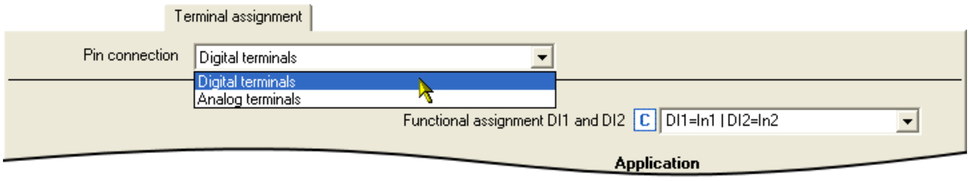
The »Engineer« serves to easily change the preconfigured terminal assignment via corresponding dialogs. The following task serves to describe the respective procedure.

Task: Based on the preset control mode "Terminals 0", the digital input DI2 is used for activating the quick stop instead of selecting the fixed setpoint 2/3. For this purpose, the digital input DI2 must not be linked to the *bJogSpeed2* input but to the *bSetQuickstop* input of the application.

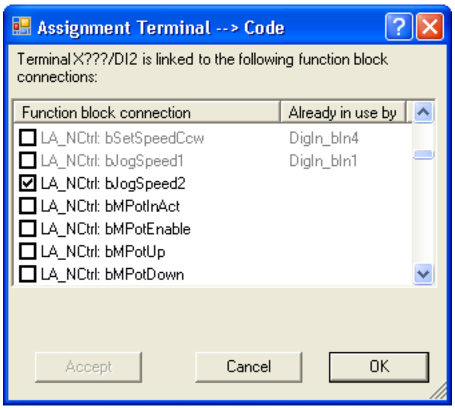
Possibility 1: Change terminal assignment by means of the Terminal Assignment tab

Procedure:

1. Select the "Digital terminals" entry on the **Terminal assignment** tab in the **Control terminals** list field:



2. Click on the  button for the DI2 terminal in order to open the dialog box *Assignment Terminal --> Function block*.
   – In the list field, all block inputs that are currently logically linked to digital input DI2 are marked with a checkmark:



3. Remove checkmark for the connection **LA_NCtrl: bJogSpeed2** in order to cancel the existing logical link.
4. Set checkmark for connection **LA_NCtrl: bSetQuickstop** in order to logically link this application input to digital input DI2.
5. Click the **OK** button to clise the dialog box again.

Possibility 2: Change terminal assignment by means of the signal flow shown

Procedure:

1. Go to the **Application parameters** tab.
2. Go to the **Application Parameters** tab and click on the **Signal flow** button in order to change to the dialog level *Overview* ➞ *Signal flow*.
3. In the **bJogSpeed2** list field, set the selection "0: Not interconnected".
4. In the **bSetQuickstop** list field, set the "12: DigIn_bIn2" selection.

Related topics:

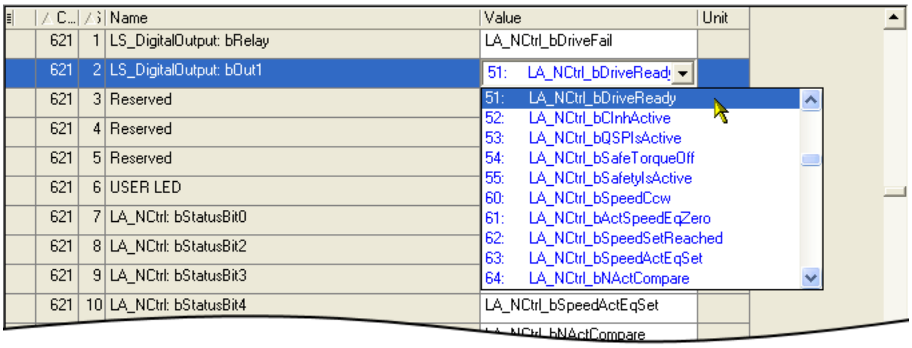
- Signal flow (📖 150)
- Interface description (📖 154)
- Pre-assignment of the drive application (📖 163)

6.3.3 Changing the terminal assignment via configuration parameters

The preconfigured terminal assignment can be reconfigured via a bus system, with the keypad or with the »Engineer« by means of configuration parameters.

- Each configuration parameter represents a signal input of a function block, a system block or an application block.
- Each configuration parameter contains a selection list with output signals of the same type of data.
- Logical linking is thus carried out by selecting the output signal for the corresponding signal input.

In the following example, digital output 1 (**LS_DigitalOutput**.*bOut1* input) is logically linked to the status signal "Drive ready" (*LA_nCtrl_bDriveReady* output signal):



Configuration parameters for the digital output terminals

The subcodes of C00621 can be used to change the preconfigured terminal assignment of the digital terminals:

Parameter	Info	Lenze setting Value	Unit
C00621/1	LS_DigitalOutput:bRelay	1001: LA_nCtrl_bDriveFail	
C00621/2	LS_DigitalOutput:bOut1	1000: LA_nCtrl_bDriveReady	

Other subcodes (not shown here) allow the configuration of input signals of different system blocks and port blocks.

Configuration parameters for the inputs of the application

The following parameters can be used to change the preconfigured assignment of the application inputs:

Parameter	Info	Lenze setting
C00700/1	LA_NCtrl: nMainSetValue_a	10: AIn1_Out
C00700/2	LA_NCtrl: nTorqueMotLim_a	22: nPar3_a
C00700/3	LA_NCtrl: nTorqueGenLim_a	22: nPar3_a
C00700/4	Reserved	0: Not connected
C00700/5	LA_NCtrl:Network(MCI/CAN)_wDriveControl	6: C_wDriveCtrl
C00700/6	LA_NCtrl: nPIDVpAdapt_a	1: C_nPos100_a(100.0%)
C00700/7	LA_NCtrl: nPIDActValue_a	0: Not connected
C00700/8	LA_NCtrl: nPIDInfluence_a	1: C_nPos100_a(100.0%)
C00700/9	LA_NCtrl: nPIDSetValue_a	0: Not connected
C00700/10	Reserved	0: Not connected
C00700/11	L_GP_Counter1: wLdVal	0: Not connected
C00700/12	L_GP_Counter1: wCmpVal	0: Not connected
C00700/13	L_GP_Compare1: nIn1_a	0: Not connected
C00700/14	L_GP_Compare1: nIn2_a	0: Not connected
C00701/1	LA_NCtrl: bCInh	0: Not connected
C00701/2	LA_NCtrl: bFailReset	10: DigIn_CInh
C00701/3	LA_NCtrl: bSetQuickstop	0: Not connected
C00701/4	LA_NCtrl: bSetDCBrake	13: DigIn_bIn3
C00701/5	LA_NCtrl: bSetSpeedCcw	14: DigIn_bIn4
C00701/6	LA_NCtrl: bJogSpeed1	11: DigIn_bIn1
C00701/7	LA_NCtrl: bJogSpeed2	12: DigIn_bIn2
C00701/8	LA_NCtrl: bMPOTUp	0: Not connected
C00701/9	LA_NCtrl: bMPOTDown	0: Not connected
C00701/10	LA_NCtrl: bMPOTInAct	0: Not connected
C00701/11	LA_NCtrl: bMPotEnable	0: Not connected
C00701/12	LA_NCtrl: bRFG_0	0: Not connected
C00701/13	LA_NCtrl: bSetError1	0: Not connected
C00701/14	LA_NCtrl: bSetError2	0: Not connected
C00701/15	LA_NCtrl: bPIDInfluenceRamp	1: C_bTrue
C00701/16	LA_NCtrl: bPIDIOff	0: Not connected

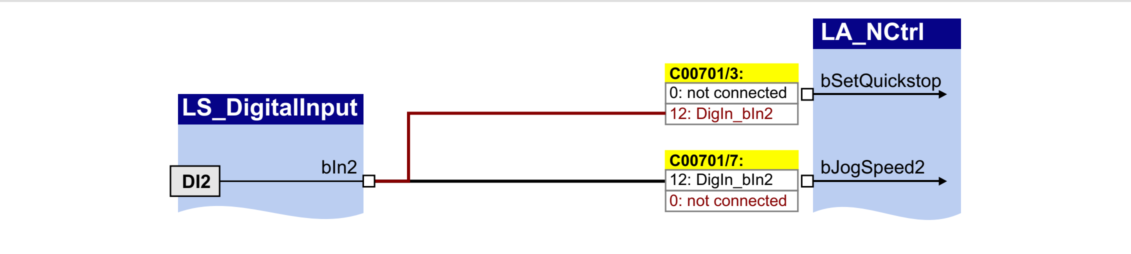
Parameter	Info	Lenze setting
C00701/17	LA_NCtrl: bRLQCw	1: C_bTrue
C00701/18	LA_NCtrl: bRLQCcw	0: Not connected
C00701/19	LA_NCtrl: bBrkRelease	15: DigIn_bIn5
C00701/20	L_GP_Counter1: bClkUp	0: Not connected
C00701/21	L_GP_Counter1: bClkDown	0: Not connected
C00701/22	L_GP_Counter1: bLoad	0: Not connected
C00701/23	L_GP_DigitalDelay1: bIn	0: Not connected
C00701/24	L_GP_DigitalDelay2: bIn	0: Not connected
C00701/25	LS_WriteParamList: bExecute	0: Not connected
C00701/26	LS_WriteParamList: bSelectWriteValue_1	0: Not connected
C00701/27	Reserved	0: Not connected
C00701/28	L_GP_DigitalLogic1: bIn1	0: Not connected
C00701/29	L_GP_DigitalLogic1: bIn2	0: Not connected

Example

Task: Based on the preset control mode "Terminals 0", the digital input DI2 is used for activating the quick stop instead of selecting the fixed setpoint 2/3. For this purpose, the digital input DI2 must not be linked to the *bJogSpeed2* input but to the *bSetQuickstop* input of the application.

Procedure:

1. Change the setting of the configuration parameter LA_NCtrl: bSetQuickstop (C00701/3) which represents the logical link of the *bSetQuickstop* application unit: "0: Not connected" ➜ "12: DigIn_bIn2"
2. Change the setting of the configuration parameter LA_NCtrl: bJogSpeed2 (C00701/7) which represents the logical link of the *bJogSpeed2* application unit: "12: DigIn_bIn2" ➜ "0: Not connected"



[6-2] Example: Changing the terminal assignment via configuration parameters

Tip!

The example shows that, for each input of the application, the associated configuration parameter (C00700/x or C00701/x) is only allowed to contain one source that you enter.

Related topics:

- Application example: Debouncing a digital input (📖 341)
- Signal flow (📖 150)
- Interface description (📖 154)
- Pre-assignment of the drive application (📖 163)

6.4 Electrical data

Digital terminals

Terminal	Application / electrical data	
24E	External 24-V voltage supply • DC 19.2 ... 28.8 V, IEC 61131-2, SELV/PELV • Current consumption ≈ 0.6 A • In case of polarity reversal: No function and no destruction	
GND	External reference potential	
RFR	Controller enable • Electrical data as in digital inputs	
DI1 ... DI5	Digital inputs	
	LOW level:	0 ... +5 V
	HIGH level:	+15 ... +30 V
	Input current:	8 mA per input (at 24 V)
	Electric strength of external voltage	max. ±30 V, permanent
	Input impedance:	3.3 kΩ (2.5 Ω ... 6 kΩ)
	Max. input frequency:	10 kHz (DI1/DI2)
	Processing cycle:	1 kHz (1 ms)
DO1	Digital output	
	LOW level:	0 ... +5 V
	HIGH level:	+15 ... +30 V
	Output current:	max. 50 mA per output (external resistance > 480 Ω at 24 V)
	Processing cycle:	1 kHz (1 ms)
24O	24-V voltage supply for external sensors	
	Output current:	max. 100 mA
GIO	Reference potential (digital ground)	
NO / COM	Relay output • Potential-free contact (NO contact) • AC 250 V / 3 A • DC 24 V / 2 A ... 240 V / 0.22 A • not inductive	

Analog terminals

Terminal	Application / electrical data	
AU/AI	Voltage or current input	
	General data:	
	Resolution:	10 bits (Error: 1 digit ≡ 0.1 %, in relation to the final value)
	Conversion rate:	1 kHz In order to filter short-time faults in the analog signal characteristic, the analog input value is led via a digital lag filter with a time constant of 5 ms.
	Processing cycle:	1 kHz (1 ms)
	Electric strength of external voltage	±15 V, permanent
	Temperature influence:	±0.5 % or ±1 mV/K (T_{amb} = -10 °C ... +55 °C)
	When being configured as voltage input (C00034 = "0")	
	Level/scaling:	0 ... +10 V ≡ 0 ... +2^{14} ≡ 0 ... +16384 ≡ 0 ... +100 %
	Input resistance:	> 80 kΩ
	Input voltage in case of open circuit:	Display 0 (U < 0.2 V, abs.)
	Accuracy:	±0.1 V
	Limit frequency:	315 Hz at -3 dB
	When being configured as current input (C00034 = "1" or "2")	
	Level/scaling:	When C00034 = "1": 0 ... +20 mA ≡ 0 ... +2^{14} ≡ 0 ... +16384 ≡ 0 ... +100 %
		When C00034 = "2" (life-zero): +4 ... +20 mA ≡ 0 ... +2^{14} ≡ 0 ... +16384 ≡ 0 ... +100 %
	Switching hysteresis:	1 % (at 20 mA)
	Input resistance:	approx. 250 Ω
	Input voltage in case of open circuit:	Display 0 (I < 0.1 mA)
	Accuracy:	±0.1 mA
AR	10-V reference voltage	
	Output current:	max. 10 mA
GA	Reference potential (analog ground, GND)	

7 Drive application

The "actuating drive speed" application provided in the 8400 motec controller is a drive solution equipped with Lenze's experience and know-how in which function and system blocks interconnected to a signal flow clearly show the basis for implementing typical drive tasks.

The application serves to solve speed-controlled drive tasks, e.g. conveyor drives (interconnected), extruders, test benches, vibrators, travelling drives, presses, machining tools, dosing systems.

Brief description of the features

- Pre-configured control modes for terminals and bus control (with predefined process data connection to the fieldbus)
- Free configuration of input and output signals
- Offset and gain of the main setpoint (if defined via analog input)
- Up to 3 fixed setpoint for speed
- Adjustable setpoint ramp times
- Linear or S-shaped ramp type
- Automatic holding brake control
- Quick stop (QSP) with adjustable ramp time
- Connectable motor potentiometer function (as alternative setpoint source)
- Connectable process controller (PID controller) with various operating modes
- Load monitoring
- Implemented and freely available "GeneralPurpose" functions:
  Counter, binary delay element, binary logic, analog comparison
- Integration of encoder feedback

Input/output interface

The application features an input interface for the connection of the signal sources (e.g. main setpoint) as well as an output interface for the control of output terminals and output ports.

Parameter

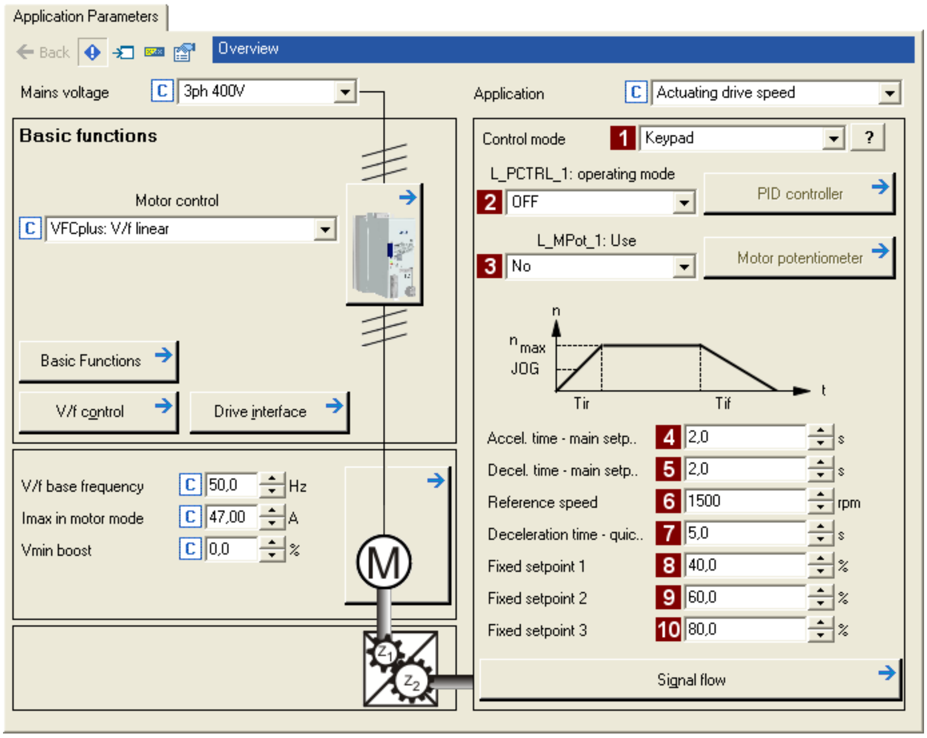
The setting/parameterisation of internal functions, the selection of setpoints and the display of actual values is executed via parameters. A re-configuration of the interfaces is also possible via the corresponding configuration parameters.

Related topics:

▸ Commissioning with the »Engineer« (📖 22)

7.1 Parameterisation dialog

Go to the **Application parameter** tab to change the most important settings for the application in the top dialog level *Overview* :



Short overview of the relevant parameters:

	Parameter	Lenze setting Value	Unit	Info
1	**Control mode** (C00007)	10: Terminals 0		Various control modes can be selected for the application. The selection of the control mode determines the way the application is controlled, e.g. via terminals or via a fieldbus. • The preconfigured assignment of the input/output terminals and ports in the respective control mode is described in the chapter entitled "Terminal assignment of the control modes". (📖 167) • Detailed information on the individual configuration of the input/output terminals can be found in the description of the I/O terminals in the subchapter "User-defined terminal assignment". (📖 139)
2	**L_PCTRL_1: Operating mode** (C00242)	0: Off		A process controller (PID controller) is connected downstream of the setpoint generator. • In the Lenze setting, the process controller is deactivated. • The activation is executed by selecting the operating mode in C00242. • For a detailed functional description see FB L_PCTRL_1. (📖 325)

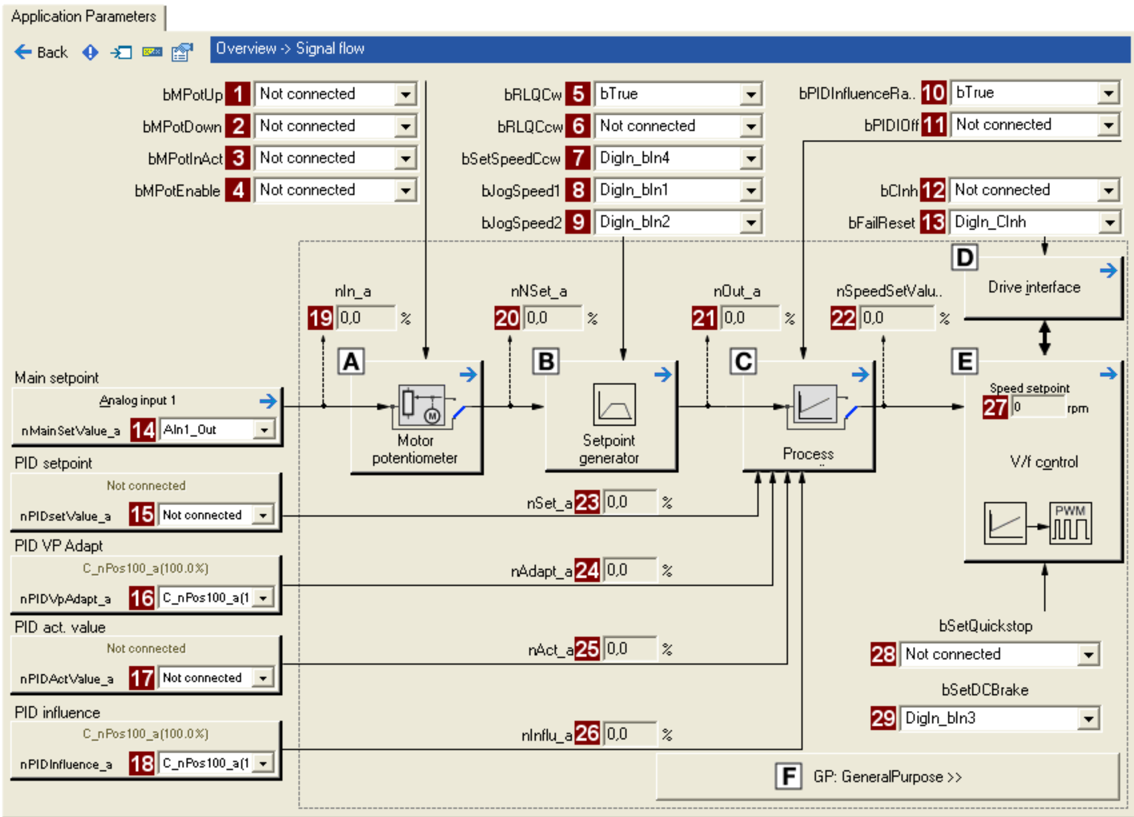
Parameter	Lenze setting Value	Unit	Info
3 **L_MPot_1: Use** (C00806)	0: No		Alternatively, the main speed setpoint can be generated via a motor potentiometer function. • In the Lenze setting, the motor potentiometer function is deactivated. • Activation is possible via C00806 or via the *bMPotEnable* input. • The behaviour of the motor potentiometer during switch-on of the drive system can be selected in C00805. • For a detailed functional description see FB L_MPot_1. (📖 314)
4 **Accel. time - main setpoint** (C00012)	2.0	s	The setpoint is led via a ramp function generator with linear characteristic. The ramp function generator converts setpoint step-changes at the input into a ramp. • For a detailed functional description see FB L_NSet_1. (📖 318)
5 **Decel. time - main setpoint** (C00013)	2.0	s	
6 **Reference speed** (C00011)	1500	rpm	All speed setpoint selections are provided in % and always refer to the reference speed set in C00011. The motor reference speed is given on the motor nameplate.
7 **Deceleration time - quick stop** (C00105)	5.0	s	When "quick stop" is requested, the motor control is decoupled from the setpoint selection and, within the deceleration time parameterised in C00105, the motor is brought to a standstill (n_{act} = 0). ▸ Activate/Deactivate quick stop (📖 39)
8 **Fixed setpoint 1** (C00039/1)	40.0	%	A fixed setpoint for the setpoint generator can be activated instead of the main setpoint via the selection inputs *bJogSpeed1* and *bJogSpeed2*. • The fixed setpoints are selected in [%] based on the reference speed (C00011). • For a detailed functional description see FB L_NSet_1. (📖 318)
9 **Fixed setpoint 2** (C00039/2)	60.0	%	
10 **Fixed setpoint 3** (C00039/3)	80.0	%	

Tip!

When you click the **Signal flow** button, you will get one dialog level down to the signal flow of the application.

7.1.1 Signal flow

When you go to the **Application parameters** tab to the top dialog level *Overview* and click the **Signal flow** button, you will get one dialog level down to the signal flow of the application (here displayed with the preset control mode "Terminals 0"):



A	Motor potentiometer (L_MPot_1)	D	Device control (LS_DriveInterface)
B	Setpoint generator (L_NSet_1)	E	Motor control (MCTRL)
C	Process controller (L_PCTRL_1)	F	"GeneralPurpose" functions

All input and output interfaces of the application are described in the chapter entitled "Interface description". (📖 154)

Configuration parameters for digital control signals:

Parameter		Selection of signal source (Lenze setting)	for control signal:
1	**bMPotUp** (C00701/8)	0: Not connected	L_MPot_1: Increase speed setpoint
2	**bMPotDown** (C00701/9)	0: Not connected	L_MPot_1: Decrease speed setpoint
3	**bMPotInAct** (C00701/10)	0: Not connected	L_MPot_1: Activate inactive function
4	**bMPotEnable** (C00701/11)	0: Not connected	L_MPot_1: Activate motor potentiometer function
5	**bRLQCw** (C00701/17)	1: C_bTrue	Activate clockwise rotation (fail-safe)

Parameter		Selection of signal source (Lenze setting)	for control signal:
6	**bRLQCcw** (C00701/18)	0: Not connected	Activate counter-clockwise rotation (fail-safe)
7	**bSetSpeedCcw** (C00701/5)	14: DigIn_bIn4 (DI4)	Change of direction of rotation
8	**bJogSpeed1** (C00701/6)	11: DigIn_bIn1 (DI1)	Selection of fixed setpoints (JOG setpoints)
9	**bJogSpeed2** (C00701/7)	12: DigIn_bIn2 (DI2)	
10	**bPIDEnableInfluenceRamp** (C00701/15)	1: C_bTrue	L_PCTRL_1: Activate ramp for influencing factor
11	**bPIDOff** (C00701/16)	0: Not connected	L_PCTRL_1: Switch off I component
12	**bCInh** (C00701/1)	1: C_bTrue	Enable/Inhibit controller
13	**bFailReset** (C00701/2)	15: DigIn_CInh (RFR)	Reset of error message
28	**bSetQuickstop** (C00701/3)	0: Not connected	Enable quick stop (QSP)
29	**bSetDCBrake** (C00701/3)	13: DigIn_bIn3 (DI3)	Manual DC-injection braking (DCB)

Configuration parameters for analog setpoints:

Parameter		Selection of signal source (Lenze setting)	for setpoint selection:
14	**nMainSetValue_a** (C00700/1)	10: AIn1_Out (Analog input 1)	Main setpoint • 100 % ≡ reference speed (C00011)
15	**nPIDSetValue_a** (C00700/9)	0: Not connected	L_PCTRL_1: Sensor setpoint or process setpoint for operating mode 2
16	**nPIDVpAdapt_a** (C00700/6)	1: C_nPos100_a (100%)	L_PCTRL_1: Adaptation of the gain Vp set in C00222 in percent
17	**nPIDActValue_a** (C00700/7)	0: Not connected	L_PCTRL_1: Actual speed value or actual sensor value (actual process value)
18	**nPIDInfluence_a** (C00700/8)	1: C_nPos100_a (100%)	L_PCTRL_1: Limitation of the influencing factor in percent

Display parameter

Parameter		Info
19	nIn_a (C00830/11)	Input value of motor potentiometer
20	nNset_a (C00830/1)	Input value of setpoint generator
21	nOut_a (C00830/2)	Output value of setpoint generator
22	nSpeedSetValue_a (C00830/2)	Speed setpoint for motor control
23	nSet_a (C00830/8)	Sensor setpoint or process setpoint for operating mode 2
24	nAdapt_a (C00830/7)	Adaptation of gain Vp set in C00222 in percent
25	nAct_a (C00830/6)	Speed or actual sensor value (actual process value)

Parameter		Info
26	nInflu_a (C00830/9)	Limitation of the influencing factor in percent
27	Speed setpoint (C00050)	Speed setpoint

7.1.1.1 Selection of the main speed setpoint

The main speed setpoint is selected in the Lenze setting via the analog input 1.

- Scaling: 10 V ≡ 100 % reference speed (C00011)
- The main setpoint is transformed to a speed setpoint in the setpoint encoder via a ramp function generator with linear or S-shaped ramps.
- For a detailed functional description see FB L_NSet_1. (📖 318)

Related topics:

- Analog terminals (📖 137)
- Parameterising analog input (📖 138)

7.1.1.2 Motor potentiometer function

Alternatively, the main speed setpoint can be generated via a motor potentiometer function.

- In the Lenze setting, the motor potentiometer function is deactivated.
- Activation is possible via C00806 or via the *bMPotEnable* input.
- The behaviour of the motor potentiometer during switch-on of the drive system can be selected in C00805.
- For a detailed functional description see FB L_MPot_1. (📖 314)

7.1.1.3 Process controller

A process controller (PID controller) is connected downstream of the setpoint generator.

- In the Lenze setting, the process controller is deactivated.
- The activation is executed by selecting the operating mode in C00242.
- For a detailed functional description see FB L_PCTRL_1. (📖 325)

7.1.1.4 "GeneralPurpose" functions

The following "GeneralPurpose" functions are freely available:

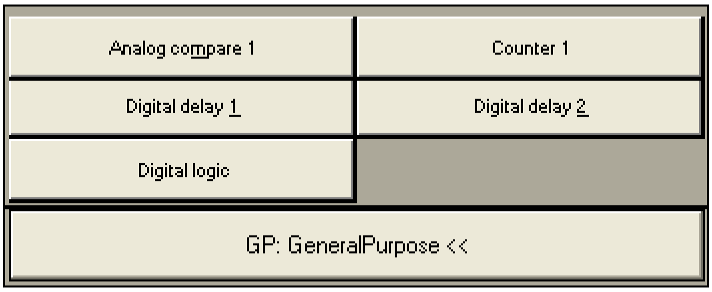
Function block	Function
L_GP_Compare1	Analog comparison
L_GP_Counter1	Digital up/down counter
L_GP_DigitalDelay1	Binary delay element (e.g. for debouncing a digital input)
L_GP_DigitalDelay2	
L_GP_DigitalLogic1	Binary logic (as of version 02.00.00)

- The inputs of the "GeneralPurpose" functions can be linked to other output signals via the configuration parameters of the application.
- On the other hand, the outputs of the "GeneralPurpose" functions can be selected in the configuration parameters of other inputs.

How to open the parameterisation dialog of a "GeneralPurpose" function:

Go to the *Overview* → *Signal flow* dialog level and click the **GP: GeneralPurpose >>** dialog box.

- Now, further buttons are displayed which are required for opening the parameterisation dialog of the corresponding "GeneralPurpose" function:



- Renewed clicking on the **GP: GeneralPurpose <<** button hides the additional buttons again.

Related topics:

- Application example: Debouncing a digital input (📖 341)

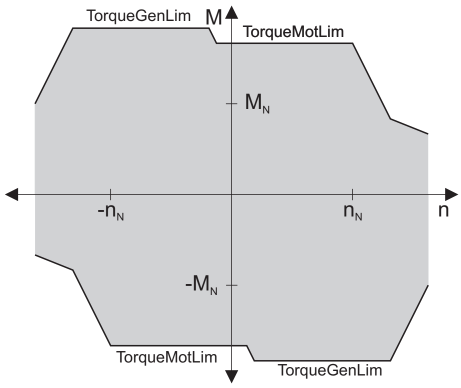
7.2 Interface description

Tip!

You can change the preconfigured assignment of the respective input via the configuration parameters given in the first column.

▶ User-defined terminal assignment (📖 139)

Inputs

Identifier Data type Configuration parameters	Information/possible settings
nMainSetValue_a INT C00700/1	Main speed setpoint • Scaling: 16384 ≡ 100 % rated speed (C00011) • The main setpoint is transformed to a speed setpoint in the setpoint encoder via a ramp function generator with linear or S-shaped ramps. • Upstream to the ramp function generator, a blocking speed masking function and a setpoint MinMax limitation are effective. • For a detailed functional description see FB L_NSet.
nTorqueMotLim_a nTorqueGenLim_a INT C00700/2...3	Torque limitation in motor mode and in generator mode • These input signals are directly transferred to the motor control to limit the controller's maximum torque in motor and generator mode. • The drive cannot output a higher torque in motor/generator mode than set here. • The applied values (any polarity) are internally interpreted as absolute values. • If sensorless vector control (SLVC) is selected, the limitation has a direct effect on the torque-producing current component. • Scaling: 16384 ≡ 100 % M_{max} (C00057)
	Torque limits in motor and generator mode: 
Device control	
wDriveControl WORD	Control word via communication interface • In the control mode "40: Network (MCI/CAN)", the controller controlled by a master control (e.g. IPC) receives its control word via the communication interface (MCI/CAN). The process data word is provided at this input by the upstream port block LP_Network_In. • See the "wDriveControl control word" subchapter for a detailed description of the individual control bits.

Identifier Data type Configuration parameters		Information/possible settings
bCInh BOOL C00701/1		Enable/Inhibit controller
	FALSE	Enable controller: The controller switches to the "OperationEnabled" device state, if no other source of a controller inhibit is active. • C00158 provides a bit coded representation of all active sources/ triggers of a controller inhibit.
	TRUE	Inhibit controller (controller inhibit): The controller switches to the "SwitchedON" device state.
bFailReset BOOL C00701/2		Reset of error message In the Lenze setting this input is connected to the digital input controller enable so that a possibly existing error message is reset together with the controller enable (if the cause for the fault is eliminated).
	TRUE	The current fault is reset, if the cause for the fault is eliminated. • If the fault still exists, the error status remains unchanged.
bSetQuickstop BOOL C00701/3		Enable quick stop (QSP) • Also see device command "Activate/Deactivate quick stop".
	TRUE	Activate quick stop • Motor control is decoupled from the setpoint selection and, within the deceleration time parameterised in C00105, the motor is brought to a standstill (n_{act} = 0). • The motor is kept at a standstill during closed-loop operation. • A pulse inhibit (CINH) is set if the auto-DCB function has been activated via C00019.
	FALSE	Deactivate quick stop • The quick stop is deactivated if no other source for the quick stop is active. • C00159 displays a bit code of active sources/causes for the quick stop.
bSetDCBrake BOOL C00701/4		Manual DC-injection braking (DCB) • Detailed information on DC-injection braking is provided in the motor control chapter, subchapter "DC-injection braking".
		Note! Holding braking is not possible when this braking mode is used! Use the basic "Holding brake control" function for controlling the holding brake with a low rate of wear.
	FALSE	Deactivate DC-injection braking.
	TRUE	Activate DC-injection braking, i.e. the drive is brought to a standstill by means of DC-injection braking. • The braking effect stops when the rotor is at standstill. • After the hold time (C00107) has expired, the controller sets the pulse inhibit (CINH).
Fail-safe selection of the direction of rotation in connection with quick stop • In control mode "Terminals 16", both inputs are connected to the digital terminals DI3 and DI4. • For a detailed functional description see FB L_RLQ.		
bRLQCw BOOL C00701/17		Activate clockwise rotation (fail-safe)
	FALSE	Quick stop
	TRUE	Clockwise rotation
bRLQCcw BOOL C00701/18		Activate counter-clockwise rotation (fail-safe)
	FALSE	Quick stop
	TRUE	Counter-clockwise rotation

Identifier Data type Configuration parameters		Information/possible settings
Setpoint generator • For a detailed functional description see FB L_NSet.		
bSetSpeedCcw BOOL C00701/5		Change of direction of rotation • For instance if a motor or gearbox is fixed laterally reversed to a machine part, but the setpoint selection should still be executed for the positive direction of rotation.
	FALSE	Direction of rotation to the right (Cw)
	TRUE	Direction of rotation to the left (Ccw)
bJogSpeed1 bJogSpeed2 BOOL C00701/6 C00701/7		Selection inputs for fixed changeover setpoints (JOG setpoints) for the main setpoint • A fixed setpoint for the setpoint generator can be activated instead of the main setpoint via these selection inputs. • The two selection inputs are binary coded, therefore you can select three fixed setpoints. • In the case of binary coded selection "0" (all inputs = FALSE or not assigned), main setpoint *nMainSetValue_a* is active. • The selection of the fixed setpoints is executed in C00039/1...3 in [%] based on the reference speed (C00011). • For a detailed functional description see FB L_NSet.
bRFG_0 BOOL C00701/12		Ramp function generator: Lead the main setpoint integrator to "0" within the current Ti times • For a detailed functional description see FB L_NSet.
	TRUE	The current value of the main setpoint integrator is led to "0" within the Ti time set.
Motor potentiometer Alternatively to the input signal *nMainSetValue_a*, the main setpoint can also be generated by a motor potentiometer function. • In the Lenze setting, the motor potentiometer function is deactivated. • Activation is possible via C00806 or via the *bMPotEnable* input. • The behaviour of the motor potentiometer during switch-on of the drive system can be selected in C00805. • For a detailed functional description see FB L_MPot.		
bMPotUp BOOL C00701/8		Increasing the speed setpoint
	TRUE	Approach the upper speed limit value set in C00800 with the acceleration time set in C00802.
bMPotDown BOOL C00701/9		Decreasing the speed setpoint
	TRUE	Approach the lower speed limit value set In C00801 with the deceleration time set in C00803.
bMPotInAct BOOL C00701/10		Activating the inactive function
	TRUE	The speed setpoint behaves according to the inactive function set in C00804. • In the Lenze setting, the speed setpoint is maintained.
bMPotEnable BOOL C00701/11		Activating the motor potentiometer function • This input and C00806 are OR'd.
	TRUE	The motor potentiometer function is active; the speed setpoint can be changed via the *bMPotUp* and *bMPotDown* control inputs.

<table>
<tr><th>Identifier
Data type
Configuration parameters</th><th colspan="2">Information/possible settings</th></tr>
<tr><td colspan="3">Process controller
• In the Lenze setting, the process controller is deactivated.
• The activation is executed by selecting the operating mode in C00242.
• For a detailed functional description see FB L_PCTRL.</td></tr>
<tr><td rowspan="3">bPIDEnableInfluenceRamp
BOOL
C00701/15</td><td colspan="2">Activate ramp for influencing factor</td></tr>
<tr><td>FALSE</td><td>Influencing factor of the PID controller is ramped down to "0".</td></tr>
<tr><td>TRUE</td><td>Influencing factor of the PID controller is ramped up to the value nPIDInfluence_a.</td></tr>
<tr><td rowspan="2">bPIDOff
BOOL
C00701/16</td><td colspan="2">Switch off I-component of process controller
• In conjunction with the operating mode set in C00242 (Lenze setting: "Off").</td></tr>
<tr><td>TRUE</td><td>I-component of the process controller is switched off.</td></tr>
<tr><td>nPIDVpAdapt_a
INT
C00700/6</td><td colspan="2">Adaptation of gain Vp set in C00222 in percent
• Scaling: 16384 ≡ 100 %
• Internal limitation to ± 199.99 %
• Changes can be done online.</td></tr>
<tr><td>nPIDActValue_a
INT
C00700/7</td><td colspan="2">Speed or actual sensor value (actual process value)
• Scaling: 16384 ≡ 100 %
• Internal limitation to ± 199.99 %</td></tr>
<tr><td>nPIDInfluence_a
INT
C00700/8</td><td colspan="2">Limitation of the influencing factor in percent
• The influence factor of the PID controller can be limited to a certain value (-199.99% ... + 199.99%) via nPIDInfluence_a.
• Scaling: 16384 ≡ 100 %
• Internal limitation to ± 199.99 %</td></tr>
<tr><td>nPIDSetValue_a
INT
C00700/9</td><td colspan="2">Sensor setpoint or process setpoint for operating mode 2
• Scaling: 16384 ≡ 100 %
• Internal limitation to ± 199.99 %</td></tr>
<tr><td colspan="3">Holding brake control
• In the Lenze setting, the holding brake control is deactivated.
• The activation is executed by selecting the operating mode in C02580.
• For a detailed function description see chapter entitled "Holding brake control".</td></tr>
<tr><td rowspan="3">bBrkRelease
BOOL
C00701/19</td><td colspan="2">Manual release of the brake in connection with the selected operating mode.
• In the Lenze setting, this input is connected to the digital input DI5.</td></tr>
<tr><td>FALSE</td><td>Do not release the brake manually.</td></tr>
<tr><td>TRUE</td><td>Release brake manually (forced release).
• Note!
The brake can also be released if the controller is inhibited!
• During automatic operation, the internal brake logic is deactivated and the brake is released (supervisor operation). If a controller inhibit has been set by the brake control, it will be deactivated.
• In semi-automatic operation, the brake is released after feedforward control.</td></tr>
<tr><td>nBrkTorqueAdd_a
INT
C00700/10</td><td colspan="2">In preparation - without function at the moment!
Additive torque value in [%] for torque precontrol on starting
• Only effective with sensorless vector control.
• 100 % ≡ maximum torque (C00057)
▸ Feedforward control of the motor before release</td></tr>
</table>

Outputs

Identifier Data type	Value/meaning	
Device control		
wDeviceStateWord WORD	Status word of the controller (based on DSP-402) • The status word contains information on the currents status of the drive controller. • In control mode "40: Network (MCI/CAN)" the status word is transmitted to the master control as process data word via the port block LP_Network_Out. • For a detailed description of the individual status bits, see subchapter entitled "wDeviceStateWord status word.	
wDeviceAuxStateWord WORD	Extended status word of the controller	
wDetermFailNoLow WORD	Display of the current error (Low-Word)	
wDetermFailNoHigh WORD	Display of the current error (High-Word)	
bDriveFail BOOL	TRUE	Drive controller in error status • "Fault" device state is active.
bDriveReady BOOL	TRUE	Controller is ready for operation. • "SwitchedON" device state is active. • The drive is in this device state if the DC bus voltage is applied and the controller is still inhibited by the user (controller inhibit).
bCInhActive BOOL	TRUE	Controller inhibit is active
bQSPIsActive BOOL	TRUE	Quick stop is active
bSafeTorqueOff BOOL	TRUE	"SafeTorqueOff" device state is active
bSafetyIsActive BOOL	TRUE	In preparation
bSpeedCcw BOOL	FALSE	Direction of rotation to the right (Cw)
	TRUE	Direction of rotation to the left (Ccw)
bSpeedSetReached BOOL	TRUE	Speed setpoint reached
bSpeedActEqSet BOOL	TRUE	Actual speed value has reached the setpoint within one hysteresis band
bNactCompare BOOL	TRUE	During open-loop operation: Speed setpoint < Comparison value (C00024)
		During closed-loop operation: Actual speed value < Comparison value (C00024)
bImaxActive BOOL	TRUE	The current setpoint is internally (the drive controller operates at the maximum current limit)

Identifier Data type	Value/meaning	
Motor control		
bHeatSinkWarning BOOL	TRUE	Heatsink overtemperature detected
bOVDetected BOOL	TRUE	Overvoltage detected
bDcBrakeOn BOOL	TRUE	DC-injection braking active
bFlyingSyncActive BOOL	TRUE	Flying restart function is executed
nMotorFreqAct_a C00058 | INT	Current field frequency	
nOutputSpeedCtrl_a INT	Speed or slip controller output • Scaling: 16384 ≡ 100 % rated speed (C00011)	
nMotorSpeedAct_a C00051 | INT	Actual speed value • Scaling: 16384 ≡ 100 % rated speed (C00011)	
nMotorVoltage_a INT	Current motor voltage/inverter output voltage • Scaling: 16384 ≡ 1000 V	
nDCVoltage_a INT	Actual DC-bus voltage • Scaling: 16384 ≡ 1000 V	
nMotorCurrent_a INT	Current motor current • Scaling: 16384 ≡ 100 % I_{max_mot} (C00022)	
nMotorTorqueAct_a C00056/2 | INT	Actual torque • With "VFC (+encoder)" motor control, this value is determined from the current motor current and corresponds to the actual torque only by approximation. • Scaling: 16384 ≡ 100 % M_{max} (C00057)	
nHeatsinktemperature_a INT	Heatsink temperature • Scaling: 0 ... 16384 ≡ 0 ... 80 °C • At sub-zero temperatures, the value "0" is output.	
Holding brake control • For a detailed function description see chapter entitled "Holding brake control".		
bBrkReleaseOut BOOL	Trigger signal for the motec-internal power output (terminals BR1 and BR2) for triggering the brake. • Use bit 0 in C02582 to activate inverted triggering of the power output. ▸ Functional settings	
	FALSE	Apply brake.
	TRUE	Release brake.
bBrkReleased BOOL	"Brake released" status signal considering the release time of the brake • If the holding brake is triggered to be closed, *bBrkReleased* is immediately reset to FALSE even if the brake closing time has not elapsed yet!	
	TRUE	Brake released (when the brake release time has elapsed).

7.2.1 wDriveControl control word

In the control mode "40: Network (MCI/CAN)", the controller is controlled by a master control (e.g. IPC) via the *wDriveControl* control word.

- The process data word received from the master control is provided to the application via the upstream port block LP_Network_In at the *wDriveControl* input.
- Display parameter: C00136/1
- The bit assignment of the control word can be obtained from the following table:

Bit	Name	Function
Bit 0	SwitchOn	1 ≡ Change to the "SwitchedON" device state • This bit must be set in the control word to ensure that the device changes to the "SwitchedON" device state after mains connection without the need for a master control specifying this bit via fieldbus.
Bit 1	DisableVoltage	1 ≡ Inhibit inverter control (IMP - pulse inhibit)
Bit 2	SetQuickStop	1 ≡ Activate quick stop (QSP). ▸ Activate/Deactivate quick stop (📖 39)
Bit 3	EnableOperation	1 ≡ Enable controller (RFR) • If control via terminals is performed, this bit must be set in the control word. Otherwise the controller is inhibited. ▸ Enable/Inhibit controller (📖 38)
Bit 4	ModeSpecific_1	Reserved (currently not assigned)
Bit 5	ModeSpecific_2	
Bit 6	ModeSpecific_3	
Bit 7	ResetFault	1 ≡ Reset fault (trip reset) • Acknowledge fault message (if the error cause has been eliminated). ▸ Reset error (📖 39)
Bit 8	SetHalt	1 ≡ Activate stop function • Stop drive via stopping ramp (in preparation).
Bit 9	reserved_1	Reserved (currently not assigned)
Bit 10	reserved_2	
Bit 11	SetDCBrake	1 ≡ Activate DC-injection braking ▸ Manual DC-injection braking (DCB) (📖 103)
Bit 12	JogSpeed1	Activation of fixed speed 1 ... 3
Bit 13	JogSpeed2	
Bit 14	SetFail	1 ≡ Set error (trip set)
Bit 15	SetSpeedCcw	0 ≡ Direction of rotation to the right (Cw) 1 ≡ Direction of rotation to the left (Ccw)

7.2.2 wDeviceStateWord status word

The *wDeviceStateWord* status word provided by the device control contains all information relevant for controlling the controller.

- In control mode "40: Network (MCI/CAN)" the status word is transmitted to the master control as process data word via the port block LP_Network_Out.
- Display parameter: C00150
- The bit assignment of the *wDeviceStateWord* status word can be obtained from the following table.

Bit	Name	Status
Bit 0	FreeStatusBit0	Free status bit 0 (configurable in C00621/7) Not assigned in Lenze setting.
Bit 1	PowerDisabled	1 ≡ Inverter control inhibited (pulse inhibit is active)
Bit 2	FreeStatusBit2	Free status bit 2 (configurable in C00621/8) In Lenze setting pre-assigned with *LA_NCtrl_bImaxActive* signal: 1 ≡ The current setpoint is internally limited (the controller operates at the maximum current limit)
Bit 3	FreeStatusBit3	Free status bit 3 (configurable in C00621/9) In the Lenze setting pre-assigned with *LA_NCtrl_bSpeedSetReached* signal: 1 ≡ Speed setpoint reached
Bit 4	FreeStatusBit4	Free status bit 4 (configurable in C00621/10) In the Lenze setting pre-assigned with *LA_NCtrl_bSpeedActEqSet* signal: 1 ≡ Actual speed value has reached the setpoint within one hysteresis band
Bit 5	FreeStatusBit5	Free status bit 5 (configurable in C00621/11) In the Lenze setting pre-assigned with *LA_NCtrl_bNActCompare* signal: • In case of the "Open loop" operation: 1 ≡ Speed setpoint < comparison value (C00024) • For "Closed loop" operatin: 1 ≡ actual speed value < comparison value (C00024)
Bit 6	ActSpeedIsZero	1 ≡ Current speed is 0
Bit 7	ControllerInhibit	1 ≡ Controller inhibited (controller inhibit is active)
Bit 8	StatusCodeBit0	Bit coded display of the active device state ▸ Device state machine and device states (see table [4-1])
Bit 9	StatusCodeBit1	
Bit 10	StatusCodeBit2	
Bit 11	StatusCodeBit3	
Bit 12	Warning	1 ≡ A warning exists.
Bit 13	Trouble	1 ≡ Controller is in the "Trouble" device state • E.g. if an overvoltage has occurred.
Bit 14	FreeStatusBit14	Free status bit 14 (configurable in C00621/12) In the Lenze setting pre-assigned with *LA_NCtrl_bSpeedCcw* signal: 0 ≡ Clockwise direction of rotation (Cw), 1 ≡ Counter-clockwise direction of rotation (Ccw)
Bit 15	FreeStatusBit15	Free status bit 15 (configurable in C00621/13) In Lenze setting pre-assigned with *LA_NCtrl_bDriveReady* signal: 1 ≡ Drive controller is ready for operation

7.3 Setting parameters (short overview)

Parameter	Info	Lenze setting	
		Value	Unit
C00012	Accel. time - main setpoint	2.0	s
C00013	Decel. time - main setpoint	2.0	s
C00182	S-ramp time PT1	20.00	s
C00134	Ramp rounding - main setpoint	0: Off	
C00019	Auto-DCB: Threshold	3	rpm
C00036	DCB: Current	50.0	%
C00039/1	Fixed setpoint 1	40.0	%
C00039/2	Fixed setpoint 2	60.0	%
C00039/3	Fixed setpoint 3	80.0	%
C00105	Deceleration time - quick stop	5.0	s
C00106	Auto-DCB: Hold time	0.5	s
C00107	DCB: Hold time	999.0	s
C00222	L_PCTRL_1: Vp	1.0	
C00223	L_PCTRL_1: Tn	400	ms
C00224	L_PCTRL_1: Kd	0.0	
C00225	L_PCTRL_1: MaxLimit	199.9	%
C00226	L_PCTRL_1: MinLimit	-199.9	%
C00227	L_PCTRL_1: Acceleration time	0.1	s
C00228	L_PCTRL_1: Deceleration time	0.1	s
C00231/1	L_PCTRL_1: Pos. maximum	199.9	%
C00231/2	L_PCTRL_1: Pos. minimum	0.0	%
C00231/3	L_PCTRL_1: Neg. minimum	0.0	%
C00231/4	L_PCTRL_1: Neg. maximum	199.9	%
C00242	L_PCTRL_1: Operating mode	0: Off	
C00243	L_PCTRL_1: Influence acceleration time	5.0	s
C00244	L_PCTRL_1: Influence deceleration time	5.0	s
C00245	L_PCTRL_1: PID output value	-	%
C00800	L_MPot_1: Upper limit	100.0	%
C00801	L_MPot_1: Lower limit	-100.0	%
C00802	L_MPot_1: Acceleration time	10.0	s
C00803	L_MPot_1: Deceleration time	10.0	s
C00804	L_MPot_1: Inactive function	0: Retain value	
C00805	L_MPot_1: Init fct.	0: Load last value	
C00806	L_MPot_1: Use	0: No	

7.4 Pre-assignment of the drive application

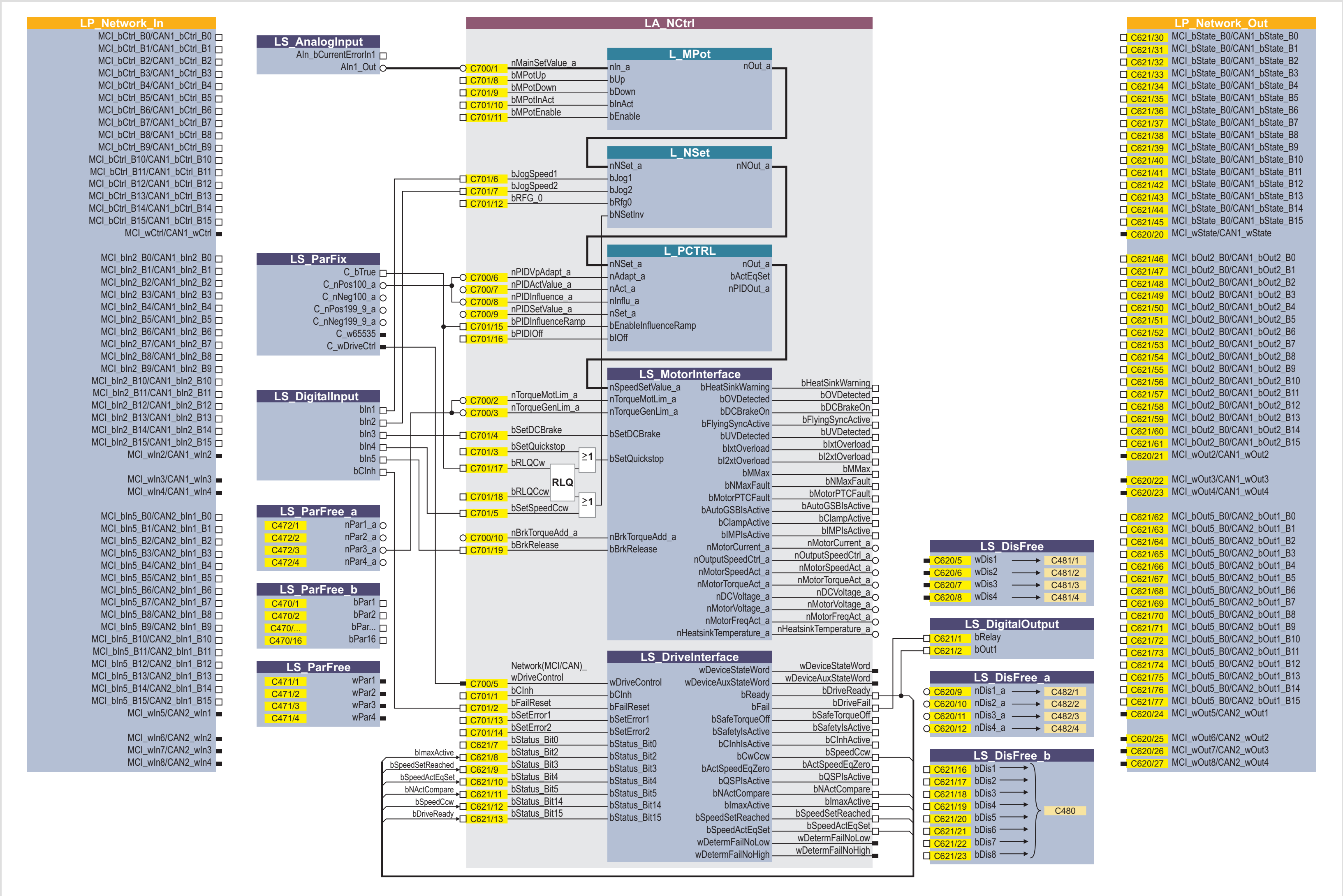
7.4.1 Input connections

Configuration parameters	Identifier	Control mode				
		10 (terminals 0) see chapter [7.4.3]	12 (terminals 2)	14 (terminals 11)	16 (terminals 16)	40 (network) see chapter [7.4.4]
C700/1	nMainSetValue_a	AU	AU	AU	AU	PDO1/word 2
C700/2	nTorqueMotLim_a	C472/3	C472/3	C472/3	C472/3	C472/3
C700/3	nTorqueGenLim_a	C472/3	C472/3	C472/3	C472/3	C472/3
C700/4	Reserved	-	-	-	-	-
C700/5	Network(MCI/CAN)_wDriveControl	0x0009	0x0009	0x0009	0x0009	PDO1/Word 1
C700/6	nPIDVpAdapt_a	100 %	100 %	100 %	100 %	100 %
C700/7	nPIDActValue_a	-	-	-	-	-
C700/8	nPIDInfluence_a	100 %	100 %	100 %	100 %	100 %
C700/9	nPIDSetValue_a	-	-	-	-	-
C700/10	Reserved	-	-	-	-	-
C700/11	L_GP_Counter1: wLdVal	-	-	-	-	-
C700/12	L_GP_Counter1: wCmpVal	-	-	-	-	-
C700/13	L_GP_Compare1: nIn1_a	-	-	-	-	-
C700/14	L_GP_Compare1: nIn2_a	-	-	-	-	-
C701/1	bCInh	-	-	-	-	-
C701/2	bFailReset	RFR	RFR	RFR	RFR	RFR
C701/3	bSetQuickstop	-	DI3	-	-	DI3
C701/4	bSetDCBrake	X4/DI3	-	DI2	-	PDO1/Bit 11
C701/5	bSetSpeedCcw	X4/DI4	DI4	DI1	-	PDO1/Bit 15
C701/6	bJogSpeed1	X4/DI1	DI1	-	DI1	PDO1/Bit 12
C701/7	bJogSpeed2	X4/DI2	DI2	-	DI2	PDO1/Bit 13
C701/8	bMPotUp	-	-	DI3	-	-
C701/9	bMPotDown	-	-	DI4	-	-
C701/10	bMPotInAct	-	-	-	-	-
C701/11	bMPotEnable	-	-	TRUE	-	-
C701/12	bRFG_0	-	-	-	-	PDO1/Bit 8
C701/13	bSetError1	-	-	-	-	-
C701/14	bSetError2	-	-	-	-	-
C701/15	bPIDInfluenceRamp	TRUE	TRUE	TRUE	TRUE	TRUE
C701/16	bPIDIOff	-	-	-	-	-
C701/17	bRLQCw	TRUE	TRUE	TRUE	DI3	TRUE
C701/18	bRLQCcw	-	-	-	DI4	-
C701/19	bBrkRelease	DI5	DI5	DI5	DI5	DI5
C701/20	L_GP_Counter1: bClkUp	-	-	-	-	-
C701/21	L_GP_Counter1: bClkDown	-	-	-	-	-
C701/22	L_GP_Counter1: bLoad	-	-	-	-	-
C701/23	L_GP_DigitalDelay1: bIn	-	-	-	-	-
C701/24	L_GP_DigitalDelay2: bIn	-	-	-	-	-
C701/25	LS_WriteParamList: bExecute	-	-	-	-	-
C701/26	LS_WriteParamList: bSelectWriteValue_1	-	-	-	-	-
C701/27	Reserved	-	-	-	-	-
C701/28	L_GP_DigitalLogic1: bIn1	-	-	-	-	-
C701/29	L_GP_DigitalLogic1: bIn2	-	-	-	-	-

7.4.2 Output connections

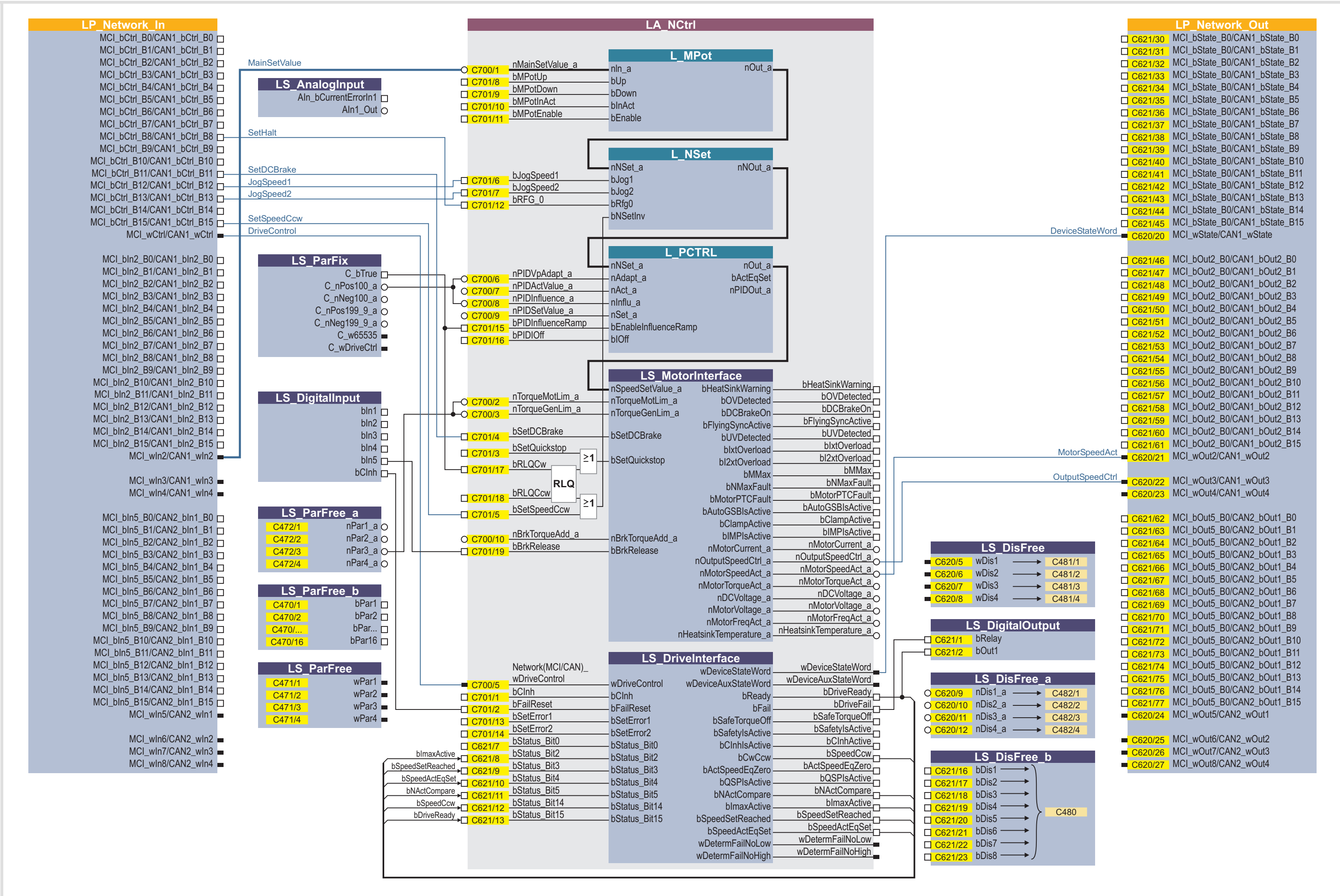
Configuration parameters	Identifier	Control mode: 10 (terminals 0) see chapter [7.4.3]	12 (terminals 2)	14 (terminals 11)	16 (terminals 16)	40 (network) see chapter [7.4.4]
C620/5	LS_DisFree: wDis1 (→C481/1)	-	-	-	-	-
C620/6	LS_DisFree: wDis2 (→C481/2)	-	-	-	-	-
C620/7	LS_DisFree: wDis3 (→C481/3)	-	-	-	-	-
C620/8	LS_DisFree: wDis4 (→C481/4)	-	-	-	-	-
C620/9	LS_DisFree_a: nDis1_a (→C482/1)	-	-	-	-	-
C620/10	LS_DisFree_a: nDis2_a (→C482/2)	-	-	-	-	-
C620/11	LS_DisFree_a: nDis3_a (→C482/3)	-	-	-	-	-
C620/12	LS_DisFree_a: nDis4_a (→C482/4)	-	-	-	-	-
C620/20	LP_Network_Out: MCI_wState/CAN1_wState	-	-	-	-	wDeviceStateWord
C620/21	LP_Network_Out: MCI_wOut2/CAN1_wOut2	-	-	-	-	nMotorSpeedAct_a
C620/22	LP_Network_Out: MCI_wOut3/CAN1_wOut3	-	-	-	-	nOutputSpeedCtrl_a
C620/23	LP_Network_Out: MCI_wOut4/CAN1_wOut4	-	-	-	-	-
C620/24	LP_Network_Out: MCI_wOut5/CAN2_wOut1	-	-	-	-	-
C620/25	LP_Network_Out: MCI_wOut6/CAN2_wOut2	-	-	-	-	-
C620/26	LP_Network_Out: MCI_wOut7/CAN2_wOut3	-	-	-	-	-
C620/27	LP_Network_Out: MCI_wOut8/CAN2_wOut4	-	-	-	-	-
C621/1	LS_DigitalOutput:bRelay	bDriveFail	bDriveFail			
C621/2	LS_DigitalOutput: bOut1 (DO1)	bDriveReady	bDriveReady			
C621/7	LA_NCtrl: bStatusBit0	-	-	-	-	-
C621/8	LA_NCtrl: bStatusBit2	bImaxActive	bImaxActive			
C621/9	LA_NCtrl: bStatusBit3	bSpeedSetReached	bSpeedSetReached			
C621/10	LA_NCtrl: bStatusBit4	bSpeedActEqSet	bSpeedActEqSet			
C621/11	LA_NCtrl: bStatusBit5	bNactCompare	bNactCompare			
C621/12	LA_NCtrl: bStatusBit14	bSpeedCcw	bSpeedCcw			
C621/13	LA_NCtrl: bStatusBit15	bDriveReady	bDriveReady			
C621/16	LS_DisFree_b: bDis1 (→C480/Bit0)	-	-	-	-	-
C621/17	LS_DisFree_b: bDis2 (→C480/Bit1)	-	-	-	-	-
C621/18 ... C621/23	LS_DisFree_b: bDis3 (→C480/Bit2) ... LS_DisFree_b: bDis8 (→C480/Bit7)	-	-	-	-	-
C621/30...45	LP_Network_Out: MCI_bState/ CAN1_bState_B0 ... B15	-	-	-	-	-
C621/46...61	LP_Network_Out: MCI_bOut2/ CAN1_bOut2_B0 ... B15	-	-	-	-	-
C621/62...77	LP_Network_Out: MCI_bOut5/ CAN2_bOut1_B0 ... B15	-	-	-	-	-

7.4.3 Internal signal flow for control via terminals



[7-1] Wiring of the internal interfaces in the Lenze setting (control mode "terminals 0")

7.4.4 Internal signal flow for control via network (MCI/CAN)



[7-2] Wiring of the internal interfaces for control via communication interface (control mode "Network (MCI/CAN)")

7.5 Terminal assignment of the control modes

The following table shows which functions are assigned to the digital terminals in the different control modes.

Control mode	Assignment of the digital terminals						Relay output
	DI1	DI2	DI3	DI4	DI5	DO1	NO / COM
Local mode (see mounting instructions)	Setpoint of P2	Fixed setpoint 2	Manual DC-injection braking	Change of direction of rotation [1]	Release holding brake manually [2]	Status "Drive is ready to start" [3]	Status "An error has occurred" [3]
	Fixed setpoint 3						
Terminals 0	Fixed setpoint 1	Fixed setpoint 2	Manual DC-injection braking	Change of direction of rotation		Status "Drive is ready to start"	Status "An error has occurred"
	Fixed setpoint 3						
Terminals 2	Fixed setpoint 1	Fixed setpoint 2	Quick stop	Change of direction of rotation			
	Fixed setpoint 3						
Terminals 11	Change of direction of rotation	Manual DC-injection braking	MPotUp	MPotDown			
Terminals 16	Fixed setpoint 1	Fixed setpoint 2	Cw/QSP	Ccw/QSP			
	Fixed setpoint 3						
Network (MCI/CAN)	Quick stop	-	-	-			

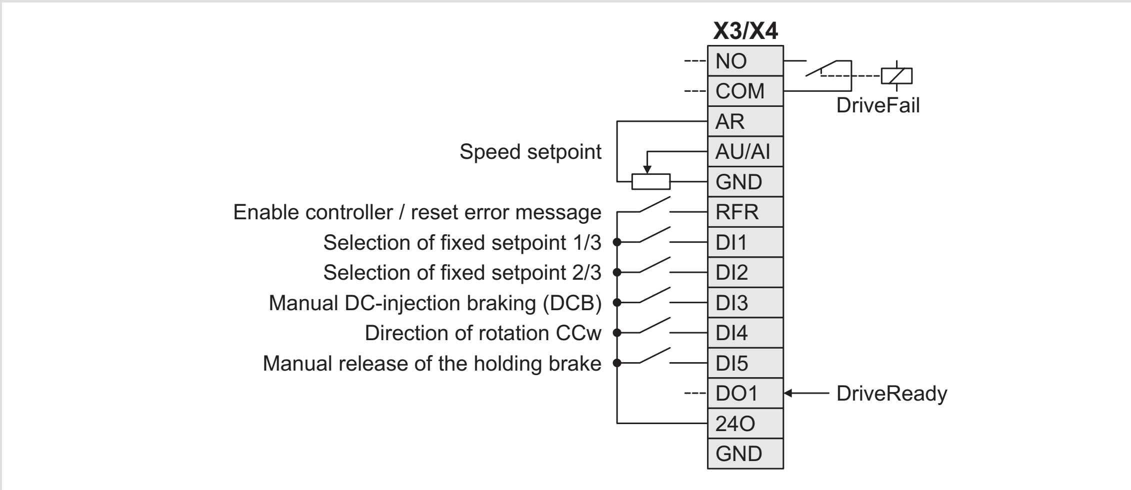
[1] If the direction of rotation is permanently set to "left" via DIP1/switch 2, DI4 has no influence in local mode.
[2] In the Lenze setting, the brake control is switched off (not active). → Set operating mode in C02580.
[3] Applies to the setting DIP1/switch 8 = "OFF". If DIP1/switch 8 = "ON", both status signals have been interchanged.

Abbreviations used:	
MPotUp	Motor potentiometer: Increase speed
MPotDown	Motor potentiometer: Decrease speed
Cw/QSP Ccw/QSP	Fail-safe selection of the direction of rotation in connection with quick stop (Cw = clockwise rotation; Ccw = counter-clockwise rotation)

Related topics:

- User-defined terminal assignment (📖 139)
- Control mode "Network (MCI/CAN)" (📖 222)

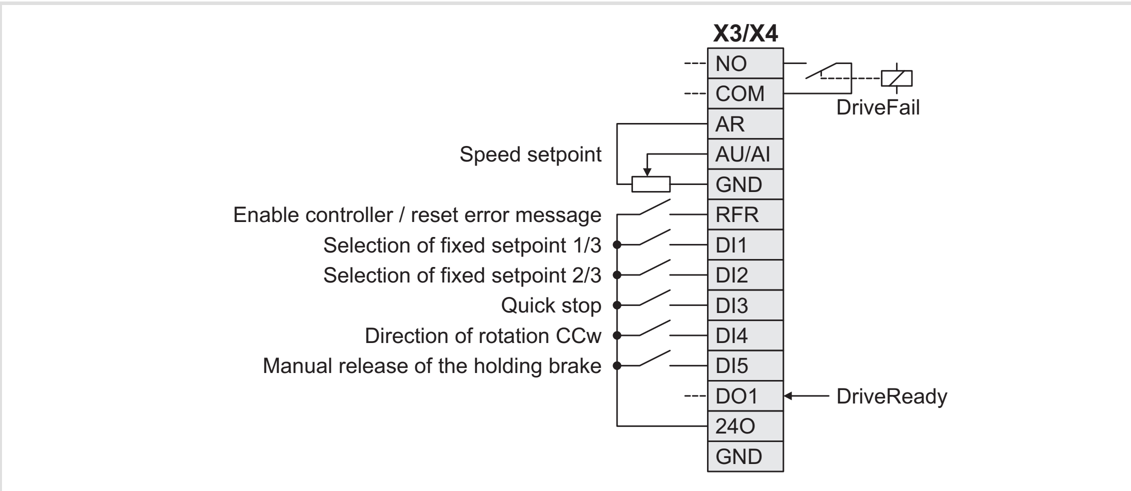
7.5.1 Terminals 0



Connection	Assignment
DI1	LA_NCtrl.bJogSpeed1
DI2	LA_NCtrl.bJogSpeed2
DI3	LA_NCtrl.bSetDCBrake
DI4	LA_NCtrl.bSetSpeedCcw
DI5	LA_NCtrl.bBrkRelease

Connection	Assignment
RFR	LA_NCtrl.bFailReset
AU/AI	LA_NCtrl.nMainSetValue_a 10 V ≡ 100 % reference speed (C00011)
NO, COM	LA_NCtrl.bDriveFail
DO1	LA_NCtrl.bDriveReady

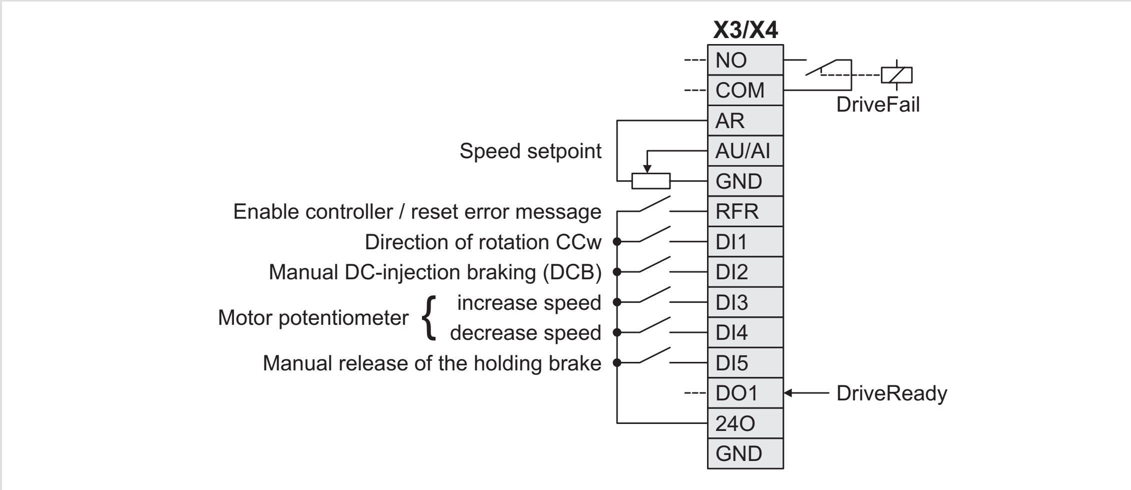
7.5.2 Terminals 2



Connection	Assignment
DI1	LA_NCtrl.bJogSpeed1
DI2	LA_NCtrl.bJogSpeed2
DI3	LA_NCtrl.bSetQuickstop
DI4	LA_NCtrl.bSetSpeedCcw
DI5	LA_NCtrl.bBrkRelease

Connection	Assignment
RFR	LA_NCtrl.bFailReset
AU/AI	LA_NCtrl.nMainSetValue_a 10 V ≡ 100 % reference speed (C00011)
NO, COM	LA_NCtrl.bDriveFail
DO1	LA_NCtrl.bDriveReady

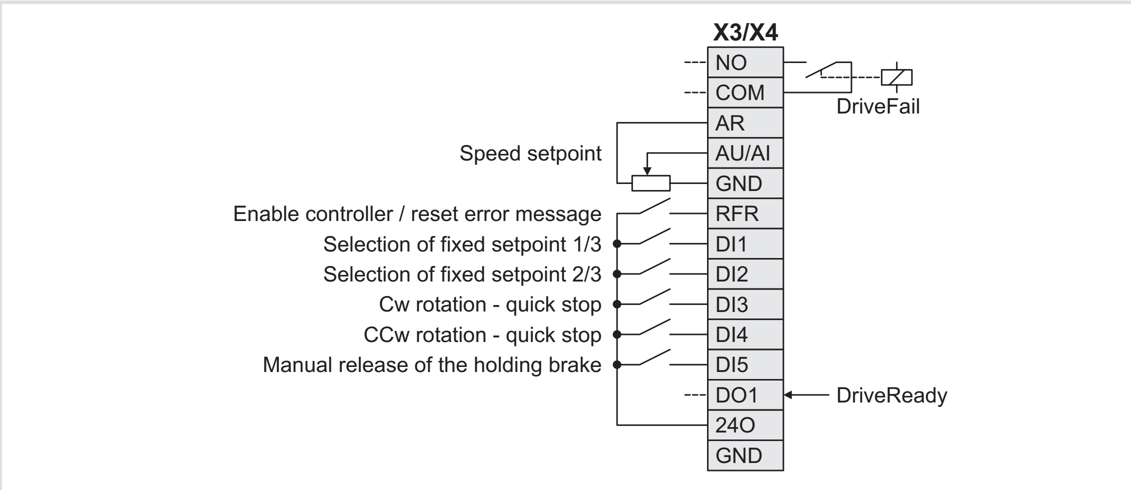
7.5.3 Terminals 11



Connection	Assignment
DI1	LA_NCtrl.bSetSpeedCcw
DI2	LA_NCtrl.bSetDCBrake
DI3	LA_NCtrl.bMPotUp
DI4	LA_NCtrl.bMPotDown
DI5	LA_NCtrl.bBrkRelease

Connection	Assignment
RFR	LA_NCtrl.bFailReset
AU/AI	LA_NCtrl.nMainSetValue_a 10 V ≡ 100 % reference speed (C00011)
NO, COM	LA_NCtrl.bDriveFail
DO1	LA_NCtrl.bDriveReady

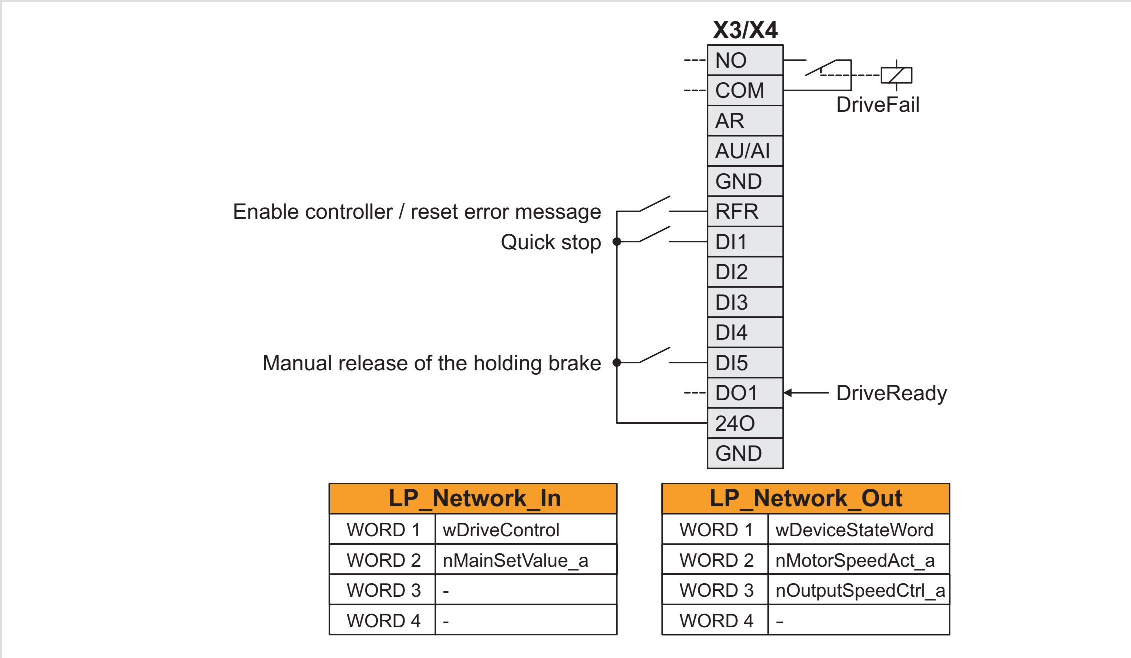
7.5.4 Terminals 16



Connection	Assignment
DI1	LA_NCtrl.bJogSpeed1
DI2	LA_NCtrl.bJogSpeed2
DI3	LA_NCtrl.bRLQCw
DI4	LA_NCtrl.bRLQCcw
DI5	LA_NCtrl.bBrkRelease

Connection	Assignment
RFR	LA_NCtrl.bFailReset
AU/AI	LA_NCtrl.nMainSetValue_a 10 V ≡ 100 % reference speed (C00011)
NO, COM	LA_NCtrl.bDriveFail
DO1	LA_NCtrl.bDriveReady

7.5.5 Network (MCI/CAN)



Connection	Assignment
DI1	LA_NCtrl.SetQuickstop
DI2	-
DI3	-
DI4	-
DI5	LA_NCtrl.bBrkRelease

Connection	Assignment
RFR	LA_NCtrl.bFailReset
AU/AI	-
NO, COM	LA_NCtrl.bDriveFail
DO1	LA_NCtrl.bDriveReady

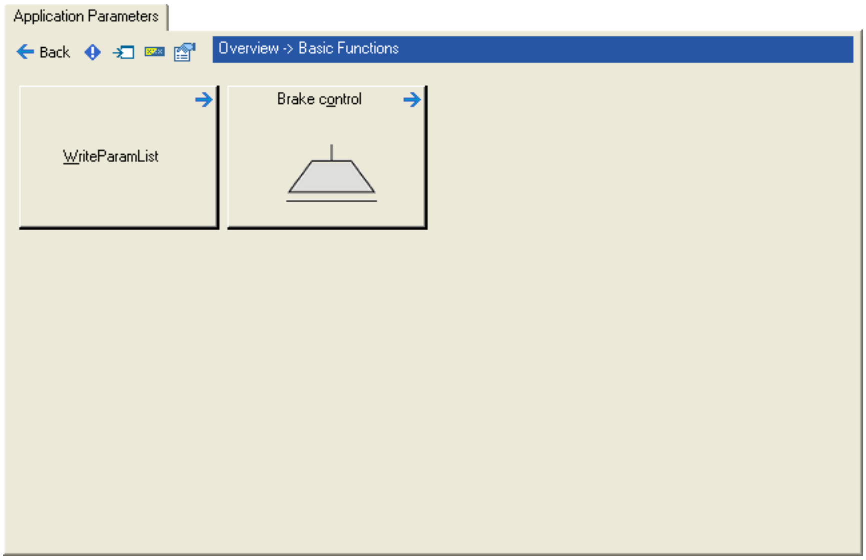
Preconfigured wiring of the internal interfaces in the control mode "Network (MCI/CAN)" is shown in chapter [7.4.4]. (📖 166)

Related topics:

- wDriveControl control word (📖 160)
- wDeviceStateWord status word (📖 161)
- Communication (📖 220)
- Control mode "Network (MCI/CAN)" (📖 222)

8 Basic functions

This chapter describes both basic functions "Parameter change-over" and "Holding brake control".



- The parameter change-over provides a change-over for up to 16 freely selectable parameters between two sets with different parameter values.
- The holding brake control serves to control the holding brake with low rate of wear as a function of the speed setpoint and various other internal digital control signals.

8.1 Parameter change-over

This basic function provides a change-over for up to 16 freely selectable parameters between two sets with different parameter values.

The parameter list is created in the same way as the user menu is composed, namely by means of parameterisation. In the »Engineer«, a user-friendly parameterisation dialog with import and export functions is available for this purpose.

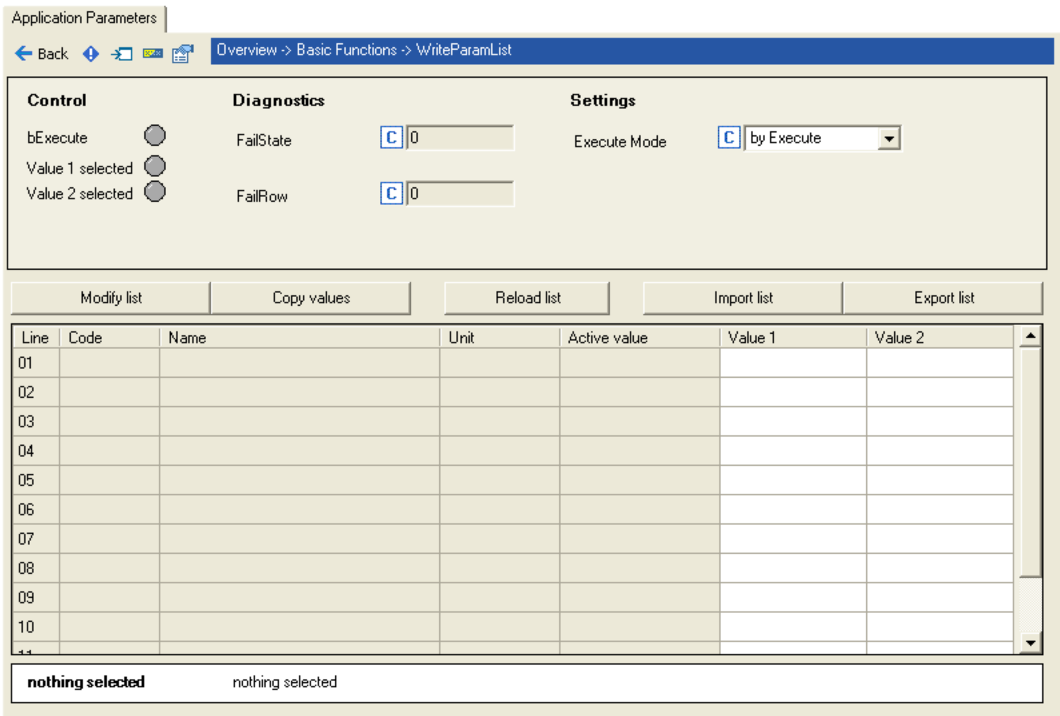
8.1.1 Configuring the list using the »Engineer« parameterisation dialog

In the »Engineer«, a parameterisation dialog is available for user-friendly creation of the parameter list and entry of the parameter values:

How to open the parameterisation dialog:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Go to the *Overview* dialog level and click the **Basic functions** button.
4. Go to the *Overview* → *Basic functions* dialog level and click the **Parameter change-over** button.

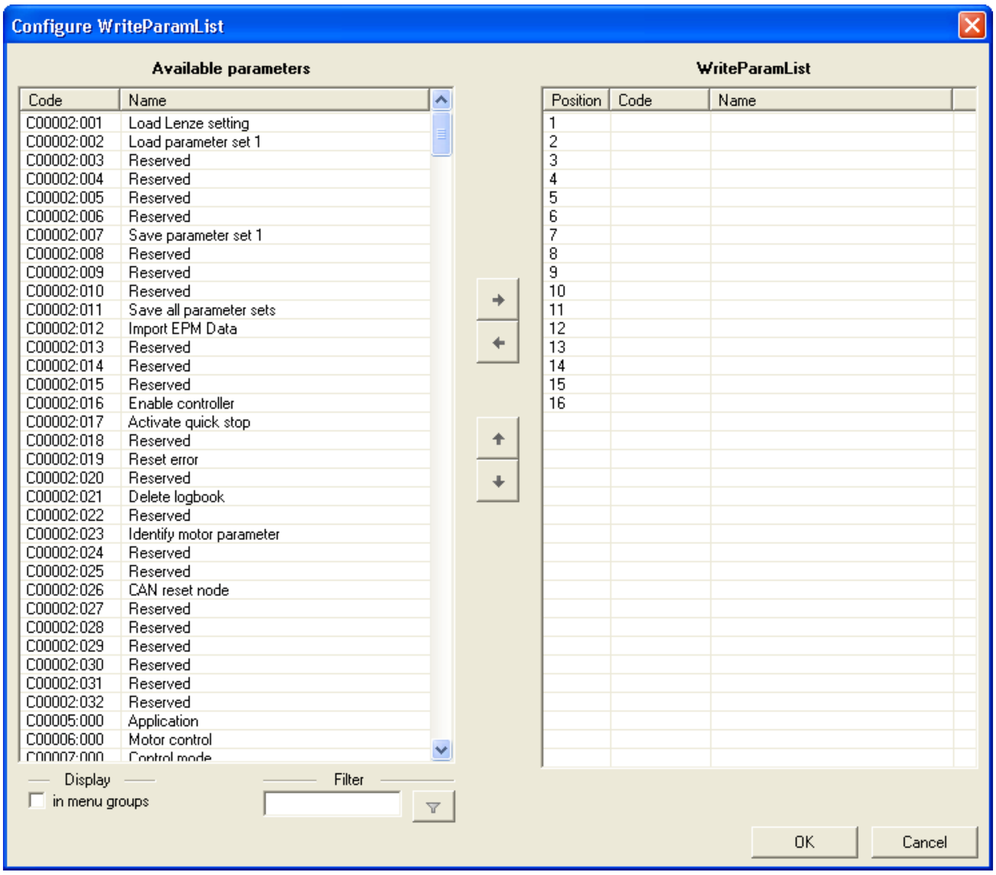
Parameterisation dialog in the »Engineer«



Creating/changing the list

To create or change the list, proceed as follows:

1. Click on **Change list** button.
    - The dialog box entitled *Configure WriteParamList* is shown:



    - On the left-hand side, all the parameters of the drive controller with write and read access are shown in the list entitled **Available parameters**.
    - If the option **In menu groups** is activated, all parameters are shown assigned to their functions.
    - By clicking on the button in the **Filter** area, you can shorten the list of available parameters. If, for example, you enter the text "ain1" and then click on the button, only those parameters whose designation contains this text are shown for selection.
2. Highlight the parameter/parameters in the **Available parameters** list that is/are to be added to the *WriteParamList*.
    - Here, you can use the <**Ctrl**> key and the<**Shift**> key for multiple selection, as in the case of general Windows functions.

3. Click on the button in order to add the highlighted parameters to the *WriteParamList* on the right-hand side.
   - With the and buttons, you can alter the sequence of parameters in the *WriteParamList*.

   To remove parameters from the *WriteParamList*, proceed as follows:
   - Highlight the parameter/parameters in the **WriteParamList** that is/are to be removed from the *WriteParamList*.
   - Click on the button to remove the highlighted parameters from the *WriteParamList*.
4. Click on the **OK** button to accept the configuration and close the dialog box.
   - You can call the configuration dialog again at any time in order to change or expand the *WriteParamList* retrospectively.

Entering values

After composing the list, you can directly enter the desired parameter values into the input fields (columns **1st value** ... **2th value**).

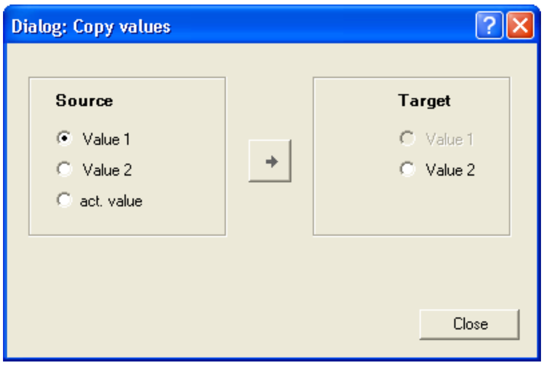
If you place the cursor in an input field, the permitted value range for the corresponding parameter is shown under the table.

Copying values

All the settings of a value set can be copied to the other value set.

To copy values, proceed as follows:

1. Click on the **Copy values** button.
   - The *Copy values* dialog box is displayed:



2. Select **Source** and **Target**.
3. Click on button in order to copy the values from **Source** to **target**.

Importing/exporting the list

For cross-device reuse of the configured *WriteParamList*, you can click on the **Export list** and **Import list** buttons to save the parameter selection as an *.epc file and then to re-import the saved *.epc file into another drive controller 8400.

8.1.2 Configuring the list by means of parameterisation

The following application example shows the necessary procedure for configuring the list without using the »Engineer« parameterisation dialog.

Task:

The parameters C00012, C00026/1, C00027/1 and C00222 to C00224 are to be written.

Compiling the parameter list

In C01085/1 ... n, specify the above-named parameters in the <Code>,<Subcode> format:

- C01085/1 = 12.000
- C01085/2 = 26.001
- C01085/3 = 27.001
- C01085/4 = 222.000
- C01085/5 = 223.000
- C01085/6 = 224.000
- C01085/7 ... n = 0.000 (no parameter)

> **Note!**
>
> Gaps in the parameter list (setting = 0.000) are permissible and are skipped during the process.
>
> Invalid parameter entries are not accepted when being entered.

Entering values for the parameters (value set 1)

In C01086/1 ... n, specify the values to be used to describe the selected parameters. The values are entered in accordance with the scaling format / scaling factor of the respective parameter.

- C01086/1 = <value> for list entry 1 (in our example: for parameter C00012)
- C01086/2 = <value> for list entry 2 (in our example: for parameter C00026/1)
- C01086/3 = <value> for list entry 3 (in our example: for parameter C00027/1)
- etc.

These values are used for writing if the *bSelectWriteValue_1* input is not assigned or set to FALSE.

Entering further different values for the parameters (value set 2)

If required, you can set another set with values in the same manner in C01087/1 ... n which serve to write the parameters.

8.1.3 Selecting a value set

The value set to be used is selected via the *bSelectWriteValue_1* selection input. This selection input can be linked with another output signal via the configuration parameter C00701/26.

bSelectWriteValue_1	Value set used
FALSE	Value set 1 (C01086/1 ... n)
TRUE	Value set 2 (C01087/1 ... n)

8.1.4 Activating the writing of the parameters

For writing the parameter list, two modes are available in C01082:

- 0: by Execute (Lenze setting)
  The writing of the parameter list is activated by a FALSE-TRUE edge at the *bExecute* control input. This control input can be linked with another output signal via the configuration parameter C00701/25.
- 1: by Input Select
  The parameter list is written if a change is made at the *bSelectWriteValue_1* selection input and once when the controller is initialised.

The parameters are written one at a time every time the main program is executed until the entire parameter list is processed. In case of an error, corresponding error messages are output.

After successful completion

... the *bDone* output is set to TRUE.

- The *bDone* output is automatically reset to FALSE if writing via *bExecute* is activated again.

In the event of an error

... the *bDone* output remains set to FALSE and the *bFail* output is set to TRUE.

- C01083 displays an error status and C01084 displays the number of the list entry at which the error occurred (in connection with the selected value set).
- If several errors occur at the same time, only the first incorrect list entry will be displayed. Hence, after elimination of the displayed error and another activation, more errors may be displayed.
- The parameter list will always be processed from beginning to end, even if errors occur in the meantime.

8.2 Holding brake control

An automatic holding brake control function is integrated in the application which controls the holding brake in relation to the speed setpoint and diverse other internal control signals. Due to integrated automatic brake operation, the user is relieved of the task of managing these control signals.

Danger!

Please note that the holding brake is an important element of the safety concept of the entire machine.

Thus, proceed very carefully when commissioning this system part!

Stop!

Holding brakes on Lenze motors are not intended for braking during operation. The increased wear caused by braking during operation can destroy the motor holding brake!

Note!

- **Deactivate automatic DC-injection braking when a holding brake is used!**
  - For this purpose, go to C00019 and set the Auto-DCB threshold to "0".
  - Background: Controller inhibit is already activated by the holding brake control.
- If an electrically holding (self-releasing) brake is to be controlled instead of an electrically released (self-holding) brake, the trigger signal must be inverted!
  Functional settings (182)
- For detailed information about the assembly and electrical installation of the motor holding brake, please see the documentation for the motor holding brake.

Intended use

Motor holding brakes are used to lock axes if the controller is inhibited or in case of "mains off" system status. This is not only important for vertical axes but also for e.g. horizontal axes which may cause various problems if the motion is not controlled.

Examples:

- Loss of the reference information after mains OFF and further spinning of the drive.
- Collision with other moving machine parts.

8.2.1 Parameter setting

Danger!

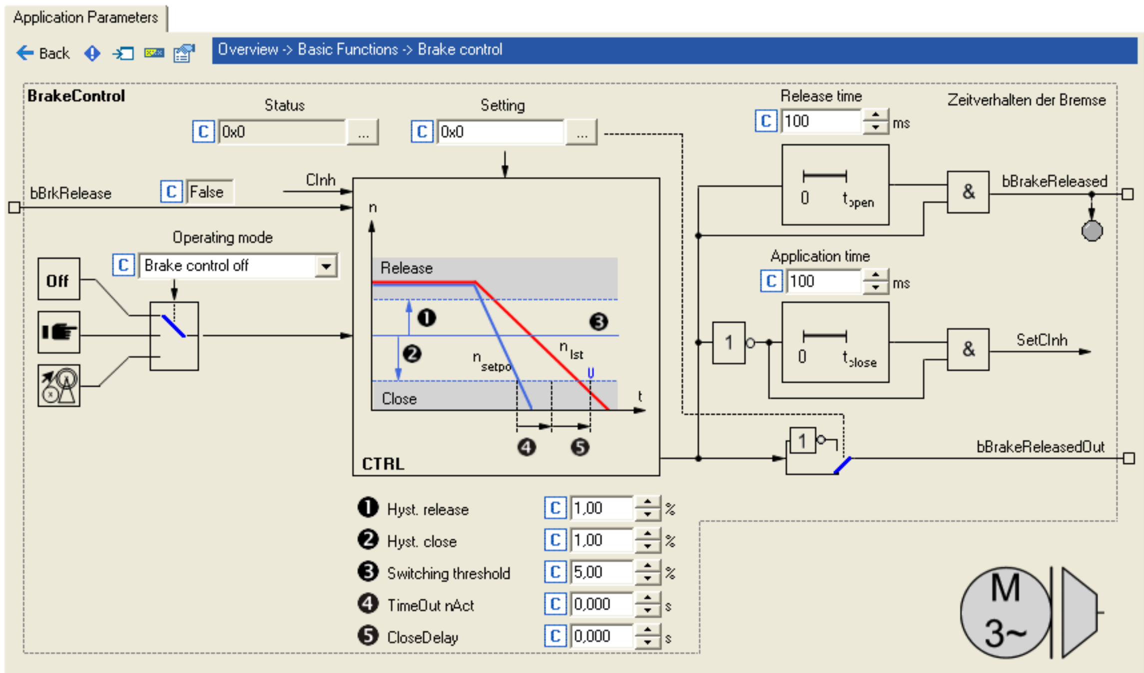
A faultless brake control function requires a correct setting of the different deceleration times in the following parameters!

A wrong setting of the delay times can cause a faulty control of the brake!

Proceed as follows to open the dialog for parameterising the holding brake control:

1. »Engineer« Go to the *Project view* and select the 8400 motec controller.
2. Go to *Workspace* and change to the **Application parameters** tab.
3. Go to the *Overview* dialog level and click the **Basic functions** button.
4. Go to the *Overview* → *Basic functions* dialog level and click the **Holding brake control** button.

Parameterisation dialog in the »Engineer«



Input and output signals of the holding brake control:

Input Data type Configuration parameters	Information/possible settings	
bBrkRelease BOOL C00701/19	Manual release of the brake in connection with the selected operating mode. • In the Lenze setting, this input is connected to the digital input DI5.	
	FALSE	Do not release the brake manually.
	TRUE	Release brake manually (forced release). • **Note!** The brake can also be released if the controller is inhibited! • During automatic operation, the internal brake logic is deactivated and the brake is released (supervisor operation). If a controller inhibit has been set by the brake control, it will be deactivated. • In semi-automatic operation, the brake is released after feedforward control.

Output Data type	Value/meaning	
bBrkReleaseOut BOOL	Trigger signal for the motec-internal power output (terminals BR1 and BR2) for triggering the brake. • Use bit 0 in C02582 to activate inverted triggering of the power output. ▶ Functional settings	
	FALSE	Apply brake.
	TRUE	Release brake.
bBrkReleased BOOL	"Brake released" status signal considering the release time of the brake • If the holding brake is triggered to be closed, *bBrkReleased* is immediately reset to FALSE even if the brake closing time has not elapsed yet!	
	TRUE	Brake released (when the brake release time has elapsed).

Short overview of parameters for holding brake control:

Parameter	Info	Lenze setting Value	 Unit
C00701/19	Signal source for bBrkRelease	15: DigIn_bIn5	
C02580	Holding brake: Operating mode	0: Brake control off	
C02581/1	Holding brake: Switching threshold	5.00	%
C02581/2	Holding brake: Hysteresis for releasing	1.00	%
C02581/3	Holding brake: Hysteresis for applying	1.00	%
C02582	Holding brake: Setting	0	
C02589/1	Holding brake: Applying time	100	ms
C02589/2	Holding brake: Release time	100	ms
C02593/1	Holding brake: Actual value monitoring	0.000	ms
C02593/2	Holding brake: Application delay	0.000	ms
C02610/1	MCK: Holding brake ramp time synchr.	2.0	s
C02607	Holding brake: Status	-	
C00158	Cause of controller inhibit → Bit 12: Automatic brake operation	-	
C00833/24	MCK: bBrkRelease	-	
Highlighted in grey = display parameter			

8.2.1.1 Operating mode

For different applications and tasks, different operating modes are available under C02580. The selected operating mode determines whether the holding brake control is used and how the holding brake will be switched.

Mode 0: Brake control off

In this mode, brake control is switched off (not active).

- The trigger signal *bBrkReleaseOut* for the holding brake control switching element is set to FALSE.
- The status signal *bBrkReleased* is set to FALSE.

Mode 11: Manual control

In this mode, brake release and brake application can be directly controlled via the input *bBrkRelease* (Configuration: C00701/19) without special logic or automatic.

- Setting pulse inhibit or controller inhibit has no influence on the trigger signal *bBrkReleaseOut* for triggering the power output (terminals BR1 and BR2).
- After brake activation and elapse of the brake application time, the controller is inhibited automatically by the basic function "holding brake control".

Tip!

You can use mode 11 to easily check if the brake switches correctly.

Mode 12: Automatic control

In this mode, the brake is controlled automatically.

- If the requested speed setpoint reaches a parameterisable upper speed threshold that allows traversing of the drive, the brake will be released and operation enabled.
- On the other hand, if speed setpoint and actual speed fall below a parameterisable lower speed threshold, the brake will be applied under consideration of different time parameters.
- The brake will also be activated automatically if quick stop is activated in the drive, e.g. by a device command or as response to an error, and in the event of controller inhibit or pulse inhibit.
- After automatic brake activation and elapse of the brake application time, the controller is inhibited automatically by the basic function "holding brake control".

Tip!

The 12 mode is the common mode to control the brake.

- In this mode, the *bBrkRelease* input should be permanently set to FALSE unless manual release is required.
- When *bBrkRelease* = TRUE, the brake is permanently released and the automatic control cannot apply the brake.
- Set "0: Not connected" in C00701/19 if you use this mode and do not want a forced release.

Mode 13: Semi-automatic control

From version 02.00.00

This mode is similar to mode 12 (automatic control). However, there are the following differences compared to mode 12:

- The brake has to be released manually via the *bBrkRelease* input. The parameterisable upper speed threshold is ineffective for releasing the brake.
- If the brake is released via the *bBrkRelease* input, the feedforward control gets active: Before and during the release, feedforward control takes place according to the settings in C02582 (bit 2 ... 4). ▶ Functional settings (📖 182)
- If controller inhibit is pending, the brake is not released.
- If the controller is inhibited, the brake is applied immediately.

Related topics:

▶ Behaviour in case of pulse inhibit (📖 191)

8.2.1.2 Functional settings

In C02582, the following functional settings for holding brake control can be made in bit-coded form:

Bit	Option	Info
Bit 0	Control inverted	Activation of inverted control • "1" ≡ Inverted logic of the trigger signal *bBrkReleaseOut* for triggering the power output (terminals BR1 and BR2).
Bit 1	nAct < nMin at CInh	Brake response in case of pulse inhibit • "1" ≡ With pulse inhibit, the actual speed value is monitored. The holding brake is applied when the actual speed reaches the "Application" threshold value. **Note:** • Function only possible if speed feedback via the digital input terminals DI1/DI2 is available. ▶ Encoder/feedback system • This function is only active if bit 3 (horizontal/winding technology) has been set. The function is used in order that, in case of controller inhibit, the holding brake of a drive with horizontal traverse path does not wear out when rotating. • With a vertical movement (bit 3 = 0), this function is not active. Especially in the case of hoist drives, immediate engagement of the brake is absolutely necessary for safety reasons if the pulse inhibit function of the drive controller has been activated!
Bit 2	Inverted feedforward control	Direction of feedforward control with vertical/hoist technology: • "0" ≡ Positive direction • "1" ≡ Negative direction **Note:** • Reversal (Ccw) is then considered.
Bit 3	Horizontal/winding technology	Direction of the axis • "0" ≡ The direction of the axis is vertical. The gravitational acceleration does not cause any movement. • "1" ≡ The direction of the axis is horizontal or rotary. The gravitational acceleration does not cause any movement.
Bit 4	No premagnetisation	From version 02.00.00 Deactivation of the 200 ms premagnetisation before releasing the brake. • "0" ≡ Premagnetisation in case of feedforward control. • "1" ≡ No premagnetisation.
Bit 5	Reserved	
Bit 6		
Bit 7		

Note!

In C00597, a motor phase monitoring can be set.

- When "1: Fault" is set, it is checked, before the brake is released and during motor premagnetisation, if all three motor phases are connected. If one or several motor phases are missing, the brake will not be released and the drive changes to the "Fault" status.
- If you want to use this function:
  – Ensure that the premagnetisation is not deactivated via bit 4 in C02582.
  – Do not release the brake manually via the *bBrkRelease* input since in this case, no premagnetisation and thus no check of the motor phases take place.

Related topics:

▸ Behaviour in case of pulse inhibit (📖 191)
▸ Feedforward control of the motor before release (📖 192)

8.2.1.3 Switching thresholds

Stop!

Do not set the lower speed threshold for brake application too high to prevent an excessive wear of the brake!

Note!

For the speed comparison, only the absolute motor speed value is considered, the direction of rotation is not taken into account.

Avoid a conflict between the mechanical holding brake and the "DC-injection braking" function by setting the auto-DCB threshold (C00019) to 0 rpm for DC-injection braking.

Upper speed threshold for brake release:

Switching threshold (C02581/1) + hysteresis for release (C02581/2)

Lower speed threshold for brake application:

Switching threshold (C02581/1) - hysteresis for application (C02581/3)

Tip!

The lower speed threshold for brake application should be set to approximately 5 ... 20 % of the maximum speed to minimise the wear of the brake and provide for an optimum brake reaction by a low grinding of the brake.

Related topics:

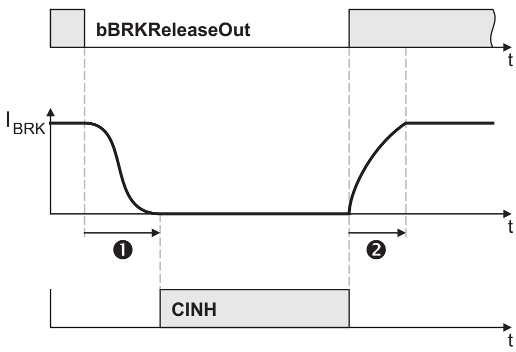
- Process when brake is released (188)
- Process when brake is closed (189)

8.2.1.4 Applying and releasing time

Danger!

A wrong setting of the closing and opening times can cause a faulty control of the brake!

- If the application time is set too low, the controller is inhibited and the drive becomes torqueless before the brake is applied completely.



❶ C02589/1: Application time
❷ C02589/2: Releasing time
CINH = controller inhibit

[8-1] Chronological sequence of the brake output signal

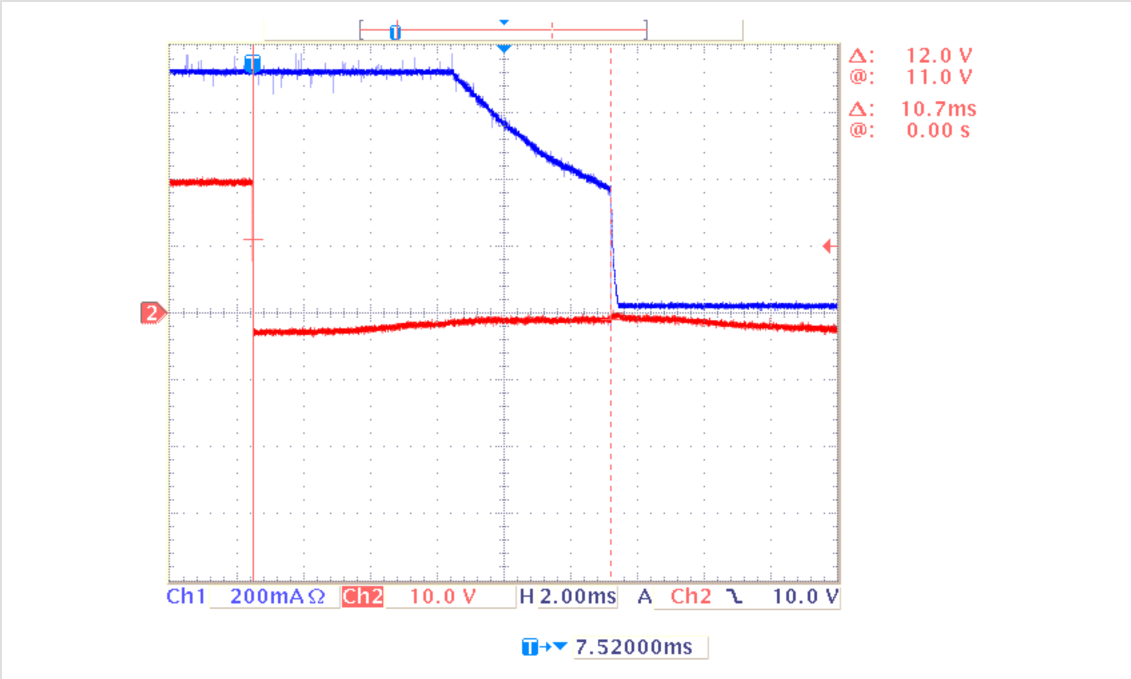
- ▶ Every mechanical holding brake comes with a construction-conditioned application and release time which must be considered by the holding brake control and is set in C02589.
- ▶ The application and release time of the Lenze holding brake is indicated in the supplied operating instructions in the "Technical data" chapter.
- ▶ If the applying and releasing times are too long, this is uncritical in respect of safety but leads to unnecessarily long delays during cyclical braking processes.

Tip!

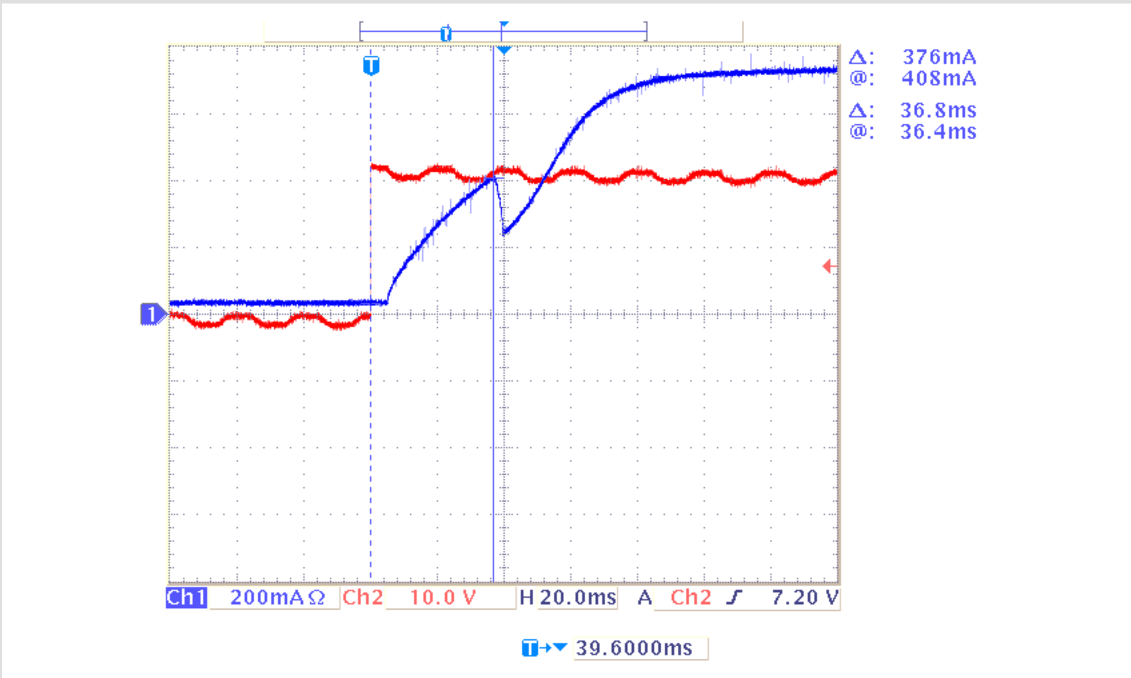
The application and release times do not only vary between the brake types but also depend on the basic conditions in the plant:

- Parameters of the hardware (cable length, temperature, level of supply voltage etc.)
- Contact elements used (contactor at the digital output)
- Type of overvoltage limitation/suppressor circuit

For optimisation purposes, detect in individual cases the response times by measurement.



[8-2] Oscillogram 1: Current characteristic when a mechanical holding brake is closed (application time: 10.7 ms)



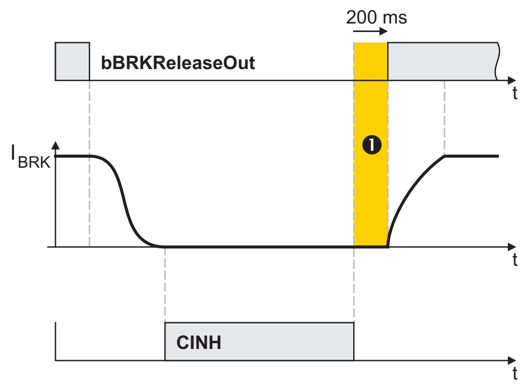
[8-3] Oscillogram 2: Current characteristic when a mechanical holding brake is released (release time: 36.8 ms)

Related topics:

- Process when brake is released (📖 188)
- Process when brake is closed (📖 189)

8.2.1.5 Motor magnetising time (only with asynchronous motor)

When an asynchronous motor is used, first the magnetic field required for the holding torque is created (which is already available when a synchronous motor is used) after the controller inhibit is deactivated and before the brake is released:



❶ Motor magnetising time (200 ms)
CINH = controller inhibit

[8-4] Chronological sequence of the brake output signal

- The frequency related to the lower speed threshold is output for 200 ms unless the premagnetisation has not been deactivated via bit 4 in C02582.
- The same frequency is output to the motor during the release time set in C02589/2.
- The direction of rotation depends on the settings in C02582 (bit 2/3) and the setpoint speed.

8.2.1.6 Actual value monitoring

Note!

Function only possible if speed feedback via the digital input terminals DI1/DI2 is available. ▶ Encoder/feedback system (📖 107)

If an actual value monitoring time > 0 s is selected under C02593/1 the actual speed time monitoring is active.

- The monitoring time starts when the speed setpoint has reached the lower switching threshold and the actual speed is still above this threshold. (See figure [8-7] in chapter entitled "Process when brake is closed".)
- If the actual speed is still above the threshold when the monitoring time has expired, the brake will be automatically applied in the automatic brake control mode (mode 12).

Note!

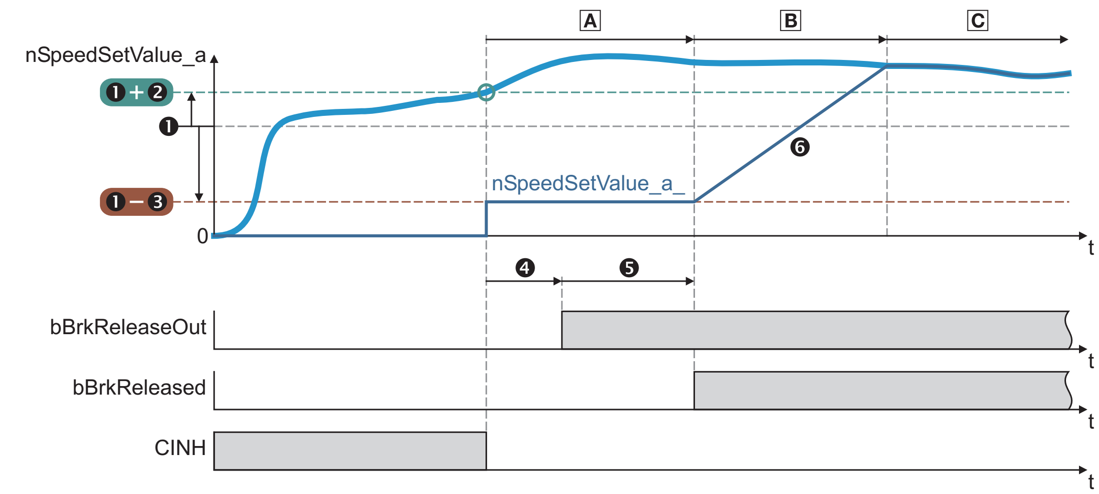
In the Lenze setting, the actual speed time monitoring is deactivated (C02593/1 = "0 s"), i.e. the brake will only be applied when the actual speed has reached the lower switching threshold if speed feedback is available.

8.2.2 Process when brake is released

1. The controller inhibit is deactivated.
2. The magnetic field required for the holding torque is created in the motor (is already available when a synchronous machine is used).
3. For brake release, the *bBrkReleaseOut* trigger signal for triggering the power output is set to TRUE.
4. After the brake opening time has elapsed:
   - The *bBrkReleased* status signal ("brake released") is set to TRUE.
   - The drive synchronises to the already accelerated speed setpoint.

Time diagram

A Feedforward control
B Setpoint synchronisation
C Follow setpoint



❶ C02581/1: Switching threshold
❷ C02581/2: Hysteresis for release
❸ C02581/3: Hysteresis for application
❹ Time slot for magnetising
❺ C02589/2: Releasing time
❻ Ramp time for approaching the setpoint speed

[8-5] Release holding brake in automatic mode via speed threshold

Related topics:

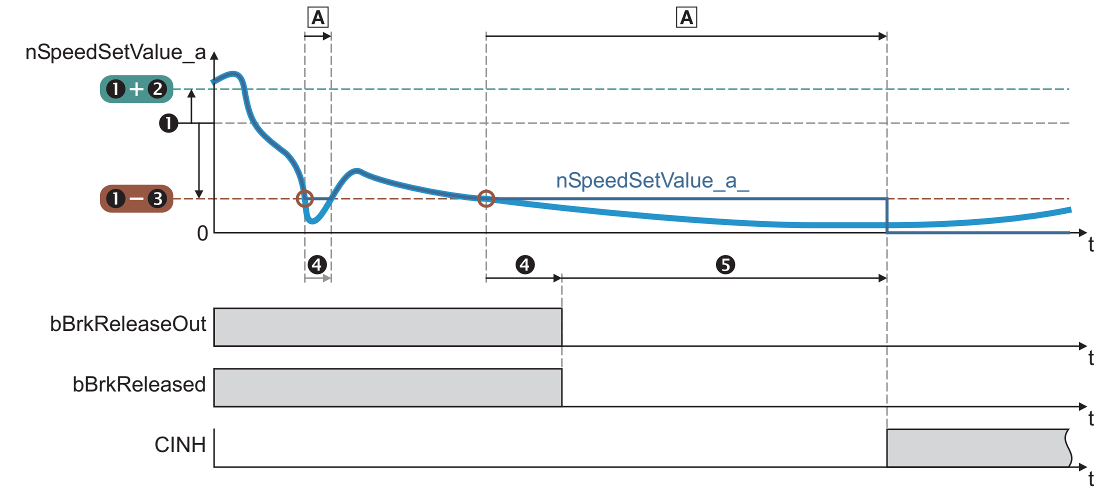
▶ Feedforward control of the motor before release (📖 192)

8.2.3 Process when brake is closed

1. The motor is braked when the setpoint is reduced by the user (e.g. turn down the potentiometer, setpoint selection via CAN).
   – The motor can also be braked by the "quick stop" or "DC-injection braking" function, either directly requested by the user or as response to an error.
2. If the speed setpoint and the actual speed have fallen below the lower speed threshold or only the speed setpoint has fallen below the lower speed threshold and the actual value monitoring time has expired:
   – For closing the brake, the *bBrkReleaseOut* trigger signal for triggering the power output is set to FALSE.
   – The *bBrkReleased* status signal is reset to FALSE.
   – The elapse of the brake closing time starts.
3. After the brake closing time has elapsed, the controller is inhibited.

Time diagrams

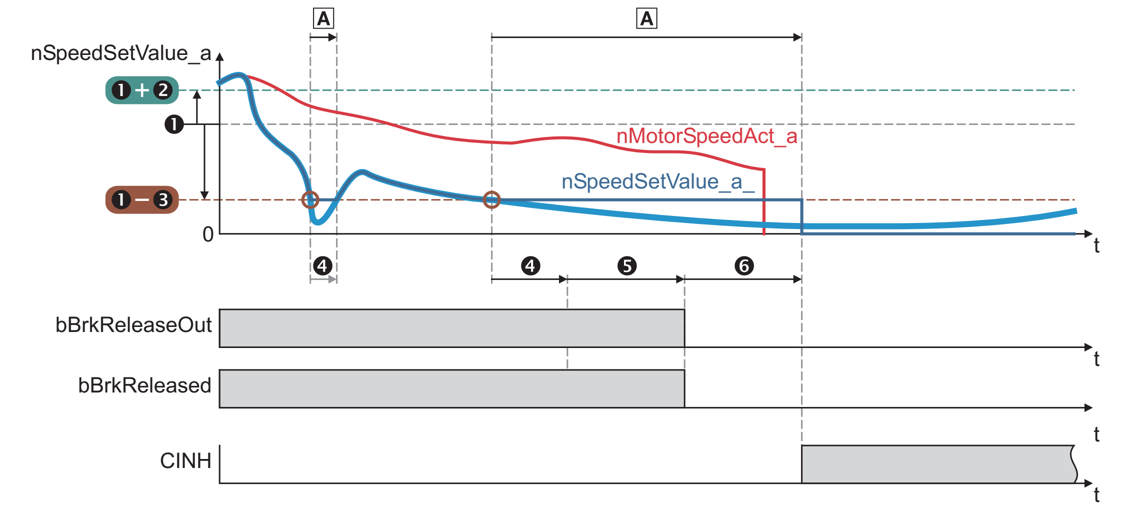
A Feedforward control



❶ C02581/1: Switching threshold
❷ C02581/2: Hysteresis for release
❸ C02581/3: Hysteresis for application
❹ C02593/2: Application delay
❺ C02589/1: Application time

[8-6] Close holding brake in automatic mode via speed threshold (actual value = setpoint)

A Feedforward control



❶ C02581/1: Switching threshold
❷ C02581/2: Hysteresis for release
❸ C02581/3: Hysteresis for application
❹ C02593/2: Application delay
❺ C02593/1: Actual value monitoring time
❻ C02589/1: Application time

[8-7] Close holding brake in automatic mode with actual value monitoring time (C02593/1 > 0 s)

8.2.4 Behaviour in case of pulse inhibit

Setting the pulse inhibit causes a load-controlled coasting of the motor until the pulse is enabled again. In the enabled controller, the pulse can be inhibited e.g. due to a DC overvoltage, DC undervoltage or the "Safe torque off" request.

The brake response to pulse inhibit can be parameterised under C02582.

Stop!

For parameterising the response to pulse inhibit under C02582, the energy conditions of the machine should be evaluated first.

The energy stored in the machine can be considerably higher than the permissible switching energy and thus lead to the destruction of the brake if applied directly!

Activate brake immediately when pulse is inhibited

If bit 1 in C02582 is set to "0" (Lenze setting), the brake is controlled to be closed immediately when a pulse inhibit is set.

Especially in the case of hoist drives, immediate engagement of the brake is absolutely necessary for safety reasons if the pulse inhibit function of the drive controller has been activated!

Only activate brake below threshold for brake activation

Note!

Function only possible if speed feedback via the digital input terminals DI1/DI2 is available. ▶ Encoder/feedback system (📖 107)

If bit 1 and bit 3 in C02582 are set to "1", the brake remains released until the lower speed threshold is reached in order to avoid an excessive wear of the brake.

- The braking action only takes places due to the friction in the load mechanics.
- Only when the motor speed has reached the threshold for brake activation, the brake will be closed. Thus, the function depends on the signal of the speed sensor.

During uncritical operation (horizontal loading condition), delayed brake application may be required to protect the brake in case of high centrifugal masses.

In case of vertical movement (bit 3 = 0), this function is not active due to safety-related reasons.

Related topics:

▶ Functional settings (📖 182)

▶ Switching thresholds (📖 183)

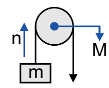
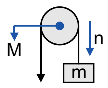
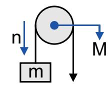
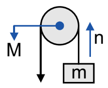
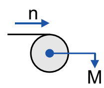
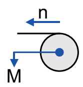
8.2.5 Feedforward control of the motor before release

The motor is precontrolled by selecting the lower speed threshold for applying the brake. When the upper speed threshold for brake release is reached, the motor is precontrolled for 200 ms with the lower threshold before the brake switches to the release mode.

Here, the direction of the feedforward control depends on two conditions:

1. On the settings selected under C02582:
   – Bit 2 = inverted feedforward control
   – Bit 3 = direction of the axis
2. On the sign of the setpoint.

Truth table for the direction of the feedforward control

Setpoint	Sense of direction	Feedforward control	Scheme	Direction	
				Feedforward control value	Start value
n ≥ 0	Vertical/hoist (C02582: Bit 3 = 0)	Not inverted (C02582: Bit 2 = 0)		+	+
		Inverted (C02582: Bit 2 = 1)		−	+
n < 0		Not inverted (C02582: Bit 2 = 0)		+	−
		Inverted (C02582: Bit 2 = 1)		−	−
n ≥ 0	Horizontal/winding drive (C02582: Bit 3 = 1)	Inversion via bit 2 is not effective in case of horizontal sense of direction		+	+
n < 0				−	−

Related topics:

- Functional settings (182)
- Switching thresholds (183)

9 Diagnostics & error management

This chapter provides information on error handling, drive diagnostics, and fault analysis.

9.1 Basics on error handling in the controller

Many of the functions integrated into the controller can

- detect errors and thus protect the device from damage or overload, e.g. short-circuit detection, Ixt overload detection, overtemperature detection, etc.
- detect operating errors by the user, e.g. a missing memory module,
- output warning signals, e.g. if the speed is too high or too low, etc.

Depending on the importance, the error detection in the device responds very fast (e.g. short-circuit detection < 1 ms) or in a slower cycle (e.g. temperature monitoring approx. 100 ms).

All functions provided with an error detection (e.g. the motor control) supply information to a so-called error handler. The error handler is processed every 1 ms and evaluates all information.

In this evaluation, the current error (display in C00165) is generated and the controller is caused to take the respective error status (e.g. trouble).

The error information in C00166/1..3 is used forerror diagnosis and contains the following information:

1. Error type (e.g. "Warning")
2. Error subject area (e.g. "motor management/encoder")
3. The error ID within the error subject area

Together all types of information form the real error number which is unique in the whole device system. ▶ Structure of the error number (bit coding) (📖 204)

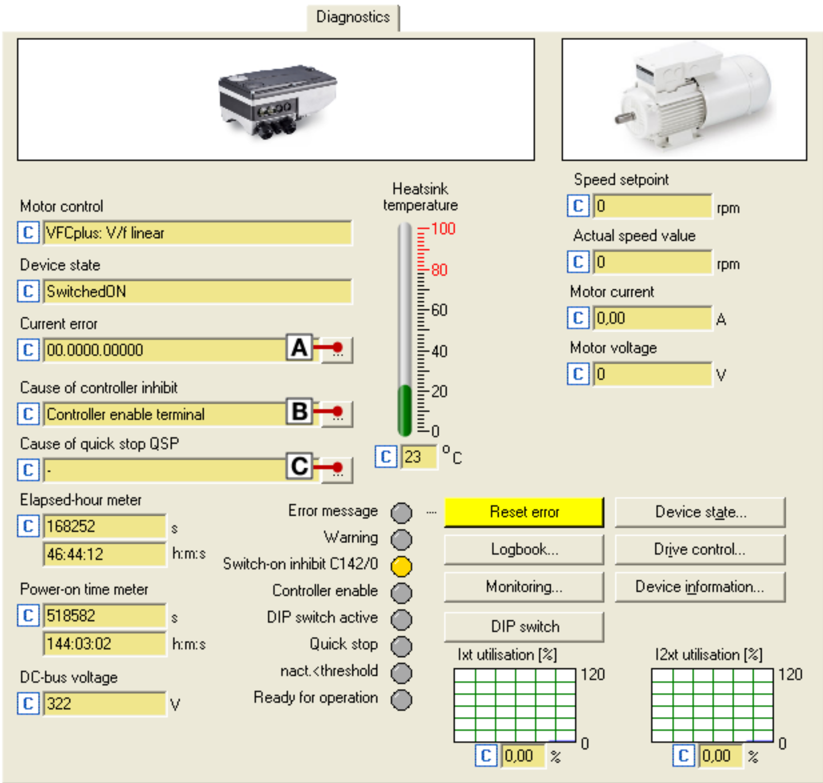
In addition to the control of the device state by the error handler, a logbook function records the errors and their histories. ▶ Logbook (📖 197)

Tip!

For many device errors, the error type and hence the response of the controller to the error can be parameterised. ▶ Setting the error response (📖 201)

9.2 Drive diagnostics with the »Engineer«

When an online connection to the controller has been established, the connected controller can be diagnosed and relevant actual controller states can be displayed in a clearly arranged visualisation using the »Engineer« :



Button		Function
...	A	Show details about the current error.
	B	Display all active sources of a controller inhibit.
	C	Display all active sources of a quick stop.
Resetting an error		Acknowledge fault message (if the error cause has been eliminated).
Logbook...		Display the Logbook of the controller. (📖 197)
Monitoring...		Configure the Monitoring. (📖 199)
DIP switch		Display setting of the DIP switches.
Device state...		Display the internal state machine including the current device state.
Drive control...		Display the bit assignment of the following control-related words: • Network MCI/CAN control word (C00136/1) • Cause of controller inhibit (C00158) • Cause of quick stop QSP (C00159) • Status word (C00150) • Extended status word (C00155)
Device information...		Display identification data, e.g. information on firmware version.

How to diagnose a drive with the »Engineer«:

1. Go to the *Project view* and select the 8400 motec controller.
2. Click the icon or execute the **Online→Go online** command to establish an online connection to the controller.
3. Select the **Diagnostics** tab.
   - With an online connection, the **Diagnostics** tab displays current status information about the controller.

Tip!

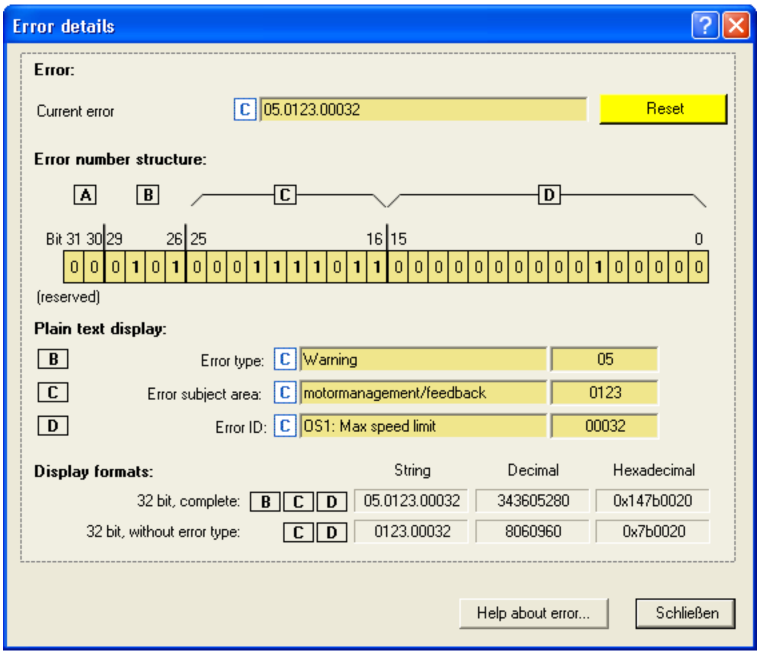
Notes on operating states can be quickly obtained via the two-colored LED display of the 8400 motec. The meaning is described in the "Commissioning" chapter, subchapter "LED status display". (📖 21)

Related topics:

- Device control (DCTRL) (📖 31)
- Device state machine and device states (📖 41)

9.2.1 Show details about the current error

If you go to the **Diagnostics** tab and click the ... button for the current error, the *Error details* dialog box displays more information on the current error:



▶ Click the **Help about error...** button to open the online help with information on the error cause and possible remedies.

9.3 Drive diagnostics via bus system

The following display parameters contain actual values, states, and error messages.

- These parameters are listed in the »Engineer« parameter list and the keypad in the **Diagnostics** category.
- A detailed description of these parameters can be found in the chapter "Parameter reference" (226).

Parameter	Display
C00051	MCTRL: Actual speed value
C00052	Motor voltage
C00053	DC-bus voltage
C00054	Motor current
C00056/1	Torque setpoint
C00056/2	Actual torque
C00058	Output frequency
C00059	Appl.: Reference frequency C11
C00061	Heatsink temperature
C00064/1	Device utilisation (Ixt)
C00064/2	Device utilisation (Ixt) 15s
C00064/3	Device utilisation (Ixt) 3 min
C00133	Brake resistor utilisation
C00136/1	Communication control word
C00137	Device state
C00150	Status word
C00155	Status word 2
C00158	Cause of controller inhibit
C00159	Cause of quick stop QSP
C00165/1	Current error
C00166/1	Error type, current
C00166/2	Error subject area, current
C00166/3	Error ID, current
C00168/1...8	Error ID, history 1 ... 8
C00169/1...8	Time of error, history 1 ... 8
C00170/1...8	Error counter, history 1 ... 8
C00177/1	Switching cycles mains switching
C00177/2	Switching cycles output relay
C00178	Time the controller was enabled (elapsed-hour meter)
C00179	Power-up time (power-on time meter)
C01911	Function DIP switch S1
C01912	Function DIP switch S2
C01913/1	Setpoint potentiometer f1 (LocalSetValue)
C01913/2	Setpoint switch f2 (fixed setpoint)
C01913/3	Ramp switch t1 (acceleration/deceleration time)

9.4 Logbook

The integrated logbook function of the controller chronologically logs important events within the system. The logbook is intended to support you in troubleshooting and controller diagnostics.

Events that can be logged

The following events can be logged in the logbook:

- Error messages of the operating system (📖 204)
- Error messages generated by the application (via LS_SetError_1)

Information saved

For each event, the following information is saved in the logbook:

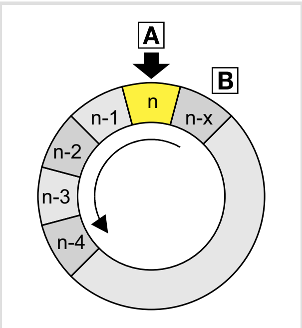
- Type of response to the event (e.g. trouble or warning)
- Subject area that activated the event (e.g. CAN or USER).
- Event
- Value of power-on time meter

Memory depth

Maximum number of logbook entries: 8

9.4.1 Functional description

The structure of the logbook corresponds to a ring buffer:



- As long as free logbook memory locations are available, the entries will be saved to the next free memory location (A).
- If all memory locations are occupied, the oldest entry (B) will be deleted in favour of a new entry.
- The newest entries will always remain available.

Note!

In the event of a supply voltage failure, the logbook is saved and reloaded automatically when the controller is switched on. This ensures that the error history of the device does not get lost. For this reason it is very important to act with caution when deleting the logbook entries.

9.4.2 Reading out logbook entries

We recommend to read out logbook entries with the »Engineer«, since the »Engineer« shows the entries clearly arranged and enables them to be exported into a log file. Alternatively, the corresponding parameters can be read out using the keypad or via the fieldbus.

How to display logbook entries in the »Engineer«:

1. Go to the *Project view* and select the 8400 motec controller.
2. Click the icon or execute the **Online→Go online** command to establish an online connection to the controller.
3. Select the **Diagnostics** tab from the *Workspace*.
4. Click **Logbook**.
   - The *Logbook* dialog box with logbook entries is displayed.
   - Click **Delete** to delete an entry from the logbook.
   - Click **Export** to export the entries from the logbook into a *.log file. Exporting logbook entries to a file (198)
5. Click the **Close** button to close the *Logbook* dialog box again.

9.4.3 Exporting logbook entries to a file

How to export the logbook entries to a file:

1. Go to the *Logbook* dialog box and click the **Export...** button.
   - The *Export logbook* dialog box is displayed.
2. Specify the folder, file name, and file type for the file.
3. Click the **Save** button to export the logbook entries to the specified file.
   - Hidden logbook entries are not exported, i.e. the filter criteria specified are accounted for during the export.
   - The logbook entries are written to the file in the form of a semicolon separated list.

9.5 Monitoring

The controller is provided with various monitoring functions which protect the drive against impermissible operating conditions.

- If a monitoring function responds,
  - an entry will be made into the Logbook of the controller,
  - the response (Trouble, Fault, etc.) set for this monitoring function will be triggered,
  - the status of the internal device control changes according to the selected response, controller inhibit is set, and the "DRIVE ERROR" LED on the top of the controller goes on:

Response	Entry in the logbook	Display in C00168	Pulse inhibit	Controller inhibit	Acknowledgement required	LED red "DRIVE ERROR"
None						Off
Fault	☑	☑	☑	☑	☑	
Trouble	☑	☑	☑	☑ (after 0.5 s)		
WarningLocked	☑	☑			☑	

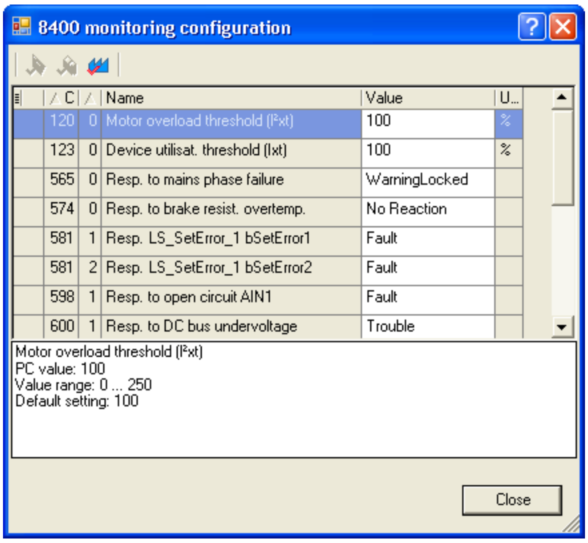
Related topics:

- LED status display (📖 21)
- Device state machine and device states (📖 41)
- Device overload monitoring (Ixt) (📖 122)
- Motor load monitoring (I2xt) (📖 123)
- Motor temperature monitoring (PTC) (📖 125)
- Brake resistor monitoring (I2xt) (📖 126)
- Mains phase failure monitoring (📖 128)

9.5.1 Monitoring configuration

How to configure the monitoring functions using the »Engineer«:

1. Go to the *Project view* and select the 8400 motec controller.
2. Select the **Diagnostics** tab from the *Workspace*.
3. Click the **Monitoring...** button.
    - The *8400 monitoring configuration* dialog box is displayed via which the desired settings can be made:



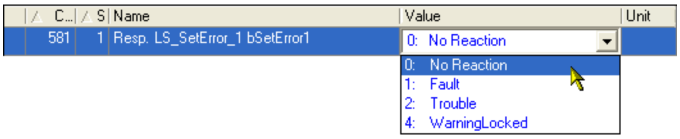
Related topics:

▶ Setting the error response (📖 201)

9.5.2 Setting the error response

When a monitoring function responds, the response set for this monitoring function (Trouble, Fault, etc.) will be triggered.

- For many monitoring functions the response can be individually parameterised via parameters.



Tip!

The table in chapter "Short overview (A-Z)" contains the error messages for which the response can be set . (208)

Warning thresholds

Some of the monitoring functions are activated if a defined warning threshold has been exceeded.

- The corresponding preset threshold values can be changed via the following parameters:

Parameter	Info	Lenze setting	
		Value	Unit
C00120	Motor overload threshold (I²xt)	100	%
C00123	Device utilisat. threshold (Ixt)	100	%
C00909/1	Max. positive speed	120	%
C00909/2	Max. negative speed	120	%
C00910/1	Max. positive output frequency	300	Hz
C00910/2	Max. negative output frequency	300	Hz

9.6 Maloperation of the drive

Maloperation	Cause	Remedy
Motor does not rotate	DC-bus voltage is too low • Red LED is blinking every 1 s	Check mains voltage
	Controller is inhibited • Green LED is blinking	Deactivate controller inhibit • Note: Controller inhibit can be set via several sources ! • C00158 displays all active sources for controller inhibit.
	Automatic start is inhibited	LOW/HIGH edge at RFR If required, correct auto-start option in C00142. ▶ Auto-start option "Inhibit at power-on"
	DC-injection braking (DCB) is active	Deactivate DC-injection braking
	Mechanical motor brake is not released	Release mechanical motor brake manually or electrically
	Quick stop (QSP) is active	Deactivate quick stop • Note: Quick stop can be set via several sources! • In C00159, all active sources for quick stop are displayed.
	Setpoint = 0	Select setpoint
	Setpoint = 0 with activated fixed setpoint	Set fixed setpoint in C00039/1...3
	Trouble is active	Clear fault
	With C00006 = 4 "SLVC: Vector control" has been set, but no motor parameter identification has been carried out.	Carry out automatic motor parameter identification with the C00002/23 controller command ▶ Automatic motor data identification
	Assignment of several mutually exclusive functions with a signal source in C00701	Correct configuration in C00701
Motor rotates irregularly	Motor cable is defective	Check motor cable
	Maximum motor current in motor or generator mode is set too low	Adjust settings to the application: C00022: Imax in motor mode C00023: Imax in generator mode
	Motor is underexcited or overexcited	Check parameterisation: C00006: Motor control C00015: VFC: V/f base frequency C00016: VFC: Vmin boost
	Rated motor data (stator resistance, speed, current, frequency, voltage) and cos φ and/or magnetising inductance is not adapted to the motor data	Carry out automatic motor parameter identification with the C00002/23 controller command - or - Adjust motor parameters manually: C00084: Motor stator resistance C00087: Rated motor speed C00088: Rated motor current C00089: Rated motor frequency C00090: Rated motor voltage C00091: Motor cosine phi C00092: Motor magnetising inductance
	Motor windings are wired incorrectly	Reverse from star connection to delta connection

Maloperation	Cause	Remedy
Motor consumes too much current	U_{min} boost has been selected too high	Correct setting with C00016
	V/f base frequency has been selected too low	Correct setting with C00015
	Rated motor data (stator resistance, speed, current, frequency, voltage) and cos φ and/ or magnetising inductance is not adapted to the motor data	Carry out automatic motor parameter identification with the C00002/23 controller command - or - Adjust motor parameters manually: C00084: Motor stator resistance C00087: Rated motor speed C00088: Rated motor current C00089: Rated motor frequency C00090: Rated motor voltage C00091: Motor cosine phi C00092: Motor magnetising inductance
Motor parameter identification is aborted with error LP1	Motor is too small compared to the rated device power (>1 : 3)	Use device with lower rated power
	DC-injection braking (DCB) is active via terminal	Deactivate DC-injection braking
Drive behaviour with vector control is not satisfactory	different	Optimise or manually adapt vector control ▸ Sensorless vector control (SLVC)
		Carry out automatic motor parameter identification with the C00002/23 controller command ▸ Automatic motor data identification
Torque dip in field weakening range or motor stalling when being operated in the field weakening range	Motor is overloaded	Check motor load
	Motor windings are wired incorrectly	Reverse from star connection to delta connection
	V/f base frequency is set too high	Correct setting with C00015
	Mains voltage is too low	Increase mains voltage
Parameter changes are not accepted	Settings according to DIP1, DIP2, P1, P2 and P3 are active (local mode)	Set DIP1/switch 1 to "OFF" in order that no parameters of the memory module are overwritten when the device is started. • See display parameters C01911 and C01912 for details.

9.7 Error messages of the operating system

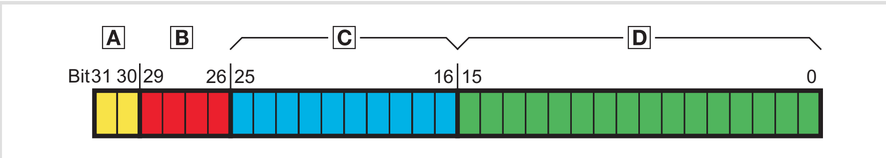
This chapter describes all error messages of the controller operating system and possible causes & remedies.

Tip!

Each error message is also saved in the logbook in chronological order. ▶ Logbook (□ 197)

9.7.1 Structure of the error number (bit coding)

If an error occurs in the controller, the internal fault memory saves a 32-bit value which contains the following information:

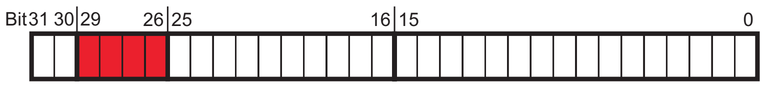


A Reserved
B Error type
C Error subject area
D Error ID

[9-1] Structure of the error number

For the sake of legibiltiy, the error number in the logbook is displayed with the following syntax: [**Error type**].[**Error subject area no.**].[**Error ID**]

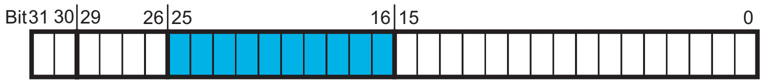
9.7.1.1 Error type



The error type gives information about the behaviour/response of the controller to the error. The error type for some device errors can also be parameterised.

Bit 29	Bit 28	Bit 27	Bit 26	Meaning
0	0	0	0	0: No reaction
0	0	0	1	1: Fault
0	0	1	0	2: Trouble
0	1	0	0	4: WarningLocked

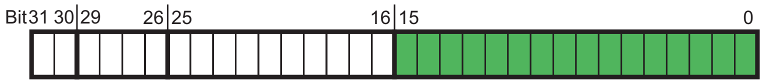
9.7.1.2 Error subject area



The error subject area indicates the internal "function unit" of the controller in which the error has occurred:

Error subject area No.	Name	Assigned errors	Remedy possible by user?
111	Supply voltage	Errors that occur in connection with the supply voltage of the device.	Yes
119	Temperature	Errors that occur for temperature reasons.	Yes
123	Motor management / encoder	Errors that occur within the motor control or encoder evaluation.	Yes
125	Analog I/O	Errors that occur in connection with the analog inputs and outputs.	Yes
127	Communication unit	Errors reported by the communication unit and communication errors to the communication unit.	Yes if it is a fieldbus error.
131	CAN general	Errors related to general CAN functions.	Yes
135	CAN PDO	Errors that are explicitly only related to the CAN-PDO (process data objects).	Yes
140	Device configuration	Errors that occur due to incompatibilities of the plugged-in individual components (drive unit, communication unit).	Yes
144	Parameter set	Errors that occur in connection with the parameter set or the parameter set memory (memory module).	Yes if the error relates to a missing or incompatible memory module.
145	Device firmware (internal error)	Internal error of the device firmware.	No
400	Device hardware defective	Errors that occur due to defective device hardware.	No
444	Fieldbus	Errors that occur in connection with fieldbus communication.	Yes
980	US01: User error 1	Errors generated by the user (by the application) via the LS_SetError_1 system block.	Yes
981	US02: User error 2		

9.7.1.3 Error ID

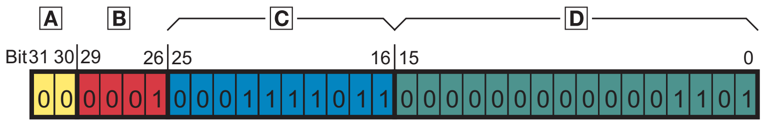


16-bit value (0 ... 65535) for error identification within the error subject area.

9.7.1.4 Example for bit coding of the error number

C00168 displays an internal error number: "75169803".

- This decimal value corresponds to the following bit sequence:



Assignment	Information	Meaning in the example
0 0	Reserved	-
0 0 0 1	Error type	1: Fault (pulse inhibit)
0 0 0 1 1 1 1 0 1 1	Error subject area	123: Motor management / encoder
0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1	Error ID	13: "LU: DC bus undervoltage"

- Thus, error number "75169803" means:
  An overcurrent has been detected in the "Motor management/encoder" subject area. A pulse inhibit is set as error response. The error message must be acknowledged after the error has been eliminated.

9.7.2 Reset of error message

An error message with the response "Fault", "Trouble", or "Warning locked" must be explicitly reset (acknowledged) after the cause of the error has been eliminated.

To reset (acknowledge) a pending error message, execute the controller command C00002/19 = "1".

Tip!

With an online connection to the controller, use the **Diagnostics** tab of the »Engineer« and click **Error message reset** to reset a pending error message.

9.7.3 Short overview (A-Z)

The table below contains all error messages of the controller operating system in alphabetical order.

Note!

For the sake of legibility, the Logbookand C00165 display the error number with the following syntax:
[**Error type**].[**Error subject area no.**].[**Error ID**]

In this documentation, "xx", a wildcard, stands for the error type since it is configurable for many error messages.

Tip!

If you click the cross-reference in the first column, "Error number", you get to the detailed description of the respective error message in the subsequent "Cause & possible remedies" chapter . (210)

Error number	Error message	Response (Lenze setting)	can be set in	CAN Emergency Error Code
xx.0125.00001	An01: AIN1_I < 4 mA	Fault	C00598/1	0xF000
xx.0131.00006	CA06: CAN CRC error	No response	C00592/1	0x8000
xx.0131.00007	CA07: CAN Bus Warn	No response	C00592/3	0x8000
xx.0131.00008	CA08: CAN Bus Stopped	No response	C00592/4	0x8000
xx.0131.00011	CA0b: CAN Bus Live Time	No response	C00592/5	0x8130
xx.0131.00015	CA0F: CAN control word	No response	C00594/2	0xF000
xx.0127.00002	CE04: MCI communication error	Fault	-	0x7000
xx.0135.00001	CE1: CAN RPDO1	No response	C00593/1	0x8100
xx.0135.00002	CE2: CAN RPDO2	No response	C00593/2	0x8100
xx.0131.00000	CE4: CAN Bus Off	No response	C00592/2	0x8000
xx.0145.00001	dF01: Internal error 01	Fault	-	0x6108
xx.0145.00002	dF02: Internal error 02	Fault	-	0x6100
xx.0145.00003	dF03: Internal error 03	Fault	-	0x6100
xx.0145.00004	dF04: Internal error 04	Fault	-	0x6107
xx.0145.00005	dF05: Internal error 05	Fault	-	0x6100
xx.0145.00006	dF06: Internal error 06	Fault	-	0x6100
xx.0145.00007	dF07: Internal error 07	Fault	-	0x6100
xx.0145.00008	dF08: Internal error 08	Fault	-	0x6100
xx.0145.00009	dF09: Internal error 09	Fault	-	0x6100
xx.0145.00010	dF10: Internal error 10	Fault	-	0x5002
xx.0400.00105	dH69: Adjustment fault	Fault	-	0x5530
xx.0123.00057	ID1: Motor data identification error	WarningLocked	-	0xF000
xx.0123.00015	LU: DC bus undervoltage	Trouble	C00600/1	0x3100
xx.0140.00013	MCI1: Module missing/incompatible	Fault	-	0x7000
xx.0123.00016	OC1: Power section - short circuit	Fault	-	0x2000
xx.0123.00017	OC2: Power section - earth fault	Fault	-	0x2000
xx.0119.00050	OC5: Ixt overload	WarningLocked	C00604	0x2000
xx.0123.00105	OC6: I2xt overload - motor	WarningLocked	C00606	0x2000
xx.0119.00052	OC9: Ixt overload - shutdown limit	Fault	-	0x2000
xx.0123.00065	OC12: I2xt overload - brake resistor	Fault	-	0xF000

Error number	Error message	Response (Lenze setting)	can be set in	CAN Emergency Error Code
xx.0119.00001	OH: Heatsink overtemperature	Fault	-	0x4000
xx.0119.00015	OH3: Motor temperature (X106) triggered	Fault	C00585	0x4000
xx.0123.00032	OS1: Maximum speed limit reached	No response	C00579	0x8400
xx.0123.00093	OT2: Speed controller output limited	No response	C00567	0xF000
xx.0123.00014	OU: DC bus overvoltage	Trouble	-	0x3100
xx.0144.00001	PS01: No memory module	WarningLocked	-	0x6300
xx.0144.00002	PS02: Par. set invalid	Fault	-	0x6300
xx.0144.00003	PS03: Par. set device invalid	Fault	-	0x6300
xx.0144.00004	PS04: Par. set device incompatible	Fault	-	0x6300
xx.0144.00031	PS31: Ident. error	Fault	-	0x6300
xx.0123.00205	SD3: Open circuit - feedback system	Fault	C00586	0x7300
xx.0123.00200	SD10: Speed limit - feedback system 12	Fault	C00607	0x7300
xx.0111.00002	Su02: One mains phase is missing	WarningLocked	C00565	0x3000
xx.0980.00000	US01: User error 1	Fault	C00581/1	0x6200
xx.0981.00000	US02: User error 2	Fault	C00581/2	0x6200

9.7.4 Cause & possible remedies

This chapter contains all error messages of the controller operating system in numerical order of the error numbers. The list provides detailed information on the response to the error message as well as information on the cause & possible remedies.

Note!

For the sake of legibility, the Logbookand C00165 display the error number with the following syntax:
[**Error type**].[**Error subject area no.**].[**Error ID**]

In this documentation, "xx", a wildcard, stands for the error type since it is configurable for many error messages.

Tip!

A list of all error messages of the controller operating system in alphabetical order can be found in the previous chapter "Short overview (A-Z)" (🕮 208).

Su02: One mains phase is missing [xx.0111.00002]

Response (Lenze setting printed in bold)	**Setting:** C00565 (☑ Adjustable response)
☑ 0: No Reaction ☑ 1: Fault ☐ 2: Trouble ☒ **4: WarningLocked**	
Cause	**Remedy**
One mains phase of a three-phase supply has failed.	Check mains connection.

OH: Heatsink overtemperature [xx.0119.00001]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
The heatsink temperature is higher than the fixed limit temperature (90 ° C). Maybe the ambient temperature of the controller is too high or the fan or its ventilation slots are dirty.	• Clean controller. • If required, clean or replace the fan. • Provide for sufficient cooling of the device.

OH3: Motor temperature (X106) triggered [xx.0119.00015]

Response (Lenze setting printed in bold)	**Setting:** C00585 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
The motor temperature monitoring mode at plug X?? has triggered. Possible causes: • The motor is overheated so that the thermal contact integrated into the motor has been switched. • An open circuit or a loose contact at the connections mentioned above has occurred.	• Check motor temperature monitoring. • Provide for sufficient cooling of the motor. • Check terminals for open circuit or loose contact.

OC5: Ixt overload [xx.0119.00050]

Response (Lenze setting printed in bold)	**Setting:** C00604 (☑ Adjustable response)
☑ 0: No Reaction ☑ 1: Fault ☐ 2: Trouble ☒ **4: WarningLocked**	

Cause	**Remedy**
The Ixt overload check has tripped. • Operating threshold = 100 % Ixt (adjustable in C00123) Possible causes: • Wrong dimensioning of the device with regard to its motor load. • Load cycles are not complied with.	• Check and, if required, correct dimensioning of the device and the motor load with regard to technical data. • Reduce motor load cycles (observe load cycles according to documentation).

OC9: Ixt overload - shutdown limit [xx.0119.00052]

Response (Lenze setting printed in bold)
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	**Remedy**
The Ixt overload check has tripped. • Operating threshold = 110 % Ixt (fixed) Possible causes: • Wrong dimensioning of the device with regard to its motor load. • Load cycles are not complied with.	• Check and, if required, correct dimensioning of the device and the motor load with regard to technical data. • Reduce motor load cycles (observe load cycles according to documentation).

OU: DC bus overvoltage [xx.0123.00014]

Response (Lenze setting printed in bold)
☐ 0: No Reaction ☑ 1: Fault ☒ **2: Trouble** ☐ 4: WarningLocked

Cause	**Remedy**
The device has detected an overvoltage in the DC bus. To protect the device hardware, the inverter control is switched off. • Depending on the configuration of the auto-start lock function, C00142 serves to set that, if this error has been tripped, the controller only starts after the controller inhibit is switched. • If this error message remains active longer than the time set in C00601, a "Fault" is tripped.	• Reduce load in generator mode. • Use a brake resistor. • Use a regenerative power supply unit. • Establish a DC-bus connection.

LU: DC bus undervoltage [xx.0123.00015]

Response (Lenze setting printed in bold)	**Setting:** C00600/1 (☑ Adjustable response)
☐ 0: No Reaction ☑ 1: Fault ☒ **2: Trouble** ☐ 4: WarningLocked	

Cause	**Remedy**
The device has detected a DC bus undervoltage. The inverter control is switched off because the drive properties of the motor control cannot be provided anymore due to the DC bus undervoltage. • Depending on the configuration of the auto-start lock function, C00142 serves to set that, if this error has been tripped, the controller only starts after the controller inhibit is switched.	• Switch on mains supply or ensure sufficient supply via DC bus. • Adjust setting in C00142 if required.

OC1: Power section - short circuit [xx.0123.00016]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
The device has recognised a short circuit of the motor phases. To protect the device electronics, the inverter control is switched off. • Mostly, incorrectly executed motor connections are the cause. • If the device is inappropriately dimensioned with regard to the motor load and the current limitation in the controller (Imax controller) is set incorrectly, this error message may also occur. ▶ Motor control: Defining current limits	• Check motor connections and the corresponding plug connector on the device. • Only use permissible combinations of device power and motor power. • Do not set the dynamics of the current limitation controller too high.

OC2: Power section - earth fault [xx.0123.00017]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
The device has recognised an earth fault at one of the motor phases. To protect the device electronics, the inverter control is switched off. • Mostly, incorrectly executed motor connections are the cause. • If motor filter, motor cable length, and cable type (shielding capacity) are dimensioned incorrectly, this error message may occur due to leakage currents to PE.	• Check motor connections and the corresponding plug connector on the device. • Use motor filters, cable lengths, and cable types recommended by Lenze.

OS1: Maximum speed limit reached [xx.0123.00032]

Response (Lenze setting printed in bold)	**Setting:** C00579 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☐ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
The device has recognised that the maximum speed has been reached.	• Limit setpoint selection to maximum values. • Adjust set speed limitation (C00909) and frequency limitation (C00910) if necessary.

ID1: Motor data identification error [xx.0123.00057]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☐ 1: Fault ☐ 2: Trouble ☒ **4: WarningLocked**	
Cause	**Remedy**
The device has detected an error during the motor data identification. Possible causes: • Interrupted motor cable. • Switched-off power section during the identification. • Implausible start parameter settings.	• Check the motor connections and the corresponding plug connector on the device and, if necessary, the motor terminal box. • Correct start parameters for the motor parameter identification (motor nameplate data). • Stable power supply of the device.

OC12: I2xt overload - brake resistor [xx.0123.00065]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Too frequent and too long braking processes.	• Check drive dimensioning. • Check parameterisation (C00129, C00130, C00131).

OT2: Speed controller output limited [xx.0123.00093]

Response (Lenze setting printed in bold)	**Setting:** C00567 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☐ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
The output of the speed controller has reached the internal limit value. In this state, the speed controller is not able anymore to correct the system deviation. • Only with "Closed loop" operation or vector control (SLVC).	• Observe load requirements. • If required, correct dimensioning or reduce dynamics of the setpoint generation. ▸ Motor control

OC6: I2xt motor overload [xx.0123.00105]

Response (Lenze setting printed in bold)	**Setting:** C00606 (☑ Adjustable response)
☑ 0: No Reaction ☑ 1: Fault ☐ 2: Trouble ☒ **4: WarningLocked**	
Cause	**Remedy**
Thermal overload of the motor.	• Observe load requirements. • Correct dimensioning if necessary. • In case of VFCplus operation: Check Vmin boost (C00016). Set ▸ Vmin boost

SD10: Speed limit - feedback system 12 [xx.0123.00200]

Response (Lenze setting printed in bold)	**Setting:** C00607 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
Maximally permissible speed of the feedback system connected to DI1/DI2 reached.	Reduce speed of the rotation shaft/feedback system. $n_{encoder}$ <= (f_{max} x 60) / encoder increment (at f_{max} = 10 kHz)

SD3: Open circuit - feedback system [xx.0123.00205]

Response (Lenze setting printed in bold)	**Setting:** C00586 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
The device has detected an open circuit in the feedback system.	Check wiring of the feedback system and the corresponding terminals.

An01: AIN1_I < 4 mA [xx.0125.00001]

Response (Lenze setting printed in bold)	**Setting:** C00598/1 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
Open-circuit monitoring for analog input 1 has tripped. • Only if the analog input has been configured as a current loop of 4 ... 20 (C00034/1 = 2).	• Check wiring of the analog input terminals for open circuit. • Check minimum current values of the signal sources.

CE04: MCI communication error [xx.0127.00002]

Response (Lenze setting printed in bold)	**Setting:** C01501/1 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
Communication error with communication unit	• Eliminate EMC interference. • Mains switching or restart of the controller, respectively. • Exchange communication unit/drive unit. • If the problem occurs again, you needs to consult Lenze.

CE4: CAN bus off [xx.0131.00000]

Response (Lenze setting printed in bold)	**Setting:** C00592/2 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: "Bus-Off" state • Received too many faulty telegrams. • Damaged cable (e.g. loose contact). • Two nodes have the same ID.	• Check wiring and bus terminating resistor. • Set identical baud rate for each bus node. • Assign diiferent IDs to nodes. • Eliminate electrical interference (e.g. EMC).

CA06: CAN CRC error [xx.0131.00006]

Response (Lenze setting printed in bold)	**Setting:** C00592/1 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: a faulty CAN telegram has been detected.	• Check wiring and bus terminating resistor. • Eliminate electrical interference (e.g. EMC).

CA07: CAN bus warning [xx.0131.00007]

Response (Lenze setting printed in bold)	**Setting:** C00592/3 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: Incorrect transmission or reception of more than 96 CAN telegrams. • The current number of incorrectly transmitted CAN telegrams is displayed in C00372/1. • The current number of incorrectly received CAN telegrams is displayed in C00372/2. • The current CAN error status is displayed in C00345.	• Check wiring and bus terminating resistor. • Set identical baud rate for each bus node. • Assign diiferent IDs to nodes. • Eliminate electrical interference (e.g. EMC).

CA08: CAN bus stopped [xx.0131.00008]

Response (Lenze setting printed in bold)	**Setting:** C00592/4 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: The device has received the "Stop Remote Node" NMT telegram.	Check CAN master (NMT master).

CA0b: CAN Bus Live Time [xx.0131.00011]

Response (Lenze setting printed in bold)	**Setting:** C00592/5 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: Cyclic node monitoring • Being a Heartbeat consumer, the device has not received a Heartbeat telegram from Heartbeat producer 1 ... 7 within the defined time. • The current states of the Heartbeat producers are displayed in C00347/1.	• Reactivate Heartbeat producers by mains switching, restarting the controller, or a CAN Reset Node. • Reparameterise CAN Heartbeat producer time or switch off consumer monitoring and reset error status if latched.

CA0F: CAN control word [xx.0131.00015]

Response (Lenze setting printed in bold)	**Setting:** C00594/2 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
Bit 14 ("SetFail") in the wCANControl control word of the system block LS_DriveInterface has been set.	Trace back signal source on the CAN bus that sets bit 14 ("SetFail").

CE1: CAN RPDO1 [xx.0135.00001]

Response (Lenze setting printed in bold)	**Setting:** C00593/1 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: Time monitoring for RPDO1 has tripped. • RPDO1 has not been received within the monitoring time set in C00357/1 or was faulty.	• Set the correct telegram length at the CAN master (transmitter). • Eliminate electrical interference (e.g. EMC). • Adjust monitoring time in C00357/1 or switch off time monitoring.

CE2: CAN RPDO2 [xx.0135.00002]

Response (Lenze setting printed in bold)	**Setting:** C00593/2 (☑ Adjustable response)
☒ **0: No Reaction** ☑ 1: Fault ☑ 2: Trouble ☑ 4: WarningLocked	

Cause	**Remedy**
CAN interface: Time monitoring for RPDO2 has tripped. • RPDO2 has not been received within the monitoring time set in C00357/2 or was faulty.	• Set the correct telegram length at the CAN master (transmitter). • Eliminate electrical interference (e.g. EMC). • Adjust monitoring time in C00357/2 or switch off time monitoring.

MCI1: Module missing/incompatible [xx.0140.00013]

Response (Lenze setting printed in bold)	**Setting:** C01501/2 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☑ 4: WarningLocked	

Cause	Remedy
There is a connection problem between the communication unit and the drive unit or an incompatibility.	• Check installation of the 8400 motec. • In case of an incompatibility, either the communication unit or the software of the drive unit is out of date. In this case, please contact Lenze.

PS01: No memory module [xx.0144.00001]

Response (Lenze setting printed in bold)
☐ 0: No Reaction ☐ 1: Fault ☐ 2: Trouble ☒ **4: WarningLocked**

Cause	Remedy
Memory module is either not available or not snapped into place correctly.	• If a memory module has been provided: Plug the memory module into the slot of the drive unit intended for this purpose. • If a memory module has been provided: Check if the memory module has been plugged-in correctly.

PS02: Par. set invalid [xx.0144.00002]

Response (Lenze setting printed in bold)
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
The parameter set saved to the memory module is invalid because it has not been saved completely. • This can be due to voltage failure or caused by removing the memory module while saving the parameter set.	Ensure voltage supply during the storage process and that the module remains plugged into the slot.

PS03: Par. set device invalid [xx.0144.00003]

Response (Lenze setting printed in bold)
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
The parameter set in the device is invalid.	Consultation with Lenze required.

PS04: Par. set device incompatible [xx.0144.00004]

Response (Lenze setting printed in bold)
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
The parameter set saved to the memory module is incompatible to the standard device. • Incompatibility of the parameter set is e.g. caused if the parameter set in the memory module has a higher version than the standard device.	When the memory modules are exchanged, observe the downward compatibility: • OK: motec V1.0 to motec > V1.0 • Not OK: motec V2.0 to motec < V2.0

PS31: Ident. error [xx.0144.00031]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Incompatible or unknown HW components have been found.	• Check which HW components are faulty (C00203/x: Product type code). • Check connection between communication unit and drive unit regarding for contact problems. • Check temperature range of the device at the start. • Replace communication unit. • Check whether a software update at Lenze is possible.

dF01: Internal error 01 [xx.0145.00001]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Device error: No pulse width modulation	• Reduce switching frequency (C00018) to 4 kHz. • If the problem occurs again, you needs to consult Lenze.

dF02: Internal error 02 [xx.0145.00002]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF03: Internal error 03 [xx.0145.00003]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF04: Internal error 04 [xx.0145.00004]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF05: Internal error 05 [xx.0145.00005]

Response (Lenze setting printed in bold)

☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF06: Internal error 06 [xx.0145.00006]

Response (Lenze setting printed in bold)

☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF07: Internal error 07 [xx.0145.00007]

Response (Lenze setting printed in bold)

☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF08: Internal error 08 [xx.0145.00008]

Response (Lenze setting printed in bold)

☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF09: Internal error 09 [xx.0145.00009]

Response (Lenze setting printed in bold)

☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked

Cause	Remedy
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dF10: Internal error 10 [xx.0145.00010]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Device error	• Mains switching or restart of the controller, respectively. • If the problem occurs again, you needs to consult Lenze.

dH69: Adjustment fault [xx.0400.00105]

Response (Lenze setting printed in bold)	
☐ 0: No Reaction ☒ **1: Fault** ☐ 2: Trouble ☐ 4: WarningLocked	
Cause	**Remedy**
Device error	Consultation with Lenze required.

US01: User error 1 [xx.0980.00000]

Response (Lenze setting printed in bold)	**Setting:** C00581/1 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☑ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
User error 1 has been tripped via the *bSetError1* input of the LS_SetError_1 system block.	User-defined.

US02: User error 2 [xx.0981.00000]

Response (Lenze setting printed in bold)	**Setting:** C00581/2 (☑ Adjustable response)
☑ 0: No Reaction ☒ **1: Fault** ☑ 2: Trouble ☑ 4: WarningLocked	
Cause	**Remedy**
User error 2 has been tripped via the *bSetError2* input of the LS_SetError_1 system block.	User-defined.

10 Communication

The following communication units are available for the 8400 motec controller:

- No fieldbus
- AS-i option
- CANopen option
- PROFIBUS option
- EtherCAT option (in preparation)
- PROFINET option (in preparation)

Detailed information on the respective "CAN" communication unit can be found in the corresponding online help and in the communication manual (KHB).

10.1 General information

The interaction of communication unit and drive unit implements fieldbus-specific functions. This comprises control words and status words, device state machines and process data mapping.

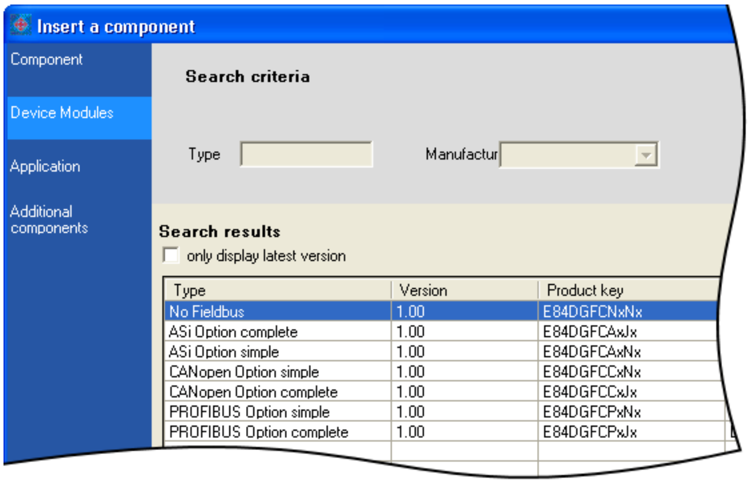
- The parameters of the fieldbus communication are saved in the memory module. The RAM copies of these data can be addressed via the fieldbus.
- The received process data are processed in the controller in a 1ms cycle.

The codes of the respective communication unit are described in the corresponding online help and in the communication manual (KHB).

10.2 Selection of the communication in the »Engineer«

If you insert the 8400 motec controller via the *Insert a component* dialog into the *Project view* of the »Engineer«, you will be queried in the second dialog step **Device modules** about the communication option in the device.

Select the communication option in the list field according to the available communication unit in order that the related configuration parameters & parameterisation dialogs are available in the »Engineer«.



Tip!

The available communication option can also be assigned subsequently to the device in the »Engineer« any time:

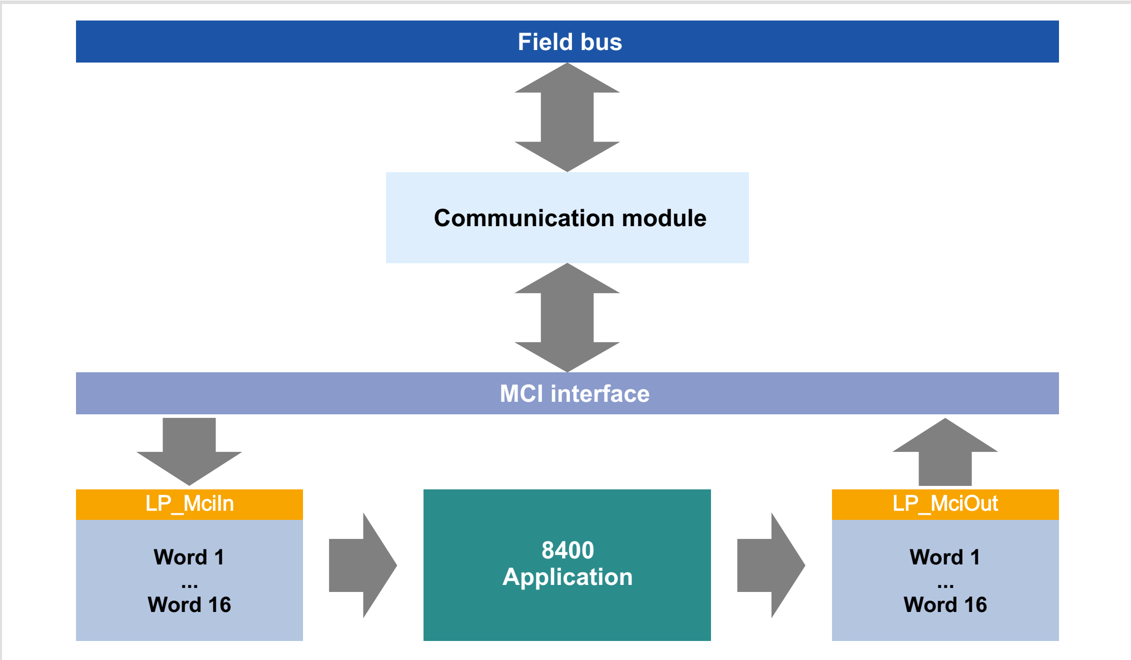
1. Go to the *Project view* and select the 8400 motec controller.
2. Click the symbol.
3. Select the available communication option in the *Insert device modules* dialog box..
4. Press **Complete** to confirm your selection.

10.3 Control mode "Network (MCI/CAN)"

40: Network (MCI/CAN)" can be selected as a control mode in C00007 in order to quickly and easily set-up controller control via fieldbus communication.

In this control mode, the process data (PDOs) are transferred via the MCI or CAN interface depending on the available communication unit.

- Max. 8 process data words per direction are exchanged.
- The process data are accessed via the **LP_Network_In** and **LP_Network_Out** port blocks. These port blocks are also called process data channels.



[10-1] External and internal data transfer between bus system, controller and application

Preconfigured wiring of the internal interfaces in control mode "Network (MCI/CAN)" is shown in figure [7-2]. (📖 166)

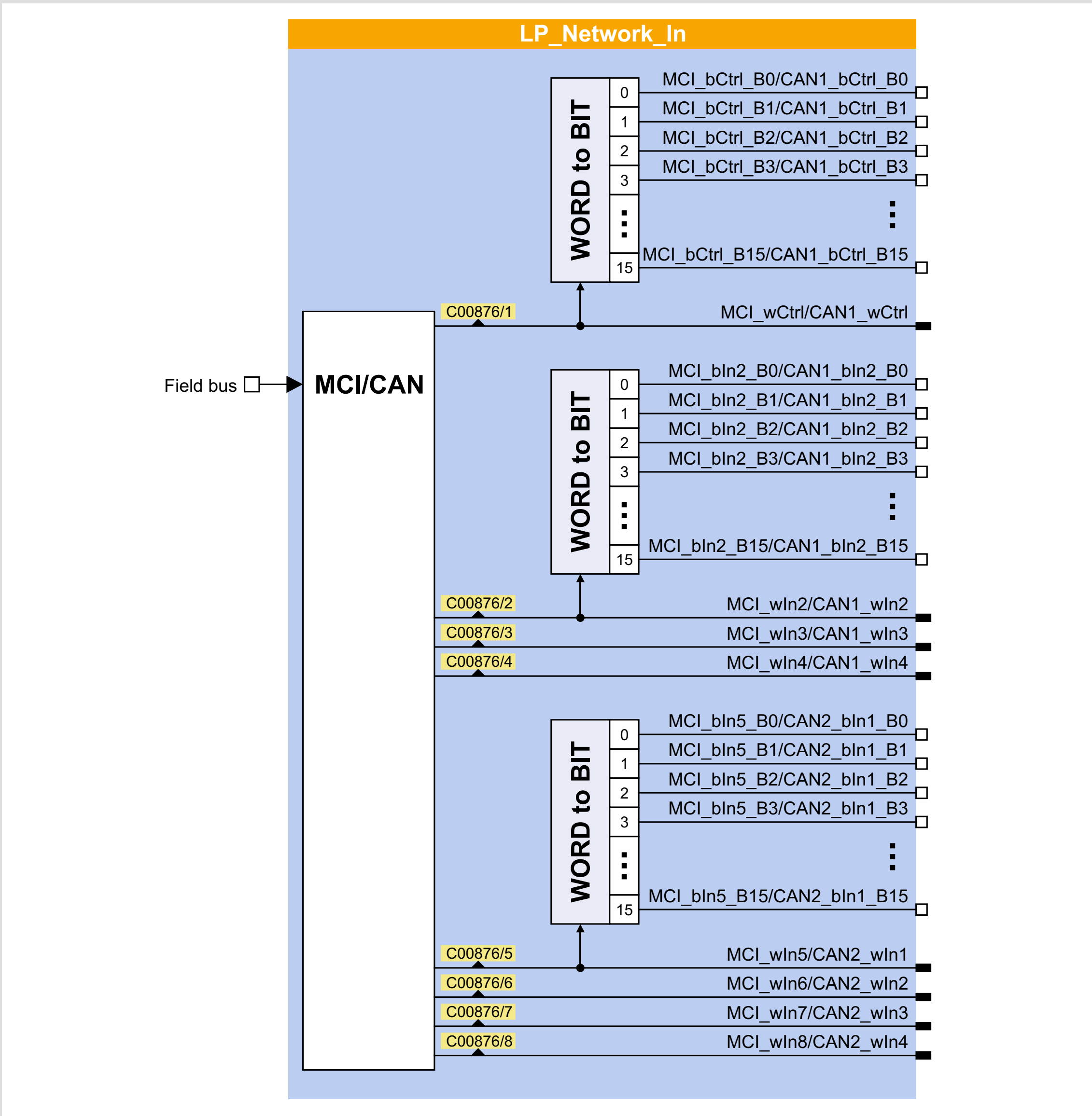
10.3.1 Pre-assignment of the data words

In the control mode "40: Network (MCI/CAN)" the process data words are already assigned sensibly:

PDO	Signal	Assignment	Info
Port block LP_Network_In			
RPDO1	wCtrl	LA_NCtrl.wDriveControl	Control word • See the "wDriveControl control word" chapter for a detailed description of the individual control bits. (🕮 160)
	bCtrl1_B8	LA_NCtrl.bRFG_0	1 ≡ Activate stop function • Stop drive via stopping ramp (in preparation).
	bCtrl1_B11	LA_NCtrl.bSetDCBrake	1 ≡ Activate DC-injection braking ▸ Manual DC-injection braking (DCB) (🕮 103)
	bCtrl1_B12	LA_NCtrl.bJogSpeed1	Activation of fixed speed 1 ... 3
	bCtrl1_B13	LA_NCtrl.bJogSpeed2	
	bCtrl1_B15	LA_NCtrl.bSetSpeedCcw	0 ≡ Direction of rotation to the right (Cw) 1 ≡ Direction of rotation to the left (Ccw)
RPDO2	wIn2	LA_NCtrl.nMainSetValue_a	Speed setpoint • Scaling: 16384 ≡ 100 % rated speed (C00011)
RPDO3	wIn3	-	-
...	...		
RPDO8	wIn8		
Port block LP_Network_Out			
TPDO1	wState	LA_NCtrl.wDriveControlStatus	Status word of the controller (based on DSP-402) • For bit assignment, see chapter entitled "wDeviceStateWord status word". (🕮 161)
TPDO2	wOut2	LA_NCtrl.nMotorSpeedAct_a	Actual speed value • Scaling: 16384 ≡ 100 % rated speed (C00011)
TPDO3	wOut3	LA_NCtrl.nOutputSpeedCtrl_a	Speed or slip controller output • Scaling: 16384 ≡ 100 % rated speed (C00011)
TPDO4	wOut4	-	-
...	...		
TPDO8	wOut8		

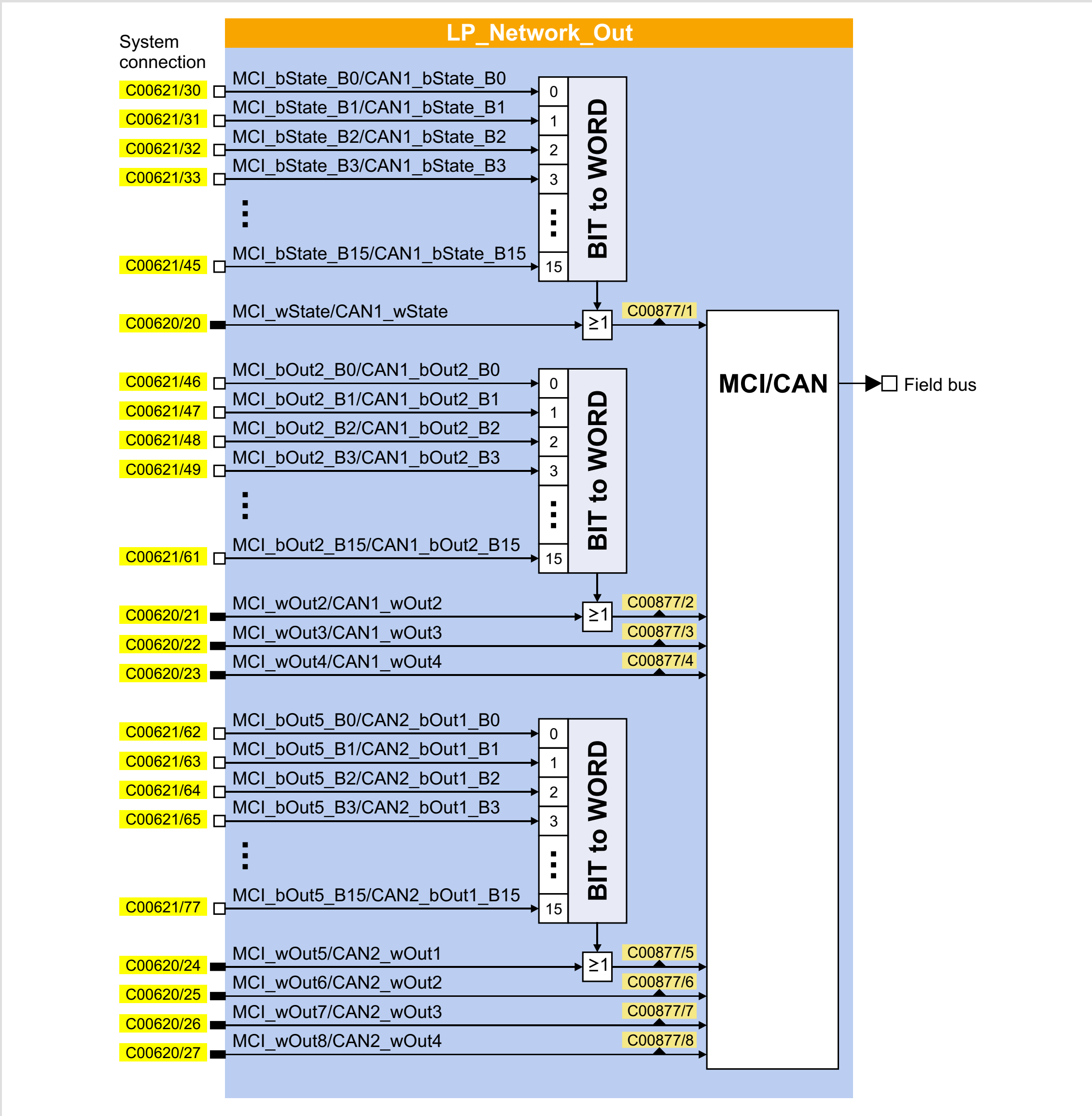
10.3.2 Port block "LP_Network_In"

When the control mode"40: Network (MCI/CAN)" has been selected, the **LP_Network_In** port block transmits the process data words (RPDOs) received by the communication unit to the application.



10.3.3 Port block "LP_Network_Out"

When the control mode "40: Network (MCI/CAN)" has been selected, the process data words (TPDOs) to be sent to the communication unit are transmitted via the **LP_Network_Out** port block..



11 Parameter reference

This chapter describes all parameters which can be used for parameterising and monitoring the controller.

Parameters which are only available in the controller from a certain software version onwards are marked with a corresponding note in the parameter description ("from version xx.xx.xx").

The parameter descriptions are based on the software version V02.00.00

Tip!

For quick reference of a parameter with a certain name, simply use the **index** of the online documentation. The index always contains the corresponding code in parentheses after the name.

General information on parameter setting can be found in the chapter entitled "Introduction: Parameterising the controller". (📖 15)

For general information on how to read and change parameters, please see the online documentation for the »Engineer«.

11.1 Structure of the parameter descriptions

Each parameter is described in the Parameter list in the form of a table which consists of the following three areas:

Table header

The table header contains the following general information:

- Parameter number (Cxxxxx)
- Parameter name (display text in the »Engineer» and keypad)
- Data type
- Parameter index in decimal and hexadecimal notation for access via a fieldbus (e.g. CAN system bus).

Tip!

The parameter index is calculated as follows:

- Index [dec] = 24575 - code
- Index [hex] = 0x5FFF - code

Example for code C00005:

- Index [dec] = 24575 - 5 = 24570
- Index [hex] = 0x5FFF - 0x{5} = 0x5FFA

Table contents

The table contains further general explanations & notes on the parameter and the possible settings, which are represented in different ways depending on the parameter type:

- Parameters with read-only access
- Parameters with write access

Table footer

The table footer contains the Parameter attributes.

11.1.1 Data type

The parameters can be of the following data types:

Data type	Meaning
INTEGER_16	16-bit value with sign
INTEGER_32	32-bit value with sign
UNSIGNED_8	8-bit value without sign
UNSIGNED_16	16-bit value without sign
UNSIGNED_32	32-bit value without sign
VISIBLE_STRING	String of characters from printable characters

11.1.2 Parameters with read-only access

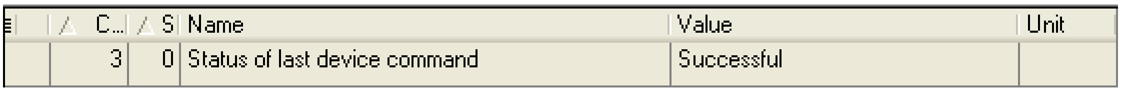
Parameters for which the "write access" attribute has not been set, can only be read. They cannot be changed by the user.

Description structure

Parameter | Name: **Cxxxxx | ______________**			Data type: _______ Index: _______
Description			
Display range **(min. value | unit | max. value)**			
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

Representation in the »Engineer«

The »Engineer« displays these parameters with a grey background or, with an online connection, with a pale-yellow background:



	C...	S	Name	Value	Unit
	3	0	Status of last device command	Successful	

11.1.3 Parameters with write access

Only parameters with a check mark (☑) in front of the "write access" attribute can be changed by the user. The Lenze setting for these parameters is **printed in bold**.

- The settings can either be selected from a selection list or the values can be entered directly.
- Values outside the valid setting range are represented in red in the »Engineer«.

11.1.3.1 Parameters with setting range

Description structure

Parameter | Name: **Cxxxxx | ____________**			Data type: _______ Index: _______
Description			
Setting range (min. value | unit | max. value)			**Lenze setting**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

Parameter setting in the »Engineer«

In the »Engineer«, parameters are set by entering the desired value into the input field:

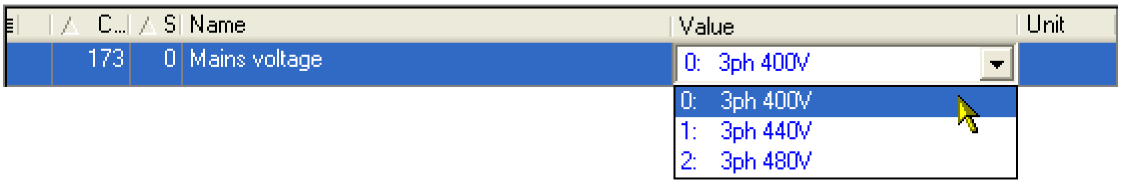
11.1.3.2 Parameters with selection list

Description structure

Parameter | Name: **Cxxxxx | ____________**		Data type: _______ Index: _______
Description		
Selection list (Lenze setting printed in bold)		
1		
2		
3		
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

Parameter setting in the »Engineer«

In the »Engineer«, a list field is used for parameter setting:



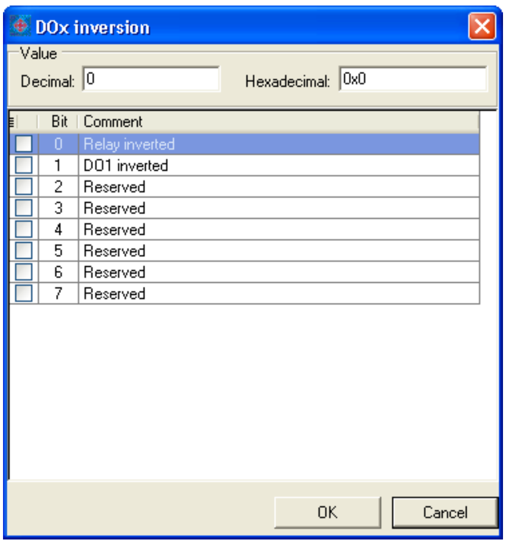
11.1.3.3 Parameters with bit-coded setting

Description structure

Parameter | Name: **Cxxxxx | ____________**		Data type: _______ Index: _______
Description		
Value is bit-coded:		
Bit 0		
...		
Bit 31		
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

Parameter setting in the »Engineer«

The »Engineer« uses a dialog box for parameter setting in which the individual bits can be set or reset. Alternatively, the value can be entered as a decimal or hexadecimal value:



11.1.3.4 Parameters with subcodes

Description structure

Parameter | Name: **Cxxxxx | ____________**			Data type: _______ Index: _______
Description			
Setting range (min. value | unit | max. value)			
Subcodes	**Lenze setting**		
Cxxxxx/1			
Cxxxxx/2			
Cxxxxx/3			
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

Parameter setting in the »Engineer«

The »Engineer« parameter list displays each subcode individually. The parameters are set as described in the previous chapters.

	C...	S	Name	Value	Unit
	39	1	Fixed setpoint 1	40.00	%
	39	2	Fixed setpoint 2	60.00	%
	39	3	Fixed setpoint 3	80.00	%

11.1.4 Parameter attributes

The table footers contain the parameter attributes:

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

Attribute	Meaning	
☑ Read access	Read access to parameter possible.	
☑ Write access	Write access to parameter possible. • Please also observe the following attributes:	
	☑ CINH	Parameter value can only be changed when the controller is inhibited.
	☑ PLC STOP	Parameter value can only be changed when the application is stopped.
☑ No transfer	Parameter is **not** transferred to controller when the command Download parameter set is executed.	
☑ COM	Communication-relevant parameter • This parameter is relevant for parameter data transfer via the (CAN) system bus.	
☑ MOT	Motor control parameters	

Scaling factor

The "scaling factor" is important for parameter access via a bus system.

Signal type	Scaling factor	Resolution	Value range
Analog (scaled)	100	16 bits signed	± 199.99 %
Angular velocity	1	16 bits signed	± 32767 incr./ms
Position in [units]	10000	32 bits signed	± 214748.3647 [units]
Digital (BOOL)	1	8 bits unsigned	0 ≡ FALSE; 1 ≡ TRUE
Time	1000	16 bits unsigned	0 ... 999.000 s
Selection value	1	16 bits unsigned	0 ... 65535

Example 1: The value "654" of the parameter C00028/1 (AIN1: input voltage) read via a bus system must be divided by the corresponding scaling factor "100" to obtain the actual display value "6.54 V".

$$\frac{\text{Read value (via bus system)}}{\text{Scaling factor}} = \text{Indicated value (Engineer)}$$

[11-1] Conversion formula for read access via bus system

Example 2: In order to set the parameter C00012 (acceleration time - main setpoint) to the value "123.4 s" via a bus system, the integer value "123400" must be transferred, i.e. the value to be set must be multiplied by the corresponding scaling factor "1000".

$$\text{Value to be written (via bus system)} = \text{Value to be set} \cdot \text{Scaling factor}$$

[11-2] Conversion formula for write access via bus system

11.2 Parameter list

This chapter lists all parameters of the operating system in numerically ascending order.

Note!

The parameter descriptions are based on the software version V02.00.00.

C00002

Parameter | Name: **C00002 | Device command**	Data type: UNSIGNED_8 Index: 24573_d = $5FFD_h$

Note:
- Before switching off the supply voltage after carrying out a device command, check whether the device command has been carried out successfully via the status display under C00003!
- Before activating device commands through a master control, wait for the "ready" signal of the controller.
- The device will reject a write process to C00002/x if the value is >1 and issue an error message.

▶ Drive control (DCTRL): Device commands

Selection list	
0	Off / ready
1	On / start
2	Work in progress
4	Action cancelled
5	No access
6	No access controller inhibit

Subcodes	Lenze setting	Info
C00002/1	0: Off / ready	Load Lenze setting • All parameters are reset to the Lenze setting. • Only possible when the controller is inhibited.
C00002/2	0: Off / ready	Load parameter set 1 • Load parameter set 1 from the memory module.
C00002/3	0: Off / ready	Reserved
C00002/4	0: Off / ready	Reserved
C00002/5	0: Off / ready	Reserved
C00002/6	0: Off / ready	Reserved
C00002/7	0: Off / ready	Save parameter set 1 • Saving parameter set 1 in the memory module safe against mains failure.
C00002/8	0: Off / ready	Reserved
C00002/9	0: Off / ready	Reserved
C00002/10	0: Off / ready	Reserved
C00002/11	0: Off / ready	Save all parameter sets • All parameter sets are saved in the memory module with mains failure protection.
C00002/12	0: Off / ready	Importing EPM data • Setting "1: On / start" activates the automatic import of parameters of the memory module after the error message "PS04".
C00002/13	0: Off / ready	Reserved
C00002/14	0: Off / ready	Reserved

Parameter | Name: **C00002 | Device command**		Data type: UNSIGNED_8 Index: 24573_d = $5FFD_h$
C00002/15	0: Off / ready	Reserved
C00002/16	1: On / start	Enable controller "1" ≡ Enable controller "0" ≡ Inhibit controller
C00002/17	0: Off / ready	Activate quick stop "1" ≡ Activate quick stop "0" ≡ Deactivate quick stop
C00002/18	0: Off / ready	Reserved
C00002/19	0: Off / ready	Reset error • After resetting the current error, further errors may be pending which must be reset as well. • Details of the currently pending error are displayed in C00166.
C00002/20	0: Off / ready	Reserved
C00002/21	0: Off / ready	Delete logbook • All entries in the controller logbook will be deleted. • In the logbook, information on the error history is saved.
C00002/22	0: Off / ready	Reserved
C00002/23	0: Off / ready	Identify motor parameter • This device command serves to carry out an automatic identification of the motor parameters of an asynchronous motor. • The device command is only carried out if the controller is in the "Switched On" status • In order to identify the motor parameters, the controller must be enabled after this device command. ▸ Identifying motor parameters automatically
C00002/24	0: Off / ready	Reserved
C00002/25	0: Off / ready	Reserved
C00002/26	0: Off / ready	CAN reset node • Reinitialise CAN interface of the communication unit CANopen. • Required when changing the baud rate, node address, or identifiers.
C00002/27	0: Off / ready	Reserved
C00002/28	0: Off / ready	Reserved
C00002/29	0: Off / ready	Reserved
C00002/30	0: Off / ready	Reserved
C00002/31	0: Off / ready	Reserved
C00002/32	0: Off / ready	Reserved
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00003

Parameter | Name: **C00003 | Status of last device command**	Data type: UNSIGNED_8 Index: 24572_d = $5FFC_h$

Status of the device command carried out last (C00002).

Note:
Before switching off the supply voltage after carrying out a device command, check whether the device command has been carried out successfully via the status display!

▸ Drive control (DCTRL): Device commands

Selection list (read only)		Info
0	Successful	Device command has been carried out successfully.
1	Command unknown	Device command is implausible or not known in the system.
2	No access	Access for requested device command is not approved.
3	Time-out	Device command could not be processed in the defined time (time-out).

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00005

Parameter | Name: **C00005 | Application**	Data type: UNSIGNED_16 Index: 24570_d = $5FFA_h$

▸ Drive application

Selection list (Lenze setting printed in bold)		Info
1000	**Actuating drive speed**	This technology application is used to solve speed-controlled drive tasks, e.g. conveying belts.

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00006

Parameter | Name: **C00006 | Motor control**	Data type: UNSIGNED_8 Index: 24569_d = $5FF9_h$

Selection of the motor control mode

▸ Motor control (MCTRL): Select control mode

Selection list (Lenze setting printed in bold)		Info
4	SLVC: Vector control	This control type is used for sensorless vector control of an asynchronous motor. • The control type requires motor parameters to be set as exactly as possible! ▸ Sensorless vector control
6	**VFCplus: V/f linear**	This control type is used for the speed control of an asynchronous motor via a linear V/f characteristic and is the simplest control type. • For setting the V/f characteristic, only the rated frequency (C00089) and the rated voltage (C00090) of the motor have to be entered. ▸ V/f characteristic control
7	VFCplus: V/f linear +encoder	From version 02.00.00 This control type is used for speed control of an asynchronous motor via a linear V/f characteristic. • This control type requires a speed feedback via an encoder connected to the motor! • For setting the V/f characteristic, only the rated frequency (C00089) and the rated voltage (C00090) of the motor have to be entered. ▸ V/f control

Parameter | Name: **C00006 | Motor control**		Data type: UNSIGNED_8 Index: 24569d = 5FF9h
8	VFCplus: V/f quadr	This control type is used for speed control of an asynchronous motor via a square-law V/f characteristic. • For setting the V/f characteristic, only the rated frequency (C00089) and the rated voltage (C00090) of the motor have to be entered. ▸ V/f characteristic control
9	VFCplus: V/f quadr +encoder	From version 02.00.00 This control type is used for speed control of an asynchronous motor via a square-law V/f characteristic. • This control type requires a speed feedback via an encoder connected to the motor! • For setting the V/f characteristic, only the rated frequency (C00089) and the rated voltage (C00090) of the motor have to be entered. ▸ V/f control
11	VFCplusEco: V/f energy-saving	This control type is used for energy-saving speed control of an asynchronous motor via a linear V/f characteristic. • For setting the V/f characteristic, only the rated frequency (C00089) and the rated voltage (C00090) of the motor have to be entered. • Predestinated application areas of this control mode are materials handling technology and pump and fan systems. ▸ V/f characteristic control - energy-saving
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00007

Parameter | Name: **C00007 | Control mode**		Data type: UNSIGNED_16 Index: 24568d = 5FF8h
Selection of how the application is to be controlled.		
Selection list (Lenze setting printed in bold)		**Info**
0	Wiring has changed	This display appears when the preset configuration has been reparameterised via the connection parameters.
9	Local mode	The technology application is controlled via the control elements at the 8400 motec. Detailed information on this control mode can be found in the mounting instructions/hardware manual. The digital input terminals in local mode are assigned as follows: • DI1 = setpoint of P2/fixed setpoint 3 • DI2 = fixed setpoint 2/3 • DI3 = activate DC injection brake • DI4 = change of direction of rotation – If the reversal of rotation direction is permanently set to ccw (left) (DIP1/2 = "ON") via DIP switches, DI4 has no influence. • DI5 = manual release of holding brake (set operating mode in C02580)
10	**Terminals 0: Jog1; Jog2; DCB; R/L**	The technology application is controlled via the digital input terminals of the controller: • DI1 = fixed setpoint 1/3 • DI2 = fixed setpoint 2/3 • DI3 = activate DC injection brake • DI4 = change of direction of rotation • DI5 = manual release of holding brake (set operating mode in C02580)

Parameter | Name: **C00007 | Control mode**		Data type: UNSIGNED_16 Index: 24568$_d$ = 5FF8$_h$
12	Terminals 2: Jog1; Jog2; QSp; R/L	The technology application is controlled via the digital input terminals of the controller: • DI1 = fixed setpoint 1/3 • DI2 = fixed setpoint 2/3 • DI3 = quick stop • DI4 = change of direction of rotation • DI5 = manual release of holding brake (set operating mode in C02580)
14	Terminals 11: R/L; DCB; MPotUp; MPotDown	The technology application is controlled via the digital input terminals of the controller: • DI1 = change of direction of rotation • DI2 = activate DC injection brake • DI3 = motor potentiometer: Higher speed • DI4 = motor potentiometer: Lower speed • DI5 = manual release of holding brake (set operating mode in C02580)
16	Terminals 16: Jog1; Jog2; R/QSP; L/QSP	The technology application is controlled via the digital input terminals of the controller: • DI1 = fixed setpoint 1/3 • DI2 = fixed setpoint 2/3 • DI3 = CW rotation/quick stop • DI4 = CCW rotation/quick stop • DI5 = manual release of holding brake (set operating mode in C02580)
40	Network (MCI/CAN)	The technology application is controlled via fieldbus communication (depending on the available communication unit). ▸ Communication

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00010

Parameter | Name: Data type: INTEGER_16
C00010 | Minimum analog setpoint Index: 24565$_d$ = 5FF5$_h$

Lower limit for analog input

▸ Analog terminals

Setting range (min. value | unit | max. value)			
0.0	%	100.0	
Subcodes	**Lenze setting**		**Info**
C00010/1	0.0 %		Min. analog setpoint

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00011

Parameter | Name: Data type: UNSIGNED_16
C00011 | Appl.: Reference speed Index: 24564$_d$ = 5FF4$_h$

Setting the reference speed
- In the controller, all speed-related signals are processed to one reference variable in percent.
- Set a reference speed here that corresponds to 100 %.

Note:
This is not a maximum limitation!
All values in percent in the controller may be in the range of 0 ... 199.99 %.

Setting range (min. value | unit | max. value)			**Lenze setting**
50	rpm	9999	**1500 rpm**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00012

Parameter | Name: **C00012 | Acceleration time main setpoint**			Data type: UNSIGNED_32 Index: 24563_d = $5FF3_h$
FB L_NSet_1: Acceleration time of the ramp generator for the main speed setpoint			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.9	**2.0 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00013

Parameter | Name: **C00013 | Deceleration time main setpoint**			Data type: UNSIGNED_32 Index: 24562_d = $5FF2_h$
FB L_NSet_1: Deceleration time of the ramp generator for the main speed setpoint			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.9	**2.0 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00015

Parameter | Name: **C00015 | VFC: V/f base frequency**			Data type: UNSIGNED_16 Index: 24560_d = $5FF0_h$
V/f base frequency for V/f characteristic control (VFCplus) and V/f closed-loop control (VFCplus+encoder) • The motor voltage increases linearly with the frequency until the base frequency is reached. From this value on, the motor voltage remains constant, the speed increases and the maximum torque decreases. • After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well.			
Setting range (min. value | unit | max. value)			**Lenze setting**
7.5	Hz	999.9	**50.0 Hz**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 10			

C00016

Parameter | Name: **C00016 | VFC: Vmin boost**			Data type: UNSIGNED_16 Index: 24559_d = $5FEF_h$
Boost of the V/f voltage characteristic in the range of low speeds or frequencies with V/f characteristic control (VFCplus) and V/f control (VFCplus+encoder) • This may increase the starting torque. • After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well. ▸ Motor control (MCTRL): Setting Vmin boost			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	100.0	**0.0 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00018

Parameter | Name: C00018 | Switching frequency	Data type: UNSIGNED_8 Index: 24557_d = $5FED_h$

Selection of the pulse width modulated switching frequency transferred from the inverter to the motor

- When a variable switching frequency is selected, the switching frequency may change as a function of the load and rotational frequency.

▸ Selection of the switching frequency

Selection list (Lenze setting printed in bold)	
2	**8 kHz var./drive-optimised**
3	16 kHz var./drive-optimised
6	4 kHz constant/drive-optimised
7	8 kHz constant/drive-optimised
8	16 kHz constant/drive-optimised
23	16 kHz var/8 kHz min

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00019

Parameter | Name: C00019 | Auto DCB: Threshold	Data type: UNSIGNED_16 Index: 24556_d = $5FEC_h$

Setpoint speed threshold for the automatic DC-injection braking

- For speed setpoints with values below the thresholds a DC current is injected or the motor is not supplied with current, depending on the setting.

▸ DC-injection braking

Setting range (min. value | unit | max. value)			Lenze setting
0	rpm	9999	**3 rpm**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00021

Parameter | Name: C00021 | Slip comp.	Data type: INTEGER_16 Index: 24554_d = $5FEA_h$

Slip compensation for V/f characteristic control (VFCplus) and sensorless vector control (SLVC)

- An increase of the slip compensation causes a greater frequency and voltage increase when the machine is loaded.
- After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well.

▸ Motor control (MCTRL): Optimising the operational performance by slip compensation

Setting range (min. value | unit | max. value)			Lenze setting
-50.00	%	50.00	**0.00 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00022

Parameter | Name: C00022 | Imax in motor mode	Data type: UNSIGNED_16 Index: 24553_d = $5FE9_h$

Maximum current in motor mode for all motor control modes

Setting range (min. value | unit | max. value)			Lenze setting
0.00	A	99.99	**47.00 A**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00023

Parameter | Name: **C00023 | Imax in generator mode**			Data type: INTEGER_16 Index: 24552_d = $5FE8_h$
Maximum current in generator mode for all motor control modes • 100 % ≡ Imax in motor mode (C00022)			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	100.0	**100.0 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00024

Parameter | Name: **C00024 | Comparison value N_Act**			Data type: INTEGER_16 Index: 24551_d = $5FE7_h$
Threshold for the actual speed comparison • This parameter serves to set a threshold that is compared with the actual speed value. • When the value falls below this threshold, the *bNactCompare* output of the SB LS_DriveInterface switches to TRUE. • Switching hysteresis = +1 %			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	199.9	**0.0 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00026

Parameter | Name: **C00026 | AINx: Offset**			Data type: INTEGER_16 Index: 24549_d = $5FE5_h$
Offset for analog input ▸ Analog terminals			
Setting range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes	**Lenze setting**		**Info**
C00026/1	0.0 %		AIN1: Offset
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00027

Parameter | Name: **C00027 | AINx: Gain**			Data type: INTEGER_32 Index: 24548_d = $5FE4_h$
Gain for analog input ▸ Analog terminals			
Setting range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes	**Lenze setting**		**Info**
C00027/1	100.0 %		AIN1: Gain
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00028

Parameter | Name: **C00028 | AINx: Input voltage**			Data type: INTEGER_16 Index: 24547_d = $5FE3_h$
Display of the input voltage at the analog input ▸ Analog terminals			
Display range (min. value | unit | max. value)			
-10.0	V	10.0	
Subcodes			**Info**
C00028/1			AIN1: Input voltage
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00029

Parameter | Name: **C00029 | AINx: Input current**			Data type: INTEGER_16 Index: 24546_d = $5FE2_h$

Display of the input current at the analog input
- When the analog input has been configured for current measurement (C00034/1 = 1 or 2).
- When C00034/1 is set = 2 (4 ... 20 mA), 0 ... 16 mA is displayed.

▶ Analog terminals

Display range (min. value | unit | max. value)			
0.0	mA	20.0	
Subcodes			**Info**
C00029/1			AIN1: Input current

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00033

Parameter | Name: **C00033 | AINx: Output value**			Data type: INTEGER_16 Index: 24542_d = $5FDE_h$

Display of the output value in percent of the analog input amplifier
- 100 % ≡ 16384 ≡ +10 V / +20 mA

▶ Analog terminals

Display range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes			**Info**
C00033/1			AIN1: Output value

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00034

Parameter | Name: **C00034 | AINx: Configuration**		Data type: UNSIGNED_8 Index: 24541_d = $5FDD_h$

Configuration of the analog input for current or voltage measurement

▶ Analog terminals

Selection list		**Info**
0	0...+10 V	Input signal is voltage signal 0 V ... +10 V • 0 V ... +10 V ≡ 0 % ... +100 %
1	0...+20mA	With external load resistor (250 Ohms): Input signal is the current signal 0 mA ... 20 mA • 0 mA ... 20 mA ≡ 0 % ... +100 %
2	4...+20mA	With external load resistor (250 Ohms): Input signal is the current signal 4 mA ... 20 mA • 4 mA ... 20 mA ≡ 0 % ... +100 % • The current loop is monitored for open circuit (I < 4 mA) by the device.
Subcodes	**Lenze setting**	**Info**
C00034/1	0: 0...+10 V	AIN1: Config.

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00036

Parameter | Name: **C00036 | DCB: Current**			Data type: INTEGER_16 Index: 24539_d = $5FDB_h$

Current value in [%] for DC-injection braking
- 100 % ≡ Imax in motor mode (C00022)

▶ DC-injection braking

Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	150.0	**50.0 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00039

Parameter | Name: C00039 | Fixed setpoint x (L_NSet_1 n-Fix)		Data type: INTEGER_16 Index: 24536_d = $5FD8_h$
FB L_NSet_1: Fixed speed setpoints (JOG values) for the setpoint generator		
Setting range (min. value | unit | max. value)		
-199.9 % 199.9		
Subcodes	**Lenze setting**	**Info**
C00039/1	40.0 %	Fixed setpoint 1
C00039/2	60.0 %	Fixed setpoint 2
C00039/3	80.0 %	Fixed setpoint 3
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100		

C00050

Parameter | Name: C00050 | MCTRL: Speed setpoint			Data type: INTEGER_32 Index: 24525_d = $5FCD_h$
Display of the speed setpoint at the speed setpoint input of the motor control			
Display range (min. value | unit | max. value)			
-9999	rpm	9999	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00051

Parameter | Name: C00051 | MCTRL: Actual speed value			Data type: INTEGER_32 Index: 24524_d = $5FCC_h$
Display of the actual speed value of the motor shaft **Note:** The displayed value only corresponds to the real actual speed value of the motor shaft if an encoder is connected to the motor and the evaluation of the feedback signal has been set correctly ("Closed loop" operation). In case of operation without speed feedback, the signal is calculated from the motor control and thus may not correspond to the real actual speed.			
Display range (min. value | unit | max. value)			
-9999	rpm	9999	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00052

Parameter | Name: C00052 | Motor voltage			Data type: UNSIGNED_16 Index: 24523_d = $5FCB_h$
Display of the current motor voltage/output voltage of the inverter			
Display range (min. value | unit | max. value)			
0	V	1000	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00053

Parameter | Name: C00053 | DC-bus voltage			Data type: UNSIGNED_16 Index: 24522_d = $5FCA_h$
Display of the current DC-bus voltage			
Display range (min. value | unit | max. value)			
0	V	1000	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00054

Parameter | Name: **C00054 | Motor current**			Data type: UNSIGNED_16 Index: 24521_d = $5FC9_h$
Display of the current motor current/output current of the inverter			
Display range (min. value | unit | max. value)			
0.00	A	300.00	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00056

Parameter | Name: **C00056 | Torque**			Data type: INTEGER_32 Index: 24519_d = $5FC7_h$
Display of the current torque			
Display range (min. value | unit | max. value)			
-99.00	Nm	99.00	
Subcodes			**Info**
C00056/1			Torque setpoint • Only with sensorless vector control (SLVC).
C00056/2			Actual torque • Estimated actual torque for all motor control modes.
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00057

Parameter | Name: **C00057 | Maximum torque**			Data type: UNSIGNED_32 Index: 24518_d = $5FC6_h$
Display of the maximum torque to be generated by the motor • The maximum torque to be generated by the motor depends on various factors, e.g. on Imax in motor mode (C00022) and the motor type used.			
Display range (min. value | unit | max. value)			
0.0	Nm	999.9	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00058

Parameter | Name: **C00058 | Output frequency**			Data type: INTEGER_32 Index: 24517_d = $5FC5_h$
Display of the current output frequency			
Display range (min. value | unit | max. value)			
-655.0	Hz	655.0	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00059

Parameter | Name: **C00059 | Appl.: Reference frequency C11**			Data type: UNSIGNED_32 Index: 24516_d = $5FC4_h$
Display of the field frequency which corresponds to the reference speed set in C00011.			
Display range (min. value | unit | max. value)			
0.0	Hz	999.9	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00061

Parameter | Name: **C00061 | Heatsink temperature**			Data type: INTEGER_16 Index: 24514_d = $5FC2_h$
Display of the current heatsink temperature			
Display range (min. value | unit | max. value)			
-50	°C	150	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00064

Parameter | Name: **C00064 | Device utilisation (Ixt)**			Data type: INTEGER_16 Index: 24511$_d$ = 5FBF$_h$
Display of the device utilisation Ixt in different time resolutions • If the value displayed here exceeds the threshold set in C00123, the fault message "OC5: Device overload (Ixt)" is output and the fault response set in C00604 is executed (default setting: "Warning").			
Display range (min. value | unit | max. value)			
0	%	250	
Subcodes			**Info**
C00064/1			Device utilisation (Ixt) • Maximum value of the pulse utilisation (C00064/2) and permanent utilisation (C00064/3).
C00064/2			Device utilisation (Ixt) 15s • Pulse utilisation over the last 15 seconds (only for loads >160 %).
C00064/3			Device utilisation (Ixt) 3 min • Permanent utilisation over the last 3 minutes.
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00066

Parameter | Name: **C00066 | Thermal motor load (I²xt)**			Data type: INTEGER_16 Index: 24509$_d$ = 5FBD$_h$
Display of the thermal motor load being detected sensorless via a motor model • If the value displayed here exceeds the threshold set in C00120, the fault message "OC6: Thermal motor overload (I2xt)" is output and the fault response set in C00606 is executed (default setting: "Warning").			
Display range (min. value | unit | max. value)			
0	%	200	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00073

Parameter | Name: **C00073 | Vp Imax controller**			Data type: UNSIGNED_16 Index: 24502$_d$ = 5FB6$_h$
Amplification factor Vp for Imax controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.00		16.00	**0.25**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00074

Parameter | Name: **C00074 | Ti Imax controller**			Data type: UNSIGNED_16 Index: 24501$_d$ = 5FB5$_h$
Reset time Ti for Imax controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
12	ms	9990	**65 ms**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00081

Parameter | Name: **C00081 | Rated motor power**			Data type: UNSIGNED_16 Index: 24494$_d$ = 5FAE$_h$
This value can be obtained from the motor nameplate. After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. **Note:** The indication of the rated motor power is mandatory for the sensorless vector control (SLVC).			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.00	kW	99.00	**11.00 kW**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00084

Parameter | Name: **C00084 | Motor stator resistance**			Data type: UNSIGNED_32 Index: 24491$_d$ = 5FAB$_h$
After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	mohm	200000	**330 mohm**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00085

Parameter | Name: **C00085 | Motor stator leakage inductance**			Data type: UNSIGNED_16 Index: 24490$_d$ = 5FAA$_h$
After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.00	mH	650.00	**0.00 mH**
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00087

Parameter | Name: **C00087 | Rated motor speed**			Data type: UNSIGNED_16 Index: 24488$_d$ = 5FA8$_h$
This value can be obtained from the motor nameplate. After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. **Note:** The indication of the rated motor speed is mandatory for the sensorless vector control (SLVC).			
Setting range (min. value | unit | max. value)			**Lenze setting**
50	rpm	9999	**1460 rpm**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00088

Parameter | Name: **C00088 | Rated motor current**			Data type: UNSIGNED_16 Index: 24487$_d$ = 5FA7$_h$
This value can be obtained from the motor nameplate. After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.00	A	99.00	**21.00 A**
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00089

Parameter | Name: **C00089 | Rated motor frequency**			Data type: UNSIGNED_16 Index: 24486$_d$ = 5FA6$_h$
This value can be obtained from the motor nameplate. After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. **Note:** The indication of the rated motor frequency is mandatory for the sensorless vector control (SLVC).			
Setting range (min. value | unit | max. value)			**Lenze setting**
10	Hz	1000	**50 Hz**
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00090

Parameter | Name: **C00090 | Rated motor voltage**			Data type: UNSIGNED_16 Index: 24485_d = $5FA5_h$
This value can be obtained from the motor nameplate. After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	V	1000	**400 V**
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00091

Parameter | Name: **C00091 | Motor cosine phi**			Data type: UNSIGNED_8 Index: 24484_d = $5FA4_h$
This value can be obtained from the motor nameplate. After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.40		1.00	**0.85**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00092

Parameter | Name: **C00092 | Motor magnetising inductance**			Data type: UNSIGNED_16 Index: 24483_d = $5FA3_h$
After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	mH	6500.0	**0.0 mH**
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 10			

C00093

Parameter | Name: **C00093 | Power section identification**			Data type: UNSIGNED_16 Index: 24482_d = $5FA2_h$
Display of the identification of the detected power section of the controller			
Display range (min. value | unit | max. value)			
0		65535	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00094

Parameter | Name: **C00094 | Password**			Data type: INTEGER_32 Index: 24481_d = $5FA1_h$
The controller provides the opportunity to prevent the unauthorised access to the menu level of the keypad by assigning a password. When the password protection is activated, the correct password must be entered in the keypad to activate the access to the menu level. If you enter the wrong password, the keypad can only access the parameters of the user menu. • Activating the password protection: Set the desired password (1 ...9999) and save parameter set. • When "0" is set, the password protection is deactivated.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0		9999	**0**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00095

Parameter | Name: **C00095 | Motor magnetising current**			Data type: UNSIGNED_16 Index: 24480_d = $5FA0_h$
After the motor to be used has been selected from the motor catalogue, the suitable value can be entered automatically. An automatic detection via the motor parameter identification is possible as well.			
Display range (min. value | unit | max. value)			
0.00	A	99.00	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00097

Parameter | Name: **C00097 | Rated motor torque**			Data type: UNSIGNED_32 Index: 24478_d = $5F9E_h$
Display of the rated motor torque • The value displayed here is calculated from different parameters, e.g. the maximum current set in C00022.			
Display range (min. value | unit | max. value)			
0.00	Nm	99.00	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00098

Parameter | Name: **C00098 | Device rated current**			Data type: UNSIGNED_16 Index: 24477_d = $5F9D_h$
Display of the rated inverter current which is defined by the integrated power section.			
Display range (min. value | unit | max. value)			
0.0	A	999.0	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 10			

C00099

Parameter | Name: **C00099 | Firmware version**	Data type: VISIBLE_STRING Index: 24476_d = $5F9C_h$
Display of the firmware version of the device as string	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00100

Parameter | Name: **C00100 | Firmware version**			Data type: UNSIGNED_8 Index: 24475_d = $5F9B_h$
Display of the firmware version of the device, divided into subsections.			
Display range (min. value | unit | max. value)			
0		99	
Subcodes			**Info**
C00100/1			Firmware version - main version
C00100/2			Firmware version - subversion
C00100/3			Firmware version - release
C00100/4			Firmware version - build
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00105

Parameter | Name: **C00105 | Deceleration time quick stop**			Data type: UNSIGNED_32 Index: 24470_d = $5F96_h$
The set deceleration time determines the ramp slope at quick stop • When the output frequency falls below the threshold set in C00019, the DC injection brake DCB is activated. **Note:** The S-ramp time set in C00182 is also active with quick stop! In order to reach the required deceleration time for quick stop, set the time accordingly lower in this parameter.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.9	**5.0 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00106

Parameter | Name: **C00106 | Auto DCB: Hold time**			Data type: UNSIGNED_32 Index: 24469_d = $5F95_h$
Hold time of the automatic DC injection brake • The DC injection brake is applied for the time set here if the value falls below the speed setpoint set in C00019.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.0	**0.5 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00107

Parameter | Name: **C00107 | DCB: Hold time**			Data type: UNSIGNED_32 Index: 24468_d = $5F94_h$
Maximum hold time of the manual DC injection brake • In order not to overload the motor thermally, a time for automatic switch-off of the DC injection brake can be set here.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.0	**999.0 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00114

Parameter | Name: **C00114 | DIx inversion**			Data type: UNSIGNED_16 Index: 24461_d = $5F8D_h$
Polarity of the digital inputs • Every digital input of the device can be inverted with regard to polarity via this bit field. ▸ Digital terminals			
Setting range (min. hex value | max. hex value)			**Lenze setting**
0x0000		0xFFFF	**0x8000** (decimal: 32768)
Value is bit-coded: (☑ = bit set)			**Info**
Bit 0 ☐	DI1 inverted		Inversion of digital input 1
Bit 1 ☐	DI2 inverted		Inversion of digital input 2
Bit 2 ☐	DI3 inverted		Inversion of digital input 3
Bit 3 ☐	DI4 inverted		Inversion of digital input 4
Bit 4 ☐	DI5 inverted		Inversion of digital input 5
Bit 5 ☐	Reserved		
Bit 6 ☐	Reserved		
Bit 7 ☐	Reserved		
Bit 8 ☐	Reserved		
Bit 9 ☐	Reserved		
Bit 10 ☐	Reserved		
Bit 11 ☐	Reserved		
Bit 12 ☐	Reserved		
Bit 13 ☐	Reserved		
Bit 14 ☐	Reserved		
Bit 15 ☑	RFR inverted		Inversion of RFR digital input (controller enable)
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C00115

Parameter | Name: **C00115 | DI1| DI2: Function**		Data type: UNSIGNED_8 Index: 24460_d = $5F8C_h$
From version 02.00.00 Function assignment of the digital terminals DI1 and DI2 ▸ Digital terminals: Function assignment		
Selection list		**Info**
0	DI1=In1 | DI2=In2	DI1 = digital input DI2 = digital input
1	DI1=FreqIn12 | DI2=In2	DI1 = 1-track frequency input DI2 = digital input
2	(DI1/DI2)=FreqIn12 (2-track)	DI1 und DI2 = 2-track frequency input
3	(DI1/DI2=+-)=FreqIn12	DI1 = 1-track frequency input DI2 = Indication of direction
Subcodes	**Lenze setting**	**Info**
C00115/1	0: DI1=In1 | DI2=In2	Function assignment DI1 and DI2
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00118

Parameter | Name: **C00118 | DOx inversion**			Data type: UNSIGNED_8 Index: 24457_d = $5F89_h$
Polarity of the digital outputs • Every digital output of the device can be inverted with regard to polarity via this bit field.			
Setting range (min. hex value | max. hex value)			**Lenze setting**
0x00		0xFF	**0x00** (decimal: 0)
Value is bit-coded: (☑ = bit set)			**Info**
Bit 0 ☐	Relay inverted		Relay inversion
Bit 1 ☐	DO1 inverted		Inversion of digital output 1
Bit 2 ☐	Reserved		
Bit 3 ☐	Reserved		
Bit 4 ☐	Reserved		
Bit 5 ☐	Reserved		
Bit 6 ☐	Reserved		
Bit 7 ☐	Reserved		
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C00120

Parameter | Name: **C00120 | Motor overload threshold (I²xt)**			Data type: INTEGER_16 Index: 24455_d = $5F87_h$
Operating threshold for the error message "OC6: Motor overload (I²xt)" • The response for reaching the threshold can be selected in C00606. • The current thermal motor load is displayed in C00066.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	%	250	**100 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00123

Parameter | Name: **C00123 | Device utilisation threshold (Ixt)**			Data type: INTEGER_16 Index: 24452_d = $5F84_h$
Operating threshold for the error message "OC5: Device overload (Ixt)" • The response for reaching the threshold can be selected in C00604. • The current device utilisation is displayed in C00064.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	%	200	**100 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00129

Parameter | Name: **C00129 | Value brake resistor**			Data type: UNSIGNED_16 Index: 24446_d = $5F7E_h$
Resistance value of the connected brake resistor • The value to be entered can be obtained from the nameplate of the brake resistor. ▸ Settings for internal brake resistor E84DZEWxxxx			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	Ohm	500.0	**220.0 Ohms**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 10			

C00130

Parameter | Name: **C00130 | Rated power brake resistor**			Data type: UNSIGNED_16 Index: 24445_d = $5F7D_h$
Rated power of the connected brake resistor • The value to be entered can be obtained from the nameplate of the brake resistor. ▸ Settings for internal brake resistor E84DZEWxxxx			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	W	65535	**15 W**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00131

Parameter | Name: **C00131 | Heat capacity brake resistor**			Data type: UNSIGNED_16 Index: 24444_d = $5F7C_h$
Thermal capacity of the connected brake resistor • The value to be entered can be obtained from the nameplate of the brake resistor. ▸ Settings for internal brake resistor E84DZEWxxxx			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	kWs	6553.5	**0.3 kWs**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 10			

C00133

Parameter | Name: **C00133 | Load brake resistor**			Data type: UNSIGNED_16 Index: 24442_d = $5F7A_h$
Display of the utilisation of the connected brake resistor			
Display range (min. value | unit | max. value)			
0	%	65535	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00134

Parameter | Name: **C00134 | Ramp smoothing, main setpoint**		Data type: UNSIGNED_8 Index: 24441_d = $5F79_h$
FB L_NSet_1: Configuration of the ramp smoothing for the main setpoint		
Selection list (Lenze setting printed in bold)		**Info**
0	**Off**	Ramp rounding deactivated
1	PT1 behaviour	Ramp rounding with PT1 behaviour • The corresponding S-ramp time must be set in C00182.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00136

Parameter | Name: **C00136 | Communication control words**	Data type: UNSIGNED_16 Index: 24439_d = $5F77_h$

▶ Communication

Display area (min. hex value | max. hex value)		
0x0000		0xFFFF

Value is bit-coded:	
Bit 0	SwitchOn
Bit 1	IMP
Bit 2	SetQuickStop
Bit 3	EnableOperation
Bit 4	Reserved
Bit 5	Reserved
Bit 6	Reserved
Bit 7	ResetFault
Bit 8	SetHalt
Bit 9	reserved_1
Bit 10	reserved_2
Bit 11	LenzeSpecific_1
Bit 12	LenzeSpecific_2
Bit 13	LenzeSpecific_3
Bit 14	SetFail
Bit 15	LenzeSpecific_4

Subcodes	Info
C00136/1	Network MCI/CAN control word

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT

C00137

Parameter | Name: **C00137 | Device state**		Data type: UNSIGNED_16 Index: 24438_d = $5F76_h$
Display of the current device state		
Selection list (read only)		
0	Reserved	
1	Init	
2	MotorIdent	
3	ReadyToSwitchON	
4	SwitchedON	
5	OperationEnable	
6	Reserved	
7	Trouble	
8	Fault	
9	Reserved	
10	SafeTorqueOff	
11	Reserved	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00141

Parameter | Name: **C00141 | Device settings**		Data type: UNSIGNED_8 Index: 24434_d = $5F72_h$
Selection list		
0	Inactive	
1	Active	
Subcodes	**Lenze setting**	**Info**
C00141/1	0: Inactive	Always save parameters • When this function is activated, every parameter change is saved in the memory module. A manual saving of parameter sets is not required anymore. **Note:** Activating this function is not permissible if parameters are changed very frequently (e.g. in case of cyclic writing of parameters via a bus system).
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00142

Parameter | Name: C00142 | Auto-start option			Data type: UNSIGNED_8 Index: 24433_d = $5F71_h$
Starting performance of the controller after mains connection and reset of "Trouble" or "Fault".			
			Auto-start option "inhibit at power-on"
Setting range (min. hex value | max. hex value)			**Lenze setting**
0x00		0xFF	**0x01** (decimal: 1)
Value is bit-coded: (☑ = bit set)			
Bit 0 ☑	Inhibit at mains ON		
Bit 1 ☐	Inhibit at trouble		
Bit 2 ☐	Inhibit at fault		
Bit 3 ☐	Reserved		
Bit 4 ☐	Reserved		
Bit 5 ☐	Reserved		
Bit 6 ☐	Reserved		
Bit 7 ☐	Reserved		
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C00144

Parameter | Name: C00144 | Switching frequency reduction (temp.)		Data type: UNSIGNED_8 Index: 24431_d = $5F6F_h$
Activation of the automatic switching frequency reduction at too high temperature		
Selection list (Lenze setting printed in bold)		**Info**
0	Off	Automatic switching frequency reduction deactivated
1	**On**	Automatic switching frequency reduction activated
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00150

Parameter | Name: **C00150 | Status word**		Data type: UNSIGNED_16 Index: 24425_d = $5F69_h$
Bit-coded device status word		
Display area (min. hex value | max. hex value)		
0x0000	0xFFFF	
Value is bit-coded:		**Info**
Bit 0	FreeStatusBit0	Free status bit 0
Bit 1	PowerDisabled	Power switched off
Bit 2	FreeStatusBit2	Free status bit 2
Bit 3	FreeStatusBit3	Free status bit 3
Bit 4	FreeStatusBit4	Free status bit 4
Bit 5	FreeStatusBit5	Free status bit 5
Bit 6	ActSpeedIsZero	Current speed is 0
Bit 7	ControllerInhibit	Controller is inhibited
Bit 8	StatusCodeBit0	Status code bit 0
Bit 9	StatusCodeBit1	Status code bit 1
Bit 10	StatusCodeBit2	Status code bit 2
Bit 11	StatusCodeBit3	Status code bit 3
Bit 12	Warning	Warning
Bit 13	Trouble	Fault
Bit 14	FreeStatusBit14	Free status bit 14
Bit 15	FreeStatusBit15	Free status bit 15

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT

C00155

Parameter | Name: **C00155 | Status word 2**			Data type: UNSIGNED_16 Index: 24420_d = $5F64_h$
Bit-coded device status word 2			
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			**Info**
Bit 0	Fail		Error
Bit 1	M_max		Maximum torque
Bit 2	I_max		Maximum current
Bit 3	PowerDisabled		Power switched off
Bit 4	Ready		Controller is ready for operation
Bit 5	ControllerInhibit		Controller is inhibited
Bit 6	Trouble		Fault
Bit 7	InitState		Initialisation
Bit 8	CwCcw		CW/CCW rotation
Bit 9	Reserved		
Bit 10	SafeTorqueOff		Safe torque off
Bit 11	Reserved		
Bit 12	Reserved		
Bit 13	Reserved		
Bit 14	Quick stop		Quick stop is active
Bit 15	MotorIdent		Motor parameter identification active
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C00158

Parameter | Name: **C00158 | Cause for controller inhibit**		Data type: UNSIGNED_16 Index: 24417_d = $5F61_h$
Bit-coded display of the cause/source of controller inhibit		
Display area (min. hex value | max. hex value)		
0x0000		0xFFFF
Value is bit-coded:		
Bit 0	Terminal controller enable	
Bit 1	Reserved	
Bit 2	DriveControl Network MCI/CAN	
Bit 3	SwitchOn	
Bit 4	Application	
Bit 5	Device command	
Bit 6	Error response	
Bit 7	Reserved	
Bit 8	Reserved	
Bit 9	Reserved	
Bit 10	AutoStartLock	
Bit 11	Motor parameter identification	
Bit 12	Automatic brake operation	
Bit 13	DCB-IMP	
Bit 14	Reserved	
Bit 15	Reserved	

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT

C00159

Parameter | Name: **C00159 | Cause for quick stop QSP**			Data type: UNSIGNED_16 Index: 24416_d = $5F60_h$
Bit-coded display of the cause/source of quick stop			
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			
Bit 0	Terminal		
Bit 1	Reserved		
Bit 2	DriveControl Network MCI/CAN		
Bit 3	Reserved		
Bit 4	Application		
Bit 5	Device command		
Bit 6	Reserved		
Bit 7	Reserved		
Bit 8	Reserved		
Bit 9	Reserved		
Bit 10	Reserved		
Bit 11	Reserved		
Bit 12	Reserved		
Bit 13	Reserved		
Bit 14	Reserved		
Bit 15	Reserved		
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C00161

Parameter | Name: **C00161 | Current error**			Data type: UNSIGNED_32 Index: 24414_d = $5F5E_h$
Display range (min. value | unit | max. value)			
0		4294967295	
Subcodes			**Info**
C00161/1			Current error
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00165

Parameter | Name: **C00165 | Error information**	Data type: VISIBLE_STRING Index: 24410_d = $5F5A_h$
Display of the error numbers divided into sectors in the case of an error	
Subcodes	**Info**
C00165/1	Current error
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00166

Parameter | Name: **C00166 | Error information text**	Data type: VISIBLE_STRING Index: 24409_d = $5F59_h$
Display of details of the currently pending error	
Subcodes	**Info**
C00166/1	Resp. - current error • Response of the currently pending error
C00166/2	Subj.area curr. error • Subject area of the currently pending error
C00166/3	Mess.curr.error • Textual message of the currently pending error
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00167

Parameter | Name: **C00167 | Logbook data**	Data type: OCTET_STRING Index: 24408_d = $5F58_h$
This code is for device-internal use only and must not be written to by the user!	

C00168

Parameter | Name: **C00168 | Error number**			Data type: UNSIGNED_32 Index: 24407_d = $5F57_h$
Display range (min. value | unit | max. value)			
0		4294967295	
Subcodes			**Info**
C00168/1			Display of the internal error number for the last 8 occurred errors
C00168/...			
C00168/8			
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00169

Parameter | Name: **C00169 | Time of error**			Data type: UNSIGNED_32 Index: 24406_d = $5F56_h$
Display range (min. value | unit | max. value)			
0		4294967295	
Subcodes			**Info**
C00169/1			Display of the time of error for the last 8 occurred errors
C00169/...			
C00169/8			
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00170

Parameter | Name: **C00170 | Error counter**			Data type: UNSIGNED_8 Index: 24405_d = $5F55_h$
Display range (min. value | unit | max. value)			
0		255	
Subcodes			**Info**
C00170/1			Display of the error counter for the last 8 occurred errors
C00170/...			
C00170/8			
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00171

Parameter | Name: **C00171 | Logbook access index**	Data type: UNSIGNED_8 Index: 24404_d = $5F54_h$
This code is for device-internal use only and must not be written to by the user!	

C00173

Parameter | Name: **C00173 | Mains voltage**		Data type: UNSIGNED_8 Index: 24402_d = $5F52_h$
Selection of the mains voltage for operating the device.		
Selection list (Lenze setting printed in bold)		
0	**3ph 400V**	
1	3ph 440V	
2	3ph 480V	
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00174

Parameter | Name: **C00174 | Reduc. brake chopper threshold**			Data type: UNSIGNED_8 Index: 24401_d = $5F51_h$
The threshold defined via C00173 and used for the "HlgStop" (stop ramp function generator) function is reduced by the voltage value set here. **Note:** The brake chopper is triggered via a hardware circuit. The threshold cannot be parameterised.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	V	150	**0 V**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00175

Parameter | Name: **C00175 | Reaktion brake resistor control**		Data type: UNSIGNED_8 Index: 24400_d = $5F50_h$
Selection of the braking procedure		▸ Select response if the brake resistor is controlled
Selection list (Lenze setting printed in bold)		**Info**
0	**Brake resistor**	The brake resistor is used. When the threshold voltage (C00174) is exceeded, the brake resistor is energised. • The external brake resistor is triggered via a hardware circuit. The DC-bus voltage has no influence on the brake ramp.
2	Brake resistor + RfgStop	The brake resistor and the "Ramp function generator stop" signal are used. When the threshold voltage is exceeded (C00174), the ramp function generator is stopped.
4	Brake resistor + HlgStop + FU_MotBrk	From version 02.00.00 The brake resistor as well as the "Ramp function generator stop" signal and the "Inverter motor brake" function are used.
6	Brake resistor + MotorFluxAdd	From version 02.00.00 The brake resistor is used. The braking energy is degraded by overmagnetising the motor by the percentage value set in C00984.
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00177

Parameter | Name: **C00177 | Switching cycles**			Data type: UNSIGNED_32 Index: 24398_d = $5F4E_h$
Counter of different switching cycles and stressful situations			
Display range (min. value | unit | max. value)			
0		2147483647	
Subcodes			**Info**
C00177/1			Number of mains switching cycles
C00177/2			Number of switching cycles of the output relay
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00178

Parameter | Name: **C00178 | Elapsed-hour meter**			Data type: UNSIGNED_32 Index: 24397_d = $5F4D_h$
Display of the operating hours in "seconds" unit			
Display range (min. value | unit | max. value)			
0	s	2147483647	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00179

Parameter | Name: **C00179 | Power-on time meter**			Data type: UNSIGNED_32 Index: 24396_d = $5F4C_h$
Display of the power-on time in "seconds" unit			
Display range (min. value | unit | max. value)			
0	s	2147483647	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00182

Parameter | Name: **C00182 | S-ramp time PT1**			Data type: INTEGER_16 Index: 24393_d = $5F49_h$
FB L_NSet_1: PT1 S-ramp time for the main setpoint ramp function generator • Only effective with activated ramp smoothing (C00134 = "1").			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.01	s	50.00	**20.00 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00200

Parameter | Name: **C00200 | Firmware product type**	Data type: VISIBLE_STRING Index: 24375_d = $5F37_h$
Display of the firmware product type	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00201

Parameter | Name: **C00201 | Firmware compile date**	Data type: VISIBLE_STRING Index: 24374_d = $5F36_h$
Display of the firmware compilation date	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00203

Parameter | Name: **C00203 | Product type code**	Data type: VISIBLE_STRING Index: 24372_d = $5F34_h$
Display of the single device component types	
Subcodes	**Info**
C00203/1	Type: Control card
C00203/2	Type: Power section
C00203/3	Type: Comm. module
C00203/4	Reserved
C00203/5	Type: Memory module
C00203/6	Type: Safety module
C00203/7	Reserved
C00203/8	Type: Complete device
C00203/9	Reserved
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00204

Parameter | Name: **C00204 | Serial number**	Data type: VISIBLE_STRING Index: 24371_d = $5F33_h$
Display of the serial numbers of the single device components	
Subcodes	**Info**
C00204/1	Serial no.: Control card
C00204/2	Serial no.: Power section
C00204/3	Serial no.: MCI module
C00204/4	Reserved
C00204/5	Reserved
C00204/6	Reserved
C00204/7	Serial no.: Standard device
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT	

C00222

Parameter | Name: **C00222 | L_PCTRL_1: Vp**			Data type: INTEGER_16 Index: 24353_d = $5F21_h$
FB L_PCTRL_1: Gain factor Vp for the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.1		500.0	**1.0**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 10			

C00223

Parameter | Name: **C00223 | L_PCTRL_1: Tn**			Data type: UNSIGNED_16 Index: 24352_d = $5F20_h$
FB L_PCTRL_1: Reset time Tn for the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
20	ms	6000	**400 ms**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00224

Parameter | Name: **C00224 | L_PCTRL_1: Kd**			Data type: UNSIGNED_16 Index: 24351_d = $5F1F_h$
FB L_PCTRL_1: Derivative-action coefficient Kd for the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0		5.0	**0.0**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 10			

C00225

Parameter | Name: **C00225 | L_PCTRL_1: MaxLimit**			Data type: INTEGER_16 Index: 24350_d = $5F1E_h$
FB L_PCTRL_1: Maximum output value of the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
-199.9	%	199.9	**199.9 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00226

Parameter | Name: **C00226 | L_PCTRL_1: MinLimit**			Data type: INTEGER_16 Index: 24349_d = $5F1D_h$
FB L_PCTRL_1: Minimum output value of the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
-199.9	%	199.9	**-199.9 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00227

Parameter | Name: **C00227 | L_PCTRL_1: Acceleration time**			Data type: UNSIGNED_32 Index: 24348_d = $5F1C_h$
FB L_PCTRL_1: Acceleration time for the output value of the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.9	**0.1 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00228

Parameter | Name: **C00228 | L_PCTRL_1: Deceleration time**			Data type: UNSIGNED_32 Index: 24347_d = $5F1B_h$
FB L_PCTRL_1: Deceleration time for the output value of the PID process controller			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	s	999.9	**0.1 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00231

Parameter | Name: **C00231 | L_PCTRL_1: Operating range**			Data type: INTEGER_16 Index: 24344_d = $5F18_h$
FB L_PCTRL_1: Operating range for the PID process controller			
Setting range (min. value | unit | max. value)			
0.0	%	199.9	
Subcodes	**Lenze setting**		**Info**
C00231/1	199.9 %		L_PCTRL_1: Pos. maximum
C00231/2	0.0 %		L_PCTRL_1: Pos. minimum
C00231/3	0.0 %		L_PCTRL_1: Neg. minimum
C00231/4	199.9 %		L_PCTRL_1: Neg. maximum
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00234

Parameter | Name: **C00234 | Oscillation damping influence**			Data type: UNSIGNED_16 Index: 24341_d = $5F15_h$

Oscillation damping

Setting range (min. value | unit | max. value)			Lenze setting
0	%	250	**5 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00235

Parameter | Name: **C00235 | Filter time - oscill. damping**			Data type: UNSIGNED_8 Index: 24340_d = $5F14_h$

Oscillation damping

Setting range (min. value | unit | max. value)			Lenze setting
2	ms	250	**32 ms**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00242

Parameter | Name: **C00242 | L_PCTRL_1: Operating mode**	Data type: UNSIGNED_8 Index: 24333_d = $5F0D_h$

FB L_PCTRL_1: Selection of the operating mode
- Depending on the selection, the blue switches in the displayed signal flow are set accordingly in the Engineer on the **Application parameter** tab in the *Overview* → *Signal flow* → *Process controller* dialog level.

Selection list (Lenze setting printed in bold)		Info
0	**Off**	The input setpoint *nNSet_a* is output without any changes at the output *nOut_a*.
1	Additive + feedforward control	*nNSet_a* and *nAct_a* are used as PID input values. The arriving *nNSet_a* is additively linked to the value output by the PID element.
2	PID as setpoint generator.	*nSet_a* and *nAct_a* are used as PID input values. The input *nNSet_a* is not considered.
3	PID setpoint from L_NSet_1	*nNSet_a* and *nAct_a* are used as PID input values. The input *nSet_a* is not considered.

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00243

Parameter | Name: **C00243 | L_PCTRL_1: Acceleration time influence**			Data type: UNSIGNED_32 Index: 24332_d = $5F0C_h$

FB L_PCTRL_1: Acceleration time for showing the PID output value

Setting range (min. value | unit | max. value)			Lenze setting
0.0	s	999.9	**5.0 s**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000

C00244

Parameter | Name: **C00244 | L_PCTRL_1: Deceleration time influence**			Data type: UNSIGNED_32 Index: 24331_d = $5F0B_h$

FB L_PCTRL_1: Deceleration time for masking out the PID output value

Setting range (min. value | unit | max. value)			Lenze setting
0.0	s	999.9	**5.0 s**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000

C00245

Parameter | Name: **C00245 | L_PCTRL_1: PID output value**			Data type: INTEGER_16 Index: 24330_d = $5F0A_h$
FB L_PCTRL_1: Display of the output value of the PID process controller			
Display range (min. value | unit | max. value)			
-199.9	%	199.9	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00290

Parameter | Name: **C00290 | Module type**	Data type: UNSIGNED_16 Index: 24285_d = $5EDD_h$
This code is for device-internal use only and must not be written to by the user!	

C00291

Parameter | Name: **C00291 | Module software compatibility value**	Data type: UNSIGNED_16 Index: 24284_d = $5EDC_h$
This code is for device-internal use only and must not be written to by the user!	

C00292

Parameter | Name: **C00292 | Drive internal communication status**	Data type: UNSIGNED_8 Index: 24283_d = $5EDB_h$
This code is for device-internal use only and must not be written to by the user!	

C00293

Parameter | Name: **C00293 | Module internal communication status**	Data type: UNSIGNED_8 Index: 24282_d = $5EDA_h$
This code is for device-internal use only and must not be written to by the user!	

C00294

Parameter | Name: **C00294 | Module reported fault**	Data type: UNSIGNED_32 Index: 24281_d = $5ED9_h$
This code is for device-internal use only and must not be written to by the user!	

C00295

Parameter | Name: **C00295 | Internal bus counter**	Data type: UNSIGNED_16 Index: 24280_d = $5ED8_h$
This code is for device-internal use only and must not be written to by the user!	

C00296

Parameter | Name: **C00296 | Module info**	Data type: UNSIGNED_16 Index: 24279_d = $5ED7_h$
This code is for device-internal use only and must not be written to by the user!	

C00304

Parameter | Name: **C00304 | Password1**	Data type: UNSIGNED_32 Index: 24271_d = $5ECF_h$
This code is for device-internal use only and must not be written to by the user!	

C00305

Parameter | Name: **C00305 | Password2**	Data type: UNSIGNED_32 Index: 24270_d = $5ECE_h$
This code is for device-internal use only and must not be written to by the user!	

C00420

Parameter | Name: **C00420 | Number of encoder increments**			Data type: UNSIGNED_16 Index: 24155_d = $5E5B_h$
From version 02.00.00 Indication of the encoder constant			▸ Encoder/feedback system
Setting range (min. value | unit | max. value)			
1	Incr./rev.	32768	
Subcodes	**Lenze setting**		**Info**
C00420/1	128 incr./rev.		Number of encoder increments at FreqIn12
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00425

Parameter | Name: **C00425 | Encoder scanning time**		Data type: UNSIGNED_8 Index: 24150_d = $5E56_h$
From version 02.00.00 Encoder scanning time for the digital input terminals when being configured as frequency inputs		▸ Using DI1 and DI2 as frequency inputs
Selection list		
0	1 ms	
1	2 ms	
2	5 ms	
3	10 ms	
4	20 ms	
5	50 ms	
6	100 ms	
7	200 ms	
8	500 ms	
9	1000 ms	
Subcodes	**Lenze setting**	**Info**
C00425/1	3: 10 ms	Encoder scanning time FreqIn12
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00443

Parameter | Name: **C00443 | DIx: Level**			Data type: UNSIGNED_16 Index: 24132_d = $5E44_h$
Bit-coded display of the level of the digital inputs			
			Digital terminals
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			**Info**
Bit 0	DI1		Bit set = HIGH level
Bit 1	DI2		
Bit 2	DI3		
Bit 3	DI4		
Bit 4	DI5		
Bit 5	Reserve		
Bit 6	Reserve		
Bit 7	Reserve		
Bit 8	Reserve		
Bit 9	Reserve		
Bit 10	Reserve		
Bit 11	Reserve		
Bit 12	Reserve		
Bit 13	Reserve		
Bit 14	Reserve		
Bit 15	CINH		
Subcodes			**Info**
C00443/1			DIx: Terminal level
C00443/2			DIx: Output level
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C00444

Parameter | Name: **C00444 | DOx: Level**			Data type: UNSIGNED_16 Index: 24131_d = $5E43_h$
Bit-coded display of the level of the digital outputs			
			▶ Digital terminals
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			**Info**
Bit 0	Relay		Bit set = HIGH level
Bit 1	DO1		
Bit 2	Reserved		
Bit 3	Reserved		
Bit 4	Reserved		
Bit 5	Reserved		
Bit 6	Reserved		
Bit 7	Reserved		
Bit 8	Reserved		
Bit 9	Reserved		
Bit 10	Reserved		
Bit 11	Reserved		
Bit 12	Reserved		
Bit 13	Reserved		
Bit 14	Reserved		
Bit 15	Reserved		
Subcodes			**Info**
C00444/1			DOx: Input level
C00444/2			DOx: Terminal level
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C00445

Parameter | Name: **C00445 | FreqInxx_nOut_v**			Data type: INTEGER_16 Index: 24130_d = $5E42_h$
From version 02.00.00 Display of the frequency inputs signals that have been fed into the application.			
			▶ Using DI1 and DI2 as frequency inputs
Display range (min. value | unit | max. value)			
-32767	Incr/ms	32767	
Subcodes			**Info**
C00445/1			FreqIn12_nOut_v
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00446

Parameter | Name: **C00446 | FreqInxx_nOut_a**			Data type: INTEGER_16 Index: 24129_d = $5E41_h$
From version 02.00.00			
Display of the frequency inputs signals that have been fed into the application.			
			Using DI1 and DI2 as frequency inputs
Display range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes			**Info**
C00446/1			FreqIn12_nOut_a
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00462

Parameter | Name: **C00462 | Keypad/PC: Setpoint control**	Data type: UNSIGNED_16 Index: 24113_d = $5E31_h$
This code is for device-internal use only and must not be written to by the user!	

C00463

Parameter | Name: **C00463 | Keypad:**			Data type: INTEGER_32 Index: 24112_d = $5E30_h$
Setting range (min. value | unit | max. value)			
0.000		16000.000	
Subcodes	**Lenze setting**		**Info**
C00463/1	729.001		Keypad: Speed setpoint parameter
C00463/2	56.002		Keypad: Bargraph code parameter
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00466

Parameter | Name: **C00466 | Keypad: Default parameter**			Data type: INTEGER_32 Index: 24109_d = $5E2D_h$
Setting of the default parameter for the keypad			
Setting range (min. value | unit | max. value)			**Lenze setting**
0		65535	**51**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00467

Parameter | Name: **C00467 | Keypad: Default welcome screen**		Data type: INTEGER_32 Index: 24108_d = $5E2C_h$
Selection of the welcome screen of the keypad		
Selection list (Lenze setting printed in bold)		
0	Main menu	
1	**Parameter list**	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00469

Parameter | Name: **C00469 | Keypad: STOP key function**		Data type: INTEGER_32 Index: 24106_d = $5E2A_h$
Selection of the function to be executed when the STOP key on the keypad is pressed		
Selection list (Lenze setting printed in bold)		**Info**
0	No function	STOP key has no function
1	**Inhibit controller**	STOP key sets a controller inhibit in the drive
2	Activate quick stop	STOP key triggers a quick stop in the drive
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00470

Parameter | Name: C00470 | LS_ParFree_b		Data type: UNSIGNED_8 Index: 24105d = 5E29h
SB LS_ParFree_b: Setting of the signal level to be output		
Selection list		
0	False	
1	True	
Subcodes	**Lenze setting**	**Info**
C00470/1	0: FALSE	Signal level for output *bPar1* ... *bPar16*
C00470/...		
C00470/16		
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00471

Parameter | Name: C00471 | LS_ParFree			Data type: UNSIGNED_16 Index: 24104d = 5E28h
SB LS_ParFree: Setting of the words to be output			
Setting range (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			
Bit 0	Active		
...	...		
Bit 15	Active		
Subcodes	**Lenze setting**		**Info**
C00471/1	0		Value for output *wPar1* ... *wPar4*
C00471/...			
C00471/4			
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C00472

Parameter | Name: C00472 | LS_ParFree_a			Data type: INTEGER_16 Index: 24103d = 5E27h
SB LS_ParFree_a: Setting of the analog signals to be output			
Setting range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes	**Lenze setting**		**Info**
C00472/1	0.0 %		Value for output *nPar1_a*
C00472/2	0.0 %		Value for output *nPar2_a*
C00472/3	100.0 %		Value for output *nPar3_a*
C00472/4	100.0 %		Value for output *nPar4_a*
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00480

Parameter | Name: C00480 | LS_DisFree_b			Data type: UNSIGNED_8 Index: 24095$_d$ = 5E1F$_h$
SB LS_DisFree_b: Display of the input values			
Display area (min. hex value | max. hex value)			
0x00		0xFF	
Value is bit-coded:			**Info**
Bit 0	bDis1		Signal level input *bDis1* ... *bDis8*
...	...		
Bit 7	bDis8		
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C00481

Parameter | Name: C00481 | LS_DisFree			Data type: UNSIGNED_16 Index: 24094$_d$ = 5E1E$_h$
SB LS_DisFree: Display of the input values			
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			
Bit 0	Bit0		
...	...		
Bit 15	Bit15		
Subcodes			**Info**
C00481/1			Input values *wDis1* ... *wDis4*
C00481/...			
C00481/4			
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C00482

Parameter | Name: C00482 | LS_DisFree_a			Data type: INTEGER_16 Index: 24093$_d$ = 5E1D$_h$
SB LS_DisFree_a: Display of the input values			
Display range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes			**Info**
C00482/1			Input values *nDis1_a* ... *nDis4_a*
C00482/...			
C00482/4			
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00495

Parameter | Name: C00495 | Speed encoder selection		Data type: UNSIGNED_8 Index: 24080$_d$ = 5E10$_h$
From version 02.00.00 Selection of the feedback system for the actual speed for motor control and display ▸ Encoder/feedback system		
Selection list (Lenze setting printed in bold)		**Info**
0	**No encoder**	No encoder available for actual speed detection
1	Encoder signal FreqIn12	Speed encoder signal is fed in via the digital inputs DI1 and DI2
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00496

Parameter | Name: **C00496 | Encoder evaluation method**			Data type: UNSIGNED_8 Index: 24079_d = $5E0F_h$
From version 02.00.00			

▸ Encoder/feedback system

Selection list (Lenze setting printed in bold)		**Info**
1	**Low-resolution encoder (StateLine)**	High-precision procedure for low-resolution encoder (<=128 lines)
3	Edge-counting procedure	Easy edge-counting procedure with adjustable scanning time (C00425)
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00497

Parameter | Name: **C00497 | Nact filter time constant**			Data type: UNSIGNED_16 Index: 24078_d = $5E0E_h$
From version 02.00.00			

Setting range (min. value | unit | max. value)			
0.0	ms	500.0	
Subcodes	**Lenze setting**		**Info**
C00497/1	1.0 ms		Encoder filter time FreqIn12
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 10			

C00516

Parameter | Name: **C00516 | Checksums**			Data type: UNSIGNED_32 Index: 24059_d = $5DFB_h$

Display range (min. value | unit | max. value)			
0		255	
Subcodes			**Info**
C00516/1			Checksum of interconnection
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00517

Parameter | Name: **C00517 | User menu**			Data type: INTEGER_32 Index: 24058_d = $5DFA_h$
When a system is installed, parameters must be changed time and again until the system runs satisfactorily. The user menu of a device serves to create a selection of frequently used parameters to be able to access and change these parameters quickly. • Format: <Code number>,<Subcode number> • For setting "0.000" no entry is displayed in the user menu.			
Setting range (min. value | unit | max. value)			
0.000		16000.000	
Subcodes	**Lenze setting**		**Info**
C00517/1	51.000		C00051: Display of actual speed value
C00517/2	53.000		C00053: Display of DC-bus voltage
C00517/3	54.000		C00054: Display of motor current
C00517/4	61.000		C00061: Display of heatsink temperature
C00517/5	137.000		C00137: Display of device state
C00517/6	166.003		C00166/3: Display of current error message
C00517/7	0.000		User menu: entry 7
C00517/8	11.000		C00011: Reference speed
C00517/9	39.001		C00039/1: Fixed setpoint 1
C00517/10	39.002		C00039/2: Fixed setpoint 2
C00517/11	12.000		C00012: Acceleration time - main setpoint
C00517/12	13.000		C00013: Deceleration time - main setpoint
C00517/13	15.000		C00015: V/f base frequency
C00517/14	16.000		C00016: Vmin boost
C00517/15	22.000		C00022: Imax in motor mode
C00517/16	120.000		C00120: Motor overload threshold (I^2xt)
C00517/17	87.000		C00087: Rated motor speed
C00517/18	99.000		C00099: Display of firmware version
C00517/19	200.000		C00200: Display of firmware product type
C00517/20	0.000		User menu: entry 20
C00517/21	0.000		User menu: entry 21
C00517/22	0.000		User menu: entry 22
C00517/23	0.000		User menu: entry 23
C00517/24	105.000		C00105: Deceleration time - quick stop
C00517/25	173.000		C00173: Mains voltage
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00565

Parameter | Name: **C00565 | Resp. to mains phase failure**		Data type: UNSIGNED_8 Index: 24010_d = $5DCA_h$
Response to the failure of mains-phases		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	Fault	
4	**WarningLocked**	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00567

Parameter | Name: **C00567 | Resp. to lim. speed controller**		Data type: UNSIGNED_8 Index: 24008_d = $5DC8_h$
From version 02.00.00 Response when the speed controller output is limited (*bLimSpeedCtrlOut* = TRUE)		
Selection list (Lenze setting printed in bold)		
0	**No Reaction**	
1	Fault	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00572

Parameter | Name: **C00572 | Limit brake resistor overload**			Data type: UNSIGNED_8 Index: 24003_d = $5DC3_h$
Adjustable threshold for monitoring the brake resistor utilisation • The response for reaching the threshold can be selected in C00574.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	%	100	**100 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00574

Parameter | Name: **C00574 | Resp. to overtemp. brake resistance**		Data type: UNSIGNED_8 Index: 24001_d = $5DC1_h$
Response when reaching the threshold for the brake resistor utilisation set in C00572.		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	**Fault**	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00579

Parameter | Name: **C00579 | Resp. to speed monitoring**		Data type: UNSIGNED_8 Index: 23996_d = $5DBC_h$
Response when the max. speed limit (C00909) or output frequency limit (C00910) has been reached.		
Selection list (Lenze setting printed in bold)		
0	**No Reaction**	
1	Fault	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00581

Parameter | Name: **C00581 | Resp. to LS_SetError_x**		Data type: UNSIGNED_8 Index: 23994_d = $5DBA_h$
Selection of the error responses for application error messages • An application error message is tripped by a FALSE-TRUE edge at the binary inputs *bSetError1...2*.		
Selection list		
0	No Reaction	
1	Fault	
2	Trouble	
4	WarningLocked	
Subcodes	**Lenze setting**	**Info**
C00581/1	1: Fault	LS_SetError_1: Resp. bSetError1
C00581/2	1: Fault	LS_SetError_1: Resp. bSetError2
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00582

Parameter | Name: **C00582 | Resp. to heatsink temp. > cut-off temp. -5°C**		Data type: UNSIGNED_8 Index: 23993_d = $5DB9_h$
Response when the heatsink temperature has reached the shutdown temperature threshold.		
Selection list (Lenze setting printed in bold)		
0	**No Reaction**	
1	Fault	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00585

Parameter | Name: **C00585 | Resp. to motor overtemp. PTC**		Data type: UNSIGNED_8 Index: 23990_d = $5DB6_h$
Response to motor overtemperature • The motor temperature is measured by means of a PTC thermistor detector.		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	**Fault**	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00586

Parameter | Name: **C00586 | Resp. to encoder open circuit**		Data type: UNSIGNED_8 Index: 23989_d = $5DB5_h$
From version 02.00.00 Response if the encoder feedback system fails or the encoder feedback system track fails by wire breakage		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	**Fault**	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00594

Parameter | Name: **C00594 | Resp. to control word error**		Data type: UNSIGNED_8 Index: 23981_d = $5DAD_h$
Configuration of monitoring of the device control		
Selection list		
0	No Reaction	
1	Fault	
2	Trouble	
4	WarningLocked	
Subcodes	**Lenze setting**	**Info**
C00594/1	0: No Reaction	Response if error bit 14 in the CAN control word is set.
C00594/2	1: Fault	Response if error bit 14 in the MCI control word is set.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00597

Parameter | Name: **C00597 | Resp. to LP1 motor phase fault**		Data type: UNSIGNED_8 Index: 23978_d = $5DAA_h$
Response to motor phase failure • Online testing includes the monitoring of the three motor phases during operation (motor rotates). • Static testing means testing before the holding brake is released.		
Selection list (Lenze setting printed in bold)		
0	**No Reaction**	
1	Fault	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00598

Parameter | Name: **C00598 | Resp. to open circuit AINx**		Data type: UNSIGNED_8 Index: 23977_d = $5DA9_h$
Configuration of monitoring the analog input		▸ Analog terminals
Selection list		
0	No Reaction	
1	Fault	
2	Trouble	
4	WarningLocked	
Subcodes	**Lenze setting**	**Info**
C00598/1	1: Fault	Response to open circuit at AIN1 when being configured as 4 ... 20 mA-current loop
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00600

Parameter | Name: **C00600 | Resp. to DC bus undervoltage**		Data type: UNSIGNED_8 Index: 23975_d = $5DA7_h$
Configuration of monitoring of the motor control (group 3)		
Selection list		
1	Fault	
2	Trouble	
Subcodes	**Lenze setting**	**Info**
C00600/1	2: Trouble	Response to undervoltage in the DC bus
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00601

Parameter | Name: **C00601 | Del. resp.to fault: DC bus overvoltage**			Data type: UNSIGNED_16 Index: 23974_d = $5DA6_h$
Delay times for error responses			
Setting range (min. value | unit | max. value)			
0.00	s	65.00	
Subcodes	**Lenze setting**		**Info**
C00601/1	2.00 s		Delay time for error activation "DC-bus overvoltage" • In case of DC-bus overvoltage, an error is only transmitted after this delay time has elapsed.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00604

Parameter | Name: **C00604 | Resp. to device overload (Ixt)**		Data type: UNSIGNED_8 Index: 23971_d = $5DA3_h$
Response if the adjustable device utilisation threshold (C00123) is reached. • The current device utilisation is displayed in C00064.		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	Fault	
4	**WarningLocked**	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00606

Parameter | Name: **C00606 | Resp. to motor overload (I²xt)**		Data type: UNSIGNED_8 Index: 23969_d = $5DA1_h$
Response if the adjustable motor overload threshold (C00120) is reached. • The current thermal motor load is displayed in C00066.		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	Fault	
4	**WarningLocked**	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00607

Parameter | Name: **C00607 | Resp. to max. speed reached**		Data type: UNSIGNED_8 Index: 23968_d = $5DA0_h$
From version 02.00.00 Response when the maximum input frequency of the actual speed value feedback via the digital inputs has been reached.		
Selection list (Lenze setting printed in bold)		
0	No Reaction	
1	**Fault**	
4	WarningLocked	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00620

Parameter | Name: **C00620 | 16-bit system connection**		Data type: UNSIGNED_16 Index: 23955_d = $5D93_h$
Connection parameters: 16-bit inputs • Selection of the 16-bit output signals for connection with the 16-bit input signals. • The selection list contains all 16-bit output signals which can be assigned to the 16-bit inputs mapped by the subcodes.		
Selection list		
See selection list - analog signals		
Subcodes	**Lenze setting**	**Info**
C00620/1	0: Not connected	Reserved
C00620/2	0: Not connected	Reserved
C00620/3	0: Not connected	Reserved
C00620/4	0: Not connected	Reserved
C00620/5	0: Not connected	LS_DisFree:wDis1
C00620/6	0: Not connected	LS_DisFree:wDis2
C00620/7	0: Not connected	LS_DisFree:wDis3
C00620/8	0: Not connected	LS_DisFree:wDis4
C00620/9	0: Not connected	LS_DisFree_a:nDis1_a
C00620/10	0: Not connected	LS_DisFree_a:nDis2_a
C00620/11	0: Not connected	LS_DisFree_a:nDis3_a
C00620/12	0: Not connected	LS_DisFree_a:nDis4_a
C00620/13	0: Not connected	Reserved
C00620/14	0: Not connected	Reserved
C00620/15	0: Not connected	Reserved
C00620/16	0: Not connected	Reserved
C00620/17	0: Not connected	Reserved
C00620/18	0: Not connected	Reserved
C00620/19	0: Not connected	Reserved
C00620/20	0: Not connected	LP_Network_Out: MCI_wState/CAN1_wState
C00620/21	0: Not connected	LP_Network_Out: MCI_wOut2/CAN1_wOut2
C00620/22	0: Not connected	LP_Network_Out: MCI_wOut3/CAN1_wOut3
C00620/23	0: Not connected	LP_Network_Out: MCI_wOut4/CAN1_wOut4
C00620/24	0: Not connected	LP_Network_Out: MCI_wOut5/CAN2_wOut1
C00620/25	0: Not connected	LP_Network_Out: MCI_wOut6/CAN2_wOut2
C00620/26	0: Not connected	LP_Network_Out: MCI_wOut7/CAN2_wOut3
C00620/27	0: Not connected	LP_Network_Out: MCI_wOut8/CAN2_wOut4
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00621

Parameter | Name: **C00621 | Bool system connection**		Data type: UNSIGNED_16 Index: 23954_d = $5D92_h$
Connection parameters: Binary inputs • Selection of the binary output signals for connection with the binary input signals. • The selection list contains all binary output signals which can be assigned to the binary inputs mapped by the subcodes.		
Selection list		
See selection list - digital signals		
Subcodes	**Lenze setting**	**Info**
C00621/1	50: LA_NCtrl_bDriveFail	LS_DigitalOutput:bRelay

Parameter | Name: C00621 | Bool system connection		Data type: UNSIGNED_16 Index: 23954_d = $5D92_h$
C00621/2	51: LA_NCtrl_bDriveReady	LS_DigitalOutput:bOut1
C00621/3	0: Not connected	Reserved
C00621/4	0: Not connected	Reserved
C00621/5	0: Not connected	Reserved
C00621/6	0: Not connected	Reserved
C00621/7	0: Not connected	LA_NCtrl: bStatusBit0
C00621/8	65: LA_NCtrl_bImaxActive	LA_NCtrl: bStatusBit2
C00621/9	62: LA_NCtrl_bSpeedSetReached	LA_NCtrl: bStatusBit3
C00621/10	63: LA_NCtrl_bSpeedActEqSet	LA_NCtrl: bStatusBit4
C00621/11	64: LA_NCtrl_bNActCompare	LA_NCtrl: bStatusBit5
C00621/12	60: LA_NCtrl_bSpeedCcw	LA_NCtrl: bStatusBit14
C00621/13	51: LA_NCtrl_bDriveReady	LA_NCtrl: bStatusBit15
C00621/14	0: Not connected	Reserved
C00621/15	0: Not connected	Reserved
C00621/16	0: Not connected	LS_DisFree_b: bDis1
C00621/17	0: Not connected	LS_DisFree_b: bDis2
C00621/18	0: Not connected	LS_DisFree_b: bDis3
C00621/19	0: Not connected	LS_DisFree_b: bDis4
C00621/20	0: Not connected	LS_DisFree_b: bDis5
C00621/21	0: Not connected	LS_DisFree_b: bDis6
C00621/22	0: Not connected	LS_DisFree_b: bDis7
C00621/23	0: Not connected	LS_DisFree_b: bDis8
C00621/24	0: Not connected	Reserved
C00621/25	0: Not connected	Reserved
C00621/26	0: Not connected	Reserved
C00621/27	0: Not connected	Reserved
C00621/28	0: Not connected	Reserved
C00621/29	0: Not connected	Reserved
C00621/30	0: Not connected	LP_Network_Out: MCI_bState_B0/CAN1_bState_B0
C00621/31	0: Not connected	LP_Network_Out: MCI_bState_B1/CAN1_bState_B1
C00621/32	0: Not connected	LP_Network_Out: MCI_bState_B2/CAN1_bState_B2
C00621/33	0: Not connected	LP_Network_Out: MCI_bState_B3/CAN1_bState_B3
C00621/34	0: Not connected	LP_Network_Out: MCI_bState_B4/CAN1_bState_B4
C00621/35	0: Not connected	LP_Network_Out: MCI_bState_B5/CAN1_bState_B5
C00621/36	0: Not connected	LP_Network_Out: MCI_bState_B6/CAN1_bState_B6
C00621/37	0: Not connected	LP_Network_Out: MCI_bState_B7/CAN1_bState_B7
C00621/38	0: Not connected	LP_Network_Out: MCI_bState_B8/CAN1_bState_B8
C00621/39	0: Not connected	LP_Network_Out: MCI_bState_B9/CAN1_bState_B9
C00621/40	0: Not connected	LP_Network_Out: MCI_bState_B10/CAN1_bState_B10
C00621/41	0: Not connected	LP_Network_Out: MCI_bState_B11/CAN1_bState_B11
C00621/42	0: Not connected	LP_Network_Out: MCI_bState_B12/CAN1_bState_B12
C00621/43	0: Not connected	LP_Network_Out: MCI_bState_B13/CAN1_bState_B13
C00621/44	0: Not connected	LP_Network_Out: MCI_bState_B14/CAN1_bState_B14
C00621/45	0: Not connected	LP_Network_Out: MCI_bState_B15/CAN1_bState_B15

Parameter | Name: **C00621 | Bool system connection**		Data type: UNSIGNED_16 Index: 23954_d = $5D92_h$
C00621/46	0: Not connected	LP_Network_Out: MCI_bOut2_B0/CAN1_bOut2_B0
C00621/47	0: Not connected	LP_Network_Out: MCI_bOut2_B1/CAN1_bOut2_B1
C00621/48	0: Not connected	LP_Network_Out: MCI_bOut2_B2/CAN1_bOut2_B2
C00621/49	0: Not connected	LP_Network_Out: MCI_bOut2_B3/CAN1_bOut2_B3
C00621/50	0: Not connected	LP_Network_Out: MCI_bOut2_B4/CAN1_bOut2_B4
C00621/51	0: Not connected	LP_Network_Out: MCI_bOut2_B5/CAN1_bOut2_B5
C00621/52	0: Not connected	LP_Network_Out: MCI_bOut2_B6/CAN1_bOut2_B6
C00621/53	0: Not connected	LP_Network_Out: MCI_bOut2_B7/CAN1_bOut2_B7
C00621/54	0: Not connected	LP_Network_Out: MCI_bOut2_B8/CAN1_bOut2_B8
C00621/55	0: Not connected	LP_Network_Out: MCI_bOut2_B9/CAN1_bOut2_B9
C00621/56	0: Not connected	LP_Network_Out: MCI_bOut2_B10/CAN1_bOut2_B10
C00621/57	0: Not connected	LP_Network_Out: MCI_bOut2_B11/CAN1_bOut2_B11
C00621/58	0: Not connected	LP_Network_Out: MCI_bOut2_B12/CAN1_bOut2_B12
C00621/59	0: Not connected	LP_Network_Out: MCI_bOut2_B13/CAN1_bOut2_B13
C00621/60	0: Not connected	LP_Network_Out: MCI_bOut2_B14/CAN1_bOut2_B14
C00621/61	0: Not connected	LP_Network_Out: MCI_bOut2_B15/CAN1_bOut2_B15
C00621/62	0: Not connected	LP_Network_Out: MCI_bOut5_B0/CAN2_bOut1_B0
C00621/63	0: Not connected	LP_Network_Out: MCI_bOut5_B1/CAN2_bOut1_B1
C00621/64	0: Not connected	LP_Network_Out: MCI_bOut5_B2/CAN2_bOut1_B2
C00621/65	0: Not connected	LP_Network_Out: MCI_bOut5_B3/CAN2_bOut1_B3
C00621/66	0: Not connected	LP_Network_Out: MCI_bOut5_B4/CAN2_bOut1_B4
C00621/67	0: Not connected	LP_Network_Out: MCI_bOut5_B5/CAN2_bOut1_B5
C00621/68	0: Not connected	LP_Network_Out: MCI_bOut5_B6/CAN2_bOut1_B6
C00621/69	0: Not connected	LP_Network_Out: MCI_bOut5_B7/CAN2_bOut1_B7
C00621/70	0: Not connected	LP_Network_Out: MCI_bOut5_B8/CAN2_bOut1_B8
C00621/71	0: Not connected	LP_Network_Out: MCI_bOut5_B9/CAN2_bOut1_B9
C00621/72	0: Not connected	LP_Network_Out: MCI_bOut5_B10/CAN2_bOut1_B10
C00621/73	0: Not connected	LP_Network_Out: MCI_bOut5_B11/CAN2_bOut1_B11
C00621/74	0: Not connected	LP_Network_Out: MCI_bOut5_B12/CAN2_bOut1_B12
C00621/75	0: Not connected	LP_Network_Out: MCI_bOut5_B13/CAN2_bOut1_B13
C00621/76	0: Not connected	LP_Network_Out: MCI_bOut5_B14/CAN2_bOut1_B14
C00621/77	0: Not connected	LP_Network_Out: MCI_bOut5_B15/CAN2_bOut1_B15
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00632

Parameter | Name: **C00632 | L_NSet_1: Max.InhibitFrq.**			Data type: INTEGER_16 Index: 23943_d = $5D87_h$
Maximum limit values for the speed blocking zones • Selection of the maximum limit values for the blocking zones in which the speed must not be constant.			
Setting range (min. value | unit | max. value)			
0.0	%	199.9	
Subcodes	**Lenze setting**		**Info**
C00632/1	0.0 %		L_NSet_1: Blocking speed 1 max
C00632/2	0.0 %		L_NSet_1: Blocking speed 2 max
C00632/3	0.0 %		L_NSet_1: Blocking speed 3 max
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00633

Parameter | Name: **C00633 | L_NSet_1: Min.InhibitFrq.**			Data type: INTEGER_16 Index: 23942_d = $5D86_h$
Minimum limit values for the speed blocking zones • Selection of the minimum limit values for the blocking zones in which the speed must not be constant.			
Setting range (min. value | unit | max. value)			
0.0	%	199.9	
Subcodes	**Lenze setting**		**Info**
C00633/1	0.0 %		L_NSet_1: Blocking speed 1 min
C00633/2	0.0 %		L_NSet_1: Blocking speed 2 min
C00633/3	0.0 %		L_NSet_1: Blocking speed 3 min
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00634

Parameter | Name: **C00634 | L_NSet_1: wState**			Data type: UNSIGNED_16 Index: 23941_d = $5D85_h$
FB L_NSet_1: Bit-coded status display			
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			**Info**
Bit 0	No blocking zone active		"1" ≡ No blocking zone set for constant speeds
Bit 1	Blocking zone 1 active		"1" ≡ Suppression of constant speed characteristics within the limits of blocking zone 1
Bit 2	Blocking zone 2 active		"1" ≡ Suppression of constant speed characteristics within the limits of blocking zone 2
Bit 3	Blocking zone 3 active		"1" ≡ Suppression of constant speed characteristics within the limits of blocking zone 3
Bit 4	Jog in blocking zone		"1" ≡ A ramp is used to keep the speed setpoint within a speed blocking zone
Bit 5	MaxLimit active		"1" ≡ Speed setpoint is at the maximum speed limit
Bit 6	MinLimit active		"1" ≡ Speed setpoint is at the minimum speed limit
Bit 7	Reserved		
Bit 8	Reserved		
Bit 9	Reserved		
Bit 10	Reserved		
Bit 11	Reserved		
Bit 12	Reserved		
Bit 13	Reserved		
Bit 14	Reserved		
Bit 15	Reserved		
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C00680

Parameter | Name: **C00680 | L_Compare_1: Fct.**	Data type: UNSIGNED_8 Index: 23895_d = $5D57_h$
FB L_Compare_1: Comparison function • If the statement of the selected comparison operation is true, the binary output *bOut* is set to TRUE.	

Selection list (Lenze setting printed in bold)		
1	In1 = In2	
2	In1 > In2	
3	In1 < In2	
4	|In1| = |In2|	
5	|In1| > |In2|	
6	**|In1| < |In2|**	

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00681

Parameter | Name: **C00681 | L_Compare_1: Hysteresis**	Data type: INTEGER_16 Index: 23894_d = $5D56_h$
FB L_Compare_1: Hysteresis for the comparison function selected in C00680	

Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	100.0	**0.5 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00682

Parameter | Name: **C00682 | L_Compare_1: Window**	Data type: INTEGER_16 Index: 23893_d = $5D55_h$
FB L_Compare_1: Window for the comparison function selected in C00680	

Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	100.0	**2.0 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00700

Parameter | Name: **C00700 | LA_NCtrl: Analogue connection list**	Data type: UNSIGNED_16 Index: 23875_d = $5D43_h$

Selection list

See selection list - analog signals

Subcodes	Lenze setting	Info
C00700/1	10: AIn1_Out	LA_NCtrl: nMainSetValue_a
C00700/2	22: nPar3_a	LA_NCtrl: nTorqueMotLim_a
C00700/3	22: nPar3_a	LA_NCtrl: nTorqueGenLim_a
C00700/4	0: Not connected	Reserved
C00700/5	6: C_wDriveCtrl	LA_NCtrl:Network(MCI/CAN)_wDriveControl
C00700/6	1: C_nPos100_a(100.0%)	LA_NCtrl: nPIDVpAdapt_a
C00700/7	0: Not connected	LA_NCtrl: nPIDActValue_a
C00700/8	1: C_nPos100_a(100.0%)	LA_NCtrl: nPIDInfluence_a
C00700/9	0: Not connected	LA_NCtrl: nPIDSetValue_a
C00700/10	0: Not connected	Reserved
C00700/11	0: Not connected	L_GP_Counter1: wLdVal
C00700/12	0: Not connected	L_GP_Counter1: wCmpVal
C00700/13	0: Not connected	L_GP_Compare1: nIn1_a
C00700/14	0: Not connected	L_GP_Compare1: nIn2_a

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00701

Parameter | Name: C00701 | LA_NCtrl: digital connection list		Data type: UNSIGNED_16 Index: 23874_d = $5D42_h$
Selection list		
See selection list - digital signals		
Subcodes	**Lenze setting**	**Info**
C00701/1	0: Not connected	LA_NCtrl: bCInh
C00701/2	10: DigIn_CInh	LA_NCtrl: bFailReset
C00701/3	0: Not connected	LA_NCtrl: bSetQuickstop
C00701/4	13: DigIn_bIn3	LA_NCtrl: bSetDCBrake
C00701/5	14: DigIn_bIn4	LA_NCtrl: bSetSpeedCcw
C00701/6	11: DigIn_bIn1	LA_NCtrl: bJogSpeed1
C00701/7	12: DigIn_bIn2	LA_NCtrl: bJogSpeed2
C00701/8	0: Not connected	LA_NCtrl: bMPOTUp
C00701/9	0: Not connected	LA_NCtrl: bMPOTDown
C00701/10	0: Not connected	LA_NCtrl: bMPOTInAct
C00701/11	0: Not connected	LA_NCtrl: bMPotEnable
C00701/12	0: Not connected	LA_NCtrl: bRFG_0
C00701/13	0: Not connected	LA_NCtrl: bSetError1
C00701/14	0: Not connected	LA_NCtrl: bSetError2
C00701/15	1: C_bTrue	LA_NCtrl: bPIDInfluenceRamp
C00701/16	0: Not connected	LA_NCtrl: bPIDIOff
C00701/17	1: C_bTrue	LA_NCtrl: bRLQCw
C00701/18	0: Not connected	LA_NCtrl: bRLQCcw
C00701/19	15: DigIn_bIn5	LA_NCtrl: bBrkRelease
C00701/20	0: Not connected	L_GP_Counter1: bClkUp
C00701/21	0: Not connected	L_GP_Counter1: bClkDown
C00701/22	0: Not connected	L_GP_Counter1: bLoad
C00701/23	0: Not connected	L_GP_DigitalDelay1: bIn
C00701/24	0: Not connected	L_GP_DigitalDelay2: bIn
C00701/25	0: Not connected	LS_WriteParamList: bExecute
C00701/26	0: Not connected	LS_WriteParamList: bSelectWriteValue_1
C00701/27	0: Not connected	Reserved
C00701/28	0: Not connected	L_GP_DigitalLogic1:bIn1
C00701/29	0: Not connected	L_GP_DigitalLogic1:bIn2
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00720

Parameter | Name: C00720 | L_DigitalDelay_1 delay			Data type: UNSIGNED_32 Index: 23855_d = $5D2F_h$
Switch-on/off delay time			
Setting range (min. value | unit | max. value)			
0.0	s	3600.0	
Subcodes	**Lenze setting**		**Info**
C00720/1	0.0 s		L_DigitalDelay_1: On delay
C00720/2	0.0 s		L_DigitalDelay_1: Off delay
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C00721

Parameter | Name: **C00721 | L_DigitalDelay_2: Delay**			Data type: UNSIGNED_32 Index: 23854_d = $5D2E_h$
Setting range (min. value | unit | max. value)			
0.0	s	3600.0	
Subcodes	**Lenze setting**		**Info**
C00721/1	0.0 s		L_DigitalDelay_2: On delay
C00721/2	0.0 s		L_DigitalDelay_2: Off delay

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000

C00725

Parameter | Name: **C00725 | Current switching frequency** — Data type: UNSIGNED_8 Index: 23850_d = $5D2A_h$

Display of the current switching frequency
- When a variable switching frequency is selected in C00018, the switching frequency may change as a function of the load and rotational frequency.

Selection list (read only)	
0	2 kHz
1	4 kHz
2	8 kHz
3	16 kHz

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1

C00729

Parameter | Name: **C00729 | Keypad/PC: Speed setpoint** — Data type: INTEGER_16 Index: 23846_d = $5D26_h$

This code is for device-internal use only and must not be written to by the user!

C00800

Parameter | Name: **C00800 | L_MPot_1: Upper limit** — Data type: INTEGER_16 Index: 23775_d = $5CDF_h$

FB L_MPot_1: Upper limit of the motor potentiometer function

Setting range (min. value | unit | max. value)			**Lenze setting**
-199.9	%	199.9	**100.0 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00801

Parameter | Name: **C00801 | L_MPot_1: Lower limit** — Data type: INTEGER_16 Index: 23774_d = $5CDE_h$

FB L_MPot_1: Lower limit of the motor potentiometer function

Setting range (min. value | unit | max. value)			**Lenze setting**
-199.9	%	199.9	**-100.0 %**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C00802

Parameter | Name: **C00802 | L_MPot_1: Acceleration time** — Data type: UNSIGNED_16 Index: 23773_d = $5CDD_h$

FB L_MPot_1: Acceleration time of the motor potentiometer function

Setting range (min. value | unit | max. value)			**Lenze setting**
0.1	s	999.9	**10.0 s**

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 10

C00803

Parameter | Name: C00803 | L_MPot_1: Deceleration time			Data type: UNSIGNED_16 Index: 23772_d = $5CDC_h$
FB L_MPot_1: Deceleration time of the motor potentiometer function			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.1	s	999.9	**10.0 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 10			

C00804

Parameter | Name: C00804 | L_MPot_1: Inactive fct.		Data type: UNSIGNED_8 Index: 23771_d = $5CDB_h$
FB L_MPot_1: Selection of the response when deactivating the motor potentiometer via the *bInAct* input		
Selection list (Lenze setting printed in bold)		**Info**
0	**Retain value**	Keep output value
1	Deceleration to 0	Deceleration via ramp to 0
2	Deceleration to lower limit	Deceleration via ramp to lower limit (C00801)
3	Without ramp to 0	Jump to 0
4	Without ramp to lower limit	Jump to lower limit (C00800)
5	Acceleration to upper limit	Acceleration via ramp to upper limit (C00800)
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00805

Parameter | Name: C00805 | L_MPot_1: Init fct.		Data type: UNSIGNED_8 Index: 23770_d = $5CDA_h$
FB L_MPot_1: Selection of the response when switching on the device		
Selection list (Lenze setting printed in bold)		
0	**Load last value**	
1	Load lower limit	
2	Load 0	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00806

Parameter | Name: C00806 | L_MPot_1: Use		Data type: UNSIGNED_8 Index: 23769_d = $5CD9_h$
FB L_MPot_1: Use of the motor potentiometer		
Selection list (Lenze setting printed in bold)		**Info**
0	**No**	The motor potentiometer is not used. • The analog value applied to the *nIn_a* input is looped through without any changes to the *nOut_a* output.
1	Yes	The motor potentiometer is used. • The analog value applied at the *nIn_a* input is led via the motor potentiometer and provided at the *nOut_a* output.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00820

Parameter | Name: C00820 | L_DigitalLogic_1: Function		Data type: UNSIGNED_8 Index: 23755d = 5CCBh
From version 02.00.00		
FB L_DigitalLogic_1: Selection of the internal logic interconnection		
Selection list (Lenze setting printed in bold)		**Info**
0	**bOut = 0**	Constant value "FALSE"
1	bOut = 1	Constant value "TRUE"
2	bOut = bIn1 AND bIn2	AND operation
3	bOut = bIn1 OR bIn2	OR operation
4	bOut = f(truth table)	The truth table parameterised in C00821 is used.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00821

Parameter | Name: C00821 | L_DigitalLogic_1: Truth table		Data type: UNSIGNED_8 Index: 23754d = 5CCAh
From version 02.00.00		
FB L_DigitalLogic_1: Parameter setting of the truth table		
Selection list		
0	False	
1	True	
Subcodes	**Lenze setting**	**Info**
C00821/1	0: FALSE	bIn1=0/bIn2=0
C00821/2	0: FALSE	bIn1=1/bIn2=0
C00821/3	0: FALSE	bIn1=0/bIn2=1
C00821/4	0: FALSE	bIn1=1/bIn2=1
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00830

Parameter | Name: C00830 | 16-bit analogue input			Data type: INTEGER_16 Index: 23745d = 5CC1h
Display in percent of 16-bit input values of different blocks			
Display range (min. value | unit | max. value)			
-199.9	%	199.9	
Subcodes			**Info**
C00830/1			L_NSet_1: nNSet_a
C00830/2			L_NSet: nOut_a
C00830/3			LS_MCTRL: nSpeedSetValue_a
C00830/4			LS_MCTRL: nTorqueMotLimit_a
C00830/5			LS_MCTRL: nTorqueGenLimit_a
C00830/6			L_PCTRL_1: nAct_a
C00830/7			L_PCTRL_1: nAdapt_a
C00830/8			L_PCTRL_1: nSet_a
C00830/9			L_PCTRL_1: nInflu_a
C00830/10			L_PCTRL_1: nNSet_a
C00830/11			L_MPot_1: nIn_a
C00830/12			Reserved
C00830/13			L_Compare_1: nIn1_a
C00830/14			L_Compare_1: nIn2_a
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00831

Parameter | Name: **C00831 | 16-bit common input**			Data type: UNSIGNED_16 Index: 23744_d = $5CC0_h$
Decimal/hexadecimal/bit-coded display of 16-bit input values of different blocks			
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			
Bit 0	Bit0		
...	...		
Bit 15	Bit15		
Subcodes			**Info**
C00831/1			LS_DCTRL: wCANControl
C00831/2			L_Counter_1: wLdVal
C00831/3			L_Counter_1: wCmpVal
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C00833

Parameter | Name: **C00833 | 8-bit input**	Data type: UNSIGNED_8 Index: 23742_d = $5CBE_h$
Display of the signal status of the binary inputs of different blocks	
Selection list	
0 False	
1 True	
Subcodes	**Info**
C00833/1	L_NSet_1: bRfg0
C00833/2	L_NSet_1: bNSetInv
C00833/3	L_NSet_1: bJog1
C00833/4	L_NSet_1: bJog2
C00833/5	LS_SetError_1: bSetError1
C00833/6	LS_SetError_1: bSetError2
C00833/7	L_MPot_1: bUp
C00833/8	L_MPot_1: bInAct
C00833/9	L_MPot_1: bDown
C00833/10	L_MPot_1: bEnable
C00833/11	Reserved
C00833/12	L_PCTRL_1: bIOff
C00833/13	L_PCTRL_1: bEnableInfluenceRamp
C00833/14	LS_DCTRL: bCINH
C00833/15	LS_DCTRL: bFailReset
C00833/16	LS_DCTRL: bStatus_B0
C00833/17	LS_DCTRL: bStatus_B2
C00833/18	LS_DCTRL: bStatus_B3
C00833/19	LS_DCTRL: bStatus_B4
C00833/20	LS_DCTRL: bStatus_B5
C00833/21	LS_DCTRL: bStatus_B14
C00833/22	LS_DCTRL: bStatus_B15
C00833/23	L_RLQ_1: bCw
C00833/24	L_RLQ_1: bCcw
C00833/25	MCK: bBrkRelease
C00833/26	L_Counter_1: bClkUp
C00833/27	L_Counter_1: bClkDown
C00833/28	L_Counter_1: bLoad
C00833/29	L_DigitalDelay_1: bIn
C00833/30	L_DigitalDelay_2: bIn
C00833/31	LS_WriteParamList: bExecute
C00833/32	LS_WriteParamList: bSelectWriteValue
C00833/33	L_DigitalLogic_1:bIn1
C00833/34	L_DigitalLogic_1:bIn2
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1	

C00876

Parameter | Name: **C00876 | Network MCI/CAN input words**	Data type: UNSIGNED_16 Index: 23699_d = $5C93_h$
Display of the 16-bit input values of the MCI/CAN interface	
	Communication
Display area (min. hex value | max. hex value)	
0x0000 0xFFFF	
Value is bit-coded:	
Bit 0 Bit0	
... ...	
Bit 15 Bit15	
Subcodes	**Info**
C00876/1	LP_Network_In:MCI_wCtrl/CAN1_wCtrl
C00876/2	LP_Network_In:MCI_wIn2/CAN1_wIn2
C00876/3	LP_Network_In:MCI_wIn3/CAN1_wIn3
C00876/4	LP_Network_In:MCI_wIn4/CAN1_wIn4
C00876/5	LP_Network_In:MCI_wIn5/CAN2_wIn1
C00876/6	LP_Network_In:MCI_wIn6/CAN2_wIn2
C00876/7	LP_Network_In:MCI_wIn7/CAN2_wIn3
C00876/8	LP_Network_In:MCI_wIn8/CAN2_wIn4
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00877

Parameter | Name: **C00877 | Network MCI/AN output words**	Data type: UNSIGNED_16 Index: 23698_d = $5C92_h$
Display of the 16-bit output values of the MCI/CAN interface	
	Communication
Display area (min. hex value | max. hex value)	
0x0000 0xFFFF	
Value is bit-coded:	
Bit 0 Bit0	
... ...	
Bit 15 Bit15	
Subcodes	**Info**
C00877/1	LP_Network_Out: MCI_wState/CAN1_wState
C00877/2	LP_Network_Out: MCI_wOut2/CAN1_wOut2
C00877/3	LP_Network_Out: MCI_wOut3/CAN1_wOut3
C00877/4	LP_Network_Out: MCI_wOut4/CAN1_wOut4
C00877/5	LP_Network_Out: MCI_wOut5/CAN2_wOut1
C00877/6	LP_Network_Out: MCI_wOut6/CAN2_wOut2
C00877/7	LP_Network_Out: MCI_wOut7/CAN2_wOut3
C00877/8	LP_Network_Out: MCI_wOut8/CAN2_wOut4
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT	

C00909

Parameter | Name: C00909 | Speed limitation			Data type: INTEGER_16 Index: 23666_d = $5C72_h$
Maximum positive/negative speed for all operating modes			
Setting range (min. value | unit | max. value)			
0.0	%	175.0	
Subcodes	**Lenze setting**		**Info**
C00909/1	120.0 %		Max. pos. speed
C00909/2	120.0 %		Max. neg. speed
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00910

Parameter | Name: C00910 | Frequency limitation			Data type: UNSIGNED_16 Index: 23665_d = $5C71_h$
Maximum positive/negative output frequency for all operating modes			
Setting range (min. value | unit | max. value)			
0	Hz	300	
Subcodes	**Lenze setting**		**Info**
C00910/1	300 Hz		Max. pos. output frequency
C00910/2	300 Hz		Max. neg. output frequency
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00971

Parameter | Name: C00971 | VFC: Limitation V/f encoder			Data type: UNSIGNED_16 Index: 23604_d = $5C34_h$
From version 02.00.00 Limitation of the output frequency of the slip regulator and limitation of the fed-in stator frequency for the V/f control (VFCplus+encoder)			
Setting range (min. value | unit | max. value)			
0.00	Hz	100.00	
Subcodes	**Lenze setting**		**Info**
C00971/1	10.00 Hz		Maximum output value or correcting value of the slip regulator • The slip controller output is limited in motor and generator mode to value set here. • It is recommended to provide the 1 - 3-fold slip frequency of the motor as limiting value.
C00971/2	100.00 Hz		Maximum frequency deviation between the mechanical rotational frequency (speed) measured via the encoder (speed) and the fed-in stator frequency. • A limitation can prevent an overcurrent interruption if e.g. a fixed limit stop is approached.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00972

Parameter | Name: C00972 | VFC: Vp V/f +encoder			Data type: UNSIGNED_16 Index: 23603_d = $5C33_h$
From version 02.00.00 Proportional gain of the slip regulator for V/f control (VFCplus+encoder) • The gain must be selected as a function of the drive system and the encoder resolution (range of 0.005 ... 5). • High gains assume high numbers of increments.			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.000	Hz/Hz	64.000	**0.100 Hz/Hz**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1000			

C00973

Parameter | Name: **C00973 | VFC: Ti V/f +encoder**			Data type: UNSIGNED_16 Index: 23602_d = $5C32_h$
From version 02.00.00 Integral time constant of the slip regulator for V/f control (VFCplus+encoder) • The time constant should generally be selected within a range of 20 ms (high dynamic performance) up to 200 ms (low dynamic performance).			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	ms	6000.0	**100.0 ms**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 10			

C00975

Parameter | Name: **C00975 | VFC-ECO: Vp**			Data type: UNSIGNED_16 Index: 23600_d = $5C30_h$
Proportional gain of the cos/phi controller for energy-saving V/f characteristic control (VFCplusEco)			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.000	Hz/Hz	64.000	**0.500 Hz/Hz**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1000			

C00976

Parameter | Name: **C00976 | VFC-ECO: Ti**			Data type: UNSIGNED_16 Index: 23599_d = $5C2F_h$
Reset time of the cos/phi controller for energy-saving V/f characteristic control (VFCplusEco)			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	ms	6000.0	**200.0 ms**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 10			

C00977

Parameter | Name: **C00977 | VFC-ECO: Minimum voltage V/f**			Data type: UNSIGNED_8 Index: 23598_d = $5C2E_h$
V/f minimum voltage of the cos/phi controller for energy-saving V/f characteristic control (VFCplusEco)			
Setting range (min. value | unit | max. value)			**Lenze setting**
20	%	100	**20 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00978

Parameter | Name: **C00978 | VFC-ECO: Motor voltage sub**			Data type: INTEGER_16 Index: 23597_d = $5C2D_h$
Display of the voltage reduction with energy-saving V/f characteristic control (VFCplusEco)			
Display range (min. value | unit | max. value)			
-1000	V	1000	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00979

Parameter | Name: **C00979 | Cosine phi**			Data type: INTEGER_16 Index: 23596_d = $5C2C_h$
Display of the actual cos value and cos setpoint with energy-saving V/f characteristic control (VFCplusEco)			
Display range (min. value | unit | max. value)			
-1.00		1.00	
Subcodes			**Info**
C00979/1			Cosine phi act
C00979/2			Cosine phi set
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00980

Parameter | Name: **C00980 | Output power**			Data type: INTEGER_32 Index: 23595_d = $5C2B_h$
These display parameters serve to execute an energy analysis in the respective application. From this, decisions can be derived whether a measurement for energy optimisation is economical.			
Display range (min. value | unit | max. value)			
0.000	kW	32.000	
Subcodes			**Info**
C00980/1			Active output power
C00980/2			Apparent output power
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1000			

C00981

Parameter | Name: **C00981 | Energy display**			Data type: INTEGER_32 Index: 23594_d = $5C2A_h$
These display parameters serve to execute an energy analysis in the respective application. From this, decisions can be derived whether a measurement for energy optimisation is economical. • The values are saved in the device by switching off the mains and cannot be reset.			
Display range (min. value | unit | max. value)			
0.00	kWh	21474836.47	
Subcodes			**Info**
C00981/1			Output energy in motor mode
C00981/2			Output energy in generator mode
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 100			

C00982

Parameter | Name: **C00982 | VFC-ECO: Minimum voltage V/f ramp**			Data type: UNSIGNED_8 Index: 23593_d = $5C29_h$
Voltage ramp for cancelling V sub with energy-saving V/f characteristic control (VFCplusEco)			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.1	s	5.0	**0.5 s**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 10			

C00984

Parameter | Name: **C00984 | Motor flux Add**			Data type: INTEGER_16 Index: 23591_d = $5C27_h$
From version 02.00.00			
Setting range (min. value | unit | max. value)			**Lenze setting**
0.0	%	199.9	**20.0 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C00987

Parameter | Name: **C00987 | Inverter motor brake: nAdd**			Data type: INTEGER_16 Index: 23588_d = $5C24_h$
From version 02.00.00 Speed hub that is applied to the deceleration ramp in pulse mode when the motor is braked. ▶ Inverter motor brake			
Setting range (min. value | unit | max. value)			**Lenze setting**
0	rpm	1000	**80 rpm**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☑ MOT Scaling factor: 1			

C00990

Parameter | Name: **C00990 | Flying restart fct.: Activation**	Data type: UNSIGNED_8 Index: 23585_d = $5C21_h$
Switch on /activate flying restart circuit for non-feedback drive systems	
	▸ Flying restart function

Selection list (Lenze setting printed in bold)		
0	**Off**	
1	On	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00991

Parameter | Name: **C00991 | Flying restart fct.: Process**	Data type: UNSIGNED_16 Index: 23584_d = $5C20_h$
Selection of the speed search range for the flying restart function	
	▸ Flying restart function

Selection list (Lenze setting printed in bold)		
5	**-n...+n | Last output frequency**	
6	-n...+n | Actual setpoint frequency	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C00992

Parameter | Name: **C00992 | Flying restart: Start frequency**	Data type: INTEGER_16 Index: 23583_d = $5C1F_h$
Selection of the starting value for the flying restart function	
	▸ Flying restart function

Setting range (min. value | unit | max. value)			Lenze setting
-200	Hz	200	**10 Hz**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C00994

Parameter | Name: **C00994 - Flying restart fct.: Current**	Data type: INTEGER_16 Index: 23581_d = $5C1D_h$
Current to be injected during the flying restart process • 100 % ≡ rated motor current (C00081). • The flying restart current should amount to 10 ... 25 % of the rated motor current.	
	▸ Flying restart function

Setting range (min. value | unit | max. value)			Lenze setting
0.0	%	100.0	**25.0 %**
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C01082

Parameter | Name: **C01082 | LS_WriteParamList: Execute Mode**	Data type: UNSIGNED_8 Index: 23493_d = $5BC5_h$
Parameter change-over: Selection of the activation method	

Selection list (Lenze setting printed in bold)		Info
0	**by Execute**	The writing of the parameter list is activated by a FALSE/ TRUE edge at the *bExecute* input.
1	by Input Select	The parameter list is written if a change is made at the *bSelectWriteValue_1* selection input and once when the controller is initialised.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C01083

Parameter | Name: **C01083 | LS_WriteParamList: FailState**			Data type: UNSIGNED_16 Index: 23492_d = $5BC4_h$
Parameter change-over: Error status: • 0 = no error • 33804 = limit violation • 33806 = invalid code • 33813 = no element of the selection list • 33815 = writing of the parameter not permitted • 33816 = writing of the parameter only permitted when controller is inhibited • 33829 = invalid subcode • 33865 = no parameter with subcodes			
Display range (min. value | unit | max. value)			
0		34000	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C01084

Parameter | Name: **C01084 | LS_WriteParamList: FailRow**			Data type: UNSIGNED_8 Index: 23491_d = $5BC3_h$
Parameter change-over: Display of the number of list entry where the error took place (in connection with the value set selected via *bSelectWriteValue_1* and *bSelectWriteValue_2*).			
Display range (min. value | unit | max. value)			
0		16	
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C01085

Parameter | Name: **C01085 | LS_WriteParamList: Index**			Data type: INTEGER_32 Index: 23490_d = $5BC2_h$
Parameter change-over: Parameters for entries 1 ... 16			
Setting range (min. value | unit | max. value)			
0.000		16000.000	
Subcodes	**Lenze setting**		**Info**
C01085/1	0.000		Parameter for entries 1 ... 16 • Format: <code number>.<subcode number> • Examples: "12.000" = C00012; "26.001" = C00026/1
C01085/...			
C01085/16			
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C01086

Parameter | Name: **C01086 | LS_WriteParamList: WriteValue_1**			Data type: INTEGER_32 Index: 23489_d = $5BC1_h$
Parameter change-over: Parameter values - value set 1			
Setting range (min. value | unit | max. value)			
-2147483647		2147483647	
Subcodes	**Lenze setting**		**Info**
C01086/1	0		Parameter values - value set 1 • Parameter values for the parameters defined in C01085/1 ... 16.
C01086/...			
C01086/16			
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C01087

Parameter | Name: **C01087 | LS_WriteParamList: WriteValue_2**			Data type: INTEGER_32 Index: 23488_d = $5BC0_h$
Parameter change-over: Parameter values - value set 2			
Setting range (min. value | unit | max. value)			
-2147483647		2147483647	
Subcodes	**Lenze setting**		**Info**
C01087/1	0		Parameter values - value set 2 • Parameter values for the parameters defined in C01085/1 ... 16.
C01087/...			
C01087/16			
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C01100

Parameter | Name: **C01100 | L_Counter_1: Function**		Data type: UNSIGNED_8 Index: 23475_d = $5BB3_h$
Selection of reset function		
Selection list		
0	Normal counting	
1	Auto reset	
2	Manual reset	
Subcodes	**Lenze setting**	**Info**
C01100/1	0: Normal counting	L_Counter_1: Function
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C01101

Parameter | Name: **C01101 | L_Counter_1: Comparison**		Data type: UNSIGNED_8 Index: 23474_d = $5BB2_h$
Selection of comparison operation		
Selection list		
0	Greater than or equal to	
1	Less than or equal to	
2	equal to	
Subcodes	**Lenze setting**	**Info**
C01101/1	0: Greater than or equal to	L_Counter_1: Comparison
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C01206

Parameter | Name: **C01206 | Axis data: Mounting direction**		Data type: UNSIGNED_8 Index: 23369_d = $5B49_h$
From version 02.00.00 Inversion with mirrored mounting of motor and encoder		
Selection list		
0	Not inverted	
1	Inverted	
Subcodes	**Lenze setting**	**Info**
C01206/1	0: Not inverted	Motor mounting direction • Setting of the motor mounting rotated 180°.
C01206/2	0: Not inverted	Position encoder mounting direction • Setting of the mounting of a position encoder system rotated 180°.
☑ Read access ☑ Write access ☑ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C01501

Parameter | Name: **C01501 | Resp. to communication error with MCI**		Data type: UNSIGNED_8 Index: 23074_d = $5A22_h$
Configuration of monitoring modes for the communication unit		
Selection list		
0	No Reaction	
1	Fault	
4	WarningLocked	
Subcodes	**Lenze setting**	**Info**
C01501/1	1: Fault	Resp. to MCI error 1 • Response to a communication error.
C01501/2	1: Fault	Resp. to MCI error 2 • Response to an incompatible communication unit.
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1		

C01503

Parameter | Name: **C01503 | MCI timeout**			Data type: UNSIGNED_16 Index: 23072_d = $5A20_h$
Setting range (min. value | unit | max. value)			
0	ms	1000	
Subcodes	**Lenze setting**		**Info**
C01503/1	200 ms		MCI timeout
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C01911

Parameter | Name: **C01911 | DIP1 switches**			Data type: UNSIGNED_8 Index: 22664_d = 5888_h
Bit coded display of the DIP1 switch setting **Note:** • Settings made by DIP1, DIP2, P1, P2 and P3 must be activated with the DIP1/switch 1. The settings are accepted anew every time the mains is switched on. As a consequence, interim changes of parameters may be overwritten. • Information on how to commission the 8400 motec via the DIP switches/potentiometers can be found in the mounting instructions!			
Display area (min. hex value | max. hex value)			
0x00		0xFF	
Value is bit-coded:			**Info**
Bit 0	DIP1/1: DIP switch activated		"1" ≡ Settings according to DIP1, DIP2, P1, P2 and P3 are active. • C00012 and C00013 (acceleration/deceleration time) are overwritten with the setting of potentiometer P3. • C00039/1 (fixed setpoint 1) is overwritten with the setting of potentiometer P2.
Bit 1	DIP1/2: Direction of rotation inverted		C00701/5 (bSetSpeedCcw) is overwritten: "0" ≡ bSetSpeedCcw = unchanged "1" ≡ bSetSpeedCcw = TRUE (Ccw active)
Bit 2	DIP1/3: V/f setting		C00006 will be overwritten: "0" ≡ V/f linear "1" ≡ V/f square-law
Bit 3	DIP1/4: Flying restart process activated		C00990 will be overwritten: "0" ≡ Flying restart process deactivated "1" ≡ Flying restart process activated
Bit 4	DIP1/5: Reserved		
Bit 5	DIP1/6: Reserved		
Bit 6	DIP1/7: Reserved		
Bit 7	DIP1/8: relay configuration; DO1		C00621/1 and C00621/2 are overwritten: "0" ≡ DO1=DriveReady / relay=DriveFail "1" ≡ DO1=DriveFail / relay=DriveReady

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT

C01912

Parameter | Name: **C01912 | DIP2 switches**			Data type: UNSIGNED_8 Index: 22663_d = 5887_h
Bit coded display of the DIP2 switch setting **Note:** • Settings made by DIP1, DIP2, P1, P2 and P3 must be activated with the DIP1/switch 1. The settings are accepted anew every time the mains is switched on. As a consequence, interim changes of parameters may be overwritten. • Information on how to commission the 8400 motec via the DIP switches/potentiometers can be found in the mounting instructions!			
Display area (min. hex value | max. hex value)			
0x00		0xFF	
Value is bit-coded:			**Info**
	Bit 0 (Switch 1)	**Bit 1** (Switch 2)	**Freq. setting** C00015 und C00011 are overwritten:
	0 ≡ OFF	0 ≡ OFF	50 Hz, 1500 rpm
	1 ≡ ON	0 ≡ OFF	60 Hz, 1800 rpm
	0 ≡ OFF	1 ≡ ON	87 Hz, 2610 rpm
	1 ≡ ON	1 ≡ ON	120 Hz, 3600 rpm
	Bit 2 (Switch 3)	**Bit 3** (Switch 4)	**Configuration of analog input** C00034 is overwritten:
	0 ≡ OFF	0 ≡ OFF	0 ... 10 V (no load resistor)
	1 ≡ ON	0 ≡ OFF	0 ... 20 mA (load resistor is active)
	0 ≡ OFF	1 ≡ ON	4 ... 20 mA (load resistor is active)
	1 ≡ ON	1 ≡ ON	Configuration of EPM
Bit 4 (Switch 5)	**Bit 5** (Switch 6)	**Bit 6** (Switch 7)	**Control mode** C00007 is overwritten:
0 ≡ OFF	0 ≡ OFF	0 ≡ OFF	Local mode • C00142/bit 0 (inhibit at power-on) is overwritten with "0". **Stop! - Automatic motor start** In "Local mode", the "Inhibit at power-on" auto-start option is not set. The motor starts with mains connection if the RFR controller enable has been bridged or set.
1 ≡ ON	0 ≡ OFF	0 ≡ OFF	Terminals 0
0 ≡ OFF	1 ≡ ON	0 ≡ OFF	Terminals 2
1 ≡ ON	1 ≡ ON	0 ≡ OFF	Terminals 11
0 ≡ OFF	0 ≡ OFF	1 ≡ ON	Terminals 16
1 ≡ ON	0 ≡ OFF	1 ≡ ON	Reserved
0 ≡ OFF	1 ≡ ON	1 ≡ ON	Reserved
1 ≡ ON	1 ≡ ON	1 ≡ ON	Network (MCI/CAN)
		Bit 7 (Switch 8)	Reserved
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C01913

Parameter | Name: **C01913 | Switch poti: Analog values**			Data type: INTEGER_16 Index: 22662_d = 5886_h

Display of the values set via the setting elements P1 ... P3

Note:

- Settings made by DIP1, DIP2, P1, P2 and P3 must be activated with the DIP1/switch 1. The settings are accepted anew every time the mains is switched on. As a consequence, interim changes of parameters may be overwritten.
- Information on how to commission the 8400 motec via the DIP switches/potentiometers can be found in the mounting instructions!

Display range (min. value | unit | max. value)			
-199.99		199.99	

Subcodes	**Info**
C01913/1	Setpoint potentiometer P1 (LocalSetValue)
C01913/2	Setpoint switch P2 (fixed setpoint) C00039/1 is overwritten: • Setting 0 ≡ 0 % • Setting 1 ≡ 11 % • Setting 2 ≡ 22 % • Setting 3 ≡ 33 % • Setting 4 ≡ 44 % • Setting 5 ≡ 55 % • Setting 6 ≡ 66 % • Setting 7 ≡ 77 % • Setting 8 ≡ 88 % • Setting 9 ≡ 100 %
C01913/3	Ramp switch P3 (acceleration/deceleration time) C00012 and C00013 are overwritten: • Setting 0 ≡ 0.1 s • Setting 1 ≡ 0.5 s • Setting 2 ≡ 1.0 s • Setting 3 ≡ 2.0 s • Setting 4 ≡ 5.0 s • Setting 5 ≡ 10.0 s • Setting 6 ≡ 20.0 s • Setting 7 ≡ 30.0 s • Setting 8 ≡ 60.0 s • Setting 9 ≡ 120.0 s

☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT Scaling factor: 100

C02580

Parameter | Name: **C02580 | Holding brake: Operating mode**			Data type: UNSIGNED_8 Index: 21995_d = $55EB_h$
Selection of the operating mode for holding brake control			▸ Holding brake control
Selection list (Lenze setting printed in bold)		**Info**	
0	**Brake control off**	No holding brake is used. The internal control system is switched off.	
11	Manually controlled	The holding brake is released and applied via the *bBrkRelease* application input. • In the Lenze setting, *bBrkRelease* is linked with the digital input DI5 if control takes place via terminals.	
12	Autom. controlled	The holding brake is released and applied automatically via speed setpoint comparisons.	
13	Controlled semi-automatically	From version 02.00.00 The holding brake is released and applied via the *bBrkRelease* application input. • In the Lenze setting, *bBrkRelease* is linked with the digital input DI5 if control takes place via terminals. • Compared to manual operation (mode 11) –this mode provides an active feedforward control which prevents a sagging, e.g. in case of a hoist. –this mode enables the brake to be also closed when the controller is inhibited in order prevent the axis from falling in case of a hoist.	
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1			

C02581

Parameter | Name: **C02581 | Holding brake: Speed thresholds**			Data type: INTEGER_16 Index: 21994_d = $55EA_h$
Speed setpoint threshold and hysteresis for automatic holding brake control			▸ Holding brake control
Setting range (min. value | unit | max. value)			
0.00	%	199.99	
Subcodes	**Lenze setting**		**Info**
C02581/1	5.00 %		Holding brake: Switching threshold • Switching threshold of the speed setpoint from which on the holding brake is released/applied automatically.
C02581/2	1.00 %		Holding brake: Hyst.release • Hysteresis for holding brake release. • Release threshold = switching threshold + release hysteresis
C02581/3	1.00 %		Holding brake: Hyst. close • Hysteresis for holding brake application. • Application threshold = switching threshold - application hysteresis
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100			

C02582

Parameter | Name: **C02582 | Holding brake: Setting**			Data type: UNSIGNED_8 Index: 21993_d = $55E9_h$
Activation of functional holding brake control options			▸ Holding brake control
Setting range (min. hex value | max. hex value)			**Lenze setting**
0x00		0xFF	**0x08** (decimal: 8)
Value is bit-coded: (☑ = bit set)			**Info**
Bit 0 ☐	Control inverted		Activation of inverted control • "1" ≡ Inverted logic of the trigger signal *bBrkRelease* for triggering the power output (terminals BR1 and BR2).
Bit 1 ☐	nAct < nMin at CInh		Brake response in case of pulse inhibit • "1" ≡ With pulse inhibit, the actual speed value is monitored. The holding brake is applied when the actual speed reaches the "Application" threshold value. **Note:** • Function only possible with available speed feedback via the digital input terminals DI1/DI2. • This function is only active if bit 3 (horizontal/winding technology) has been set. The function is used in order that, in case of controller inhibit, the holding brake of a drive with horizontal traverse path does not wear out when rotating. • With a vertical movement (bit 3 = 0), this function is not active. Especially in the case of hoist drives, immediate engagement of the brake is absolutely necessary for safety reasons if the pulse inhibit function of the drive controller has been activated!
Bit 2 ☐	Inverted feedforward control		Direction of feedforward control with vertical/hoist technology: • "0" ≡ Positive direction • "1" ≡ Negative direction **Note:** • Reversal (Ccw) is then considered.
Bit 3 ☑	Horizontal/winding technology		Direction of the axis • "1" ≡ The direction of the axis is horizontal or rotary. The gravitational acceleration does not cause any movement. • "0" ≡ The direction of the axis is vertical. The gravitational acceleration does not cause any movement.
Bit 4 ☐	No premagnetisation		From version 02.00.00 Deactivation of the 200 ms premagnetisation before releasing the brake. • "0" ≡ Premagnetisation in case of feedforward control. • "1" ≡ No premagnetisation.
Bit 5 ☐	Reserved		
Bit 6 ☐	Reserved		
Bit 7 ☐	Reserved		
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT			

C02589

Parameter | Name: **C02589 | Holding brake: Time system**			Data type: UNSIGNED_16 Index: 21986_d = $55E2_h$

Operating times of the holding brake
- The electromechanical delay times of the holding brake are specified in the data sheets or on the holding brake nameplate.

▸ Holding brake control

Setting range (min. value | unit | max. value)			
0	ms	60000	
Subcodes	**Lenze setting**		**Info**
C02589/1	100 ms		Holding brake: Closing time • Time in which the holding brake is completely applied from the beginning of control and in which the controller is inhibited.
C02589/2	100 ms		Holding brake: Release time • Time in which the holding brake is completely released from the beginning of control.
C02589/3	0 ms		Reserved

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1

C02593

Parameter | Name: **C02593 | Holding brake: Activation time**			Data type: UNSIGNED_32 Index: 21982_d = $55DE_h$

Time parameter for the delay of trigger signals of the holding brake control

▸ Holding brake control

Setting range (min. value | unit | max. value)			
0.0	s	3600.0	
Subcodes	**Lenze setting**		**Info**
C02593/1	0.0 s		Holding brake: Actual value monitoring • Time in which the actual value shall have reached the threshold for brake application when the setpoint has already reached the threshold. • Time > 0 s: If the actual speed value has not reached the threshold within the time for brake application, the holding brake is applied by control. • Time = 0 s: The brake is only applied by control when the actual speed has reached the application threshold.
C02593/2	0.0 s		Holding brake: Application delay

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000

C02607

Parameter | Name: **C02607 | Holding brake: Status**			Data type: UNSIGNED_16 Index: 21968_d = $55D0_h$
Switching status of the holding brake control			▸ Holding brake control
Display area (min. hex value | max. hex value)			
0x0000		0xFFFF	
Value is bit-coded:			**Info**
Bit 0	Brake closed		Holding brake is completely applied
Bit 1	Brake released		Holding brake is completely released
Bit 2	Feedforward control active		Feedforward control for holding of the load via the motor is active before the holding brake releases.
Bit 3	Closing active		The brake application time (C02589/1) expires
Bit 4	Forced release active		In case of automatic operation of the holding brake control, the brake is directly released via the MCK input *bBrkRelease* = TRUE
Bit 5	Release active		The brake application time (C02589/2) expires
Bit 6	Setpoint synchronisation active		A speed setpoint at the MCK is approached along a defined ramp after brake release
Bit 7	Brake control fault		Motor phase error detected before brake is released. For configuration of monitoring see C00597.
Bit 8	Reserved		
Bit 9	Reserved		
Bit 10	Reserved		
Bit 11	Reserved		
Bit 12	Reserved		
Bit 13	Reserved		
Bit 14	Reserved		
Bit 15	Reserved		
☑ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☑ No transfer ☐ COM ☐ MOT			

C02610

Parameter | Name: **C02610 | MCK: Accel./deceleration times**			Data type: UNSIGNED_32 Index: 21965_d = $55CD_h$
From version 02.00.00 Ramp times for speed setpoint synchronisation			
Setting range (min. value | unit | max. value)			
0.0	s	999.9	
Subcodes	**Lenze setting**		**Info**
C02610/1	2.0 s		MCK: Holding brake ramp time synchr. • Ramp time for approaching the speed setpoint pending at the MCK after the holding brake release has been completed. ▸ Holding brake control
☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 1000			

C02842

Parameter | Name: **C02842 | FreqInxx: Offset**			Data type: INTEGER_16 Index: 21733_d = $54E5_h$

From version 02.00.00
Offset for digital frequency input

▶ Using DI1 and DI2 as frequency inputs

Setting range (min. value | unit | max. value)			
-199.99	%	199.99	
Subcodes	**Lenze setting**		**Info**
C02842/1	0.00 %		FreqIn12: Offset

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

C02843

Parameter | Name: **C02843 | FreqInxx: Gain**			Data type: INTEGER_16 Index: 21732_d = $54E4_h$

From version 02.00.00
Gain for digital frequency input

▶ Using DI1 and DI2 as frequency inputs

Setting range (min. value | unit | max. value)			
-199.99	%	199.99	
Subcodes	**Lenze setting**		**Info**
C02843/1	100.00 %		FreqIn12: Gain

☑ Read access ☑ Write access ☐ CINH ☐ PLC STOP ☐ No transfer ☐ COM ☐ MOT Scaling factor: 100

11.2.1 Selection lists for configuration parameters

11.2.1.1 Selection list - analog signals

This selection list is relevant for the following parameters:

Parameter	
C00620	16-bit sys. conn.
C00700	LA_NCtrl: Analogue connection list

Selection list - analog signals	
0	Not connected
Frequently used constants:	
1	C_nPos100_a(100.0%)
2	C_nNeg100_a(-100.0%)
3	C_nPos199_9_a(199.9%)
4	C_nNeg199_9_a(-199.9%)
5	C_w65535
6	C_wDriveCtrl
Analog terminals:	
10	AIn1_Out
Setpoint generator L_NSet_1:	
13	SetSpeedValueEff
Digital terminals:	
14	DIGIN_nFreqIn12_a
Potentiometer P1:	
15	LocalSetValue
Free parameters (C00471/1...4):	
16	wPar1
17	wPar2
18	wPar3
19	wPar4
Free parameters (C00472/1...4):	
20	nPar1_a
21	nPar2_a
22	nPar3_a
23	nPar4_a
Data received via network (MCI/CAN):	
30	LP_Network_In: MCI_wCtrl/CAN1_wCtrl
31	LP_Network_In: MCI_wIn2/CAN1_wIn2
32	LP_Network_In: MCI_wIn3/CAN1_wIn3
33	LP_Network_In: MCI_wIn4/CAN1_wIn4
34	LP_Network_In: MCI_wIn5/CAN2_wIn1
35	LP_Network_In: MCI_wIn6/CAN2_wIn2
36	LP_Network_In: MCI_wIn7/CAN2_wIn3
37	LP_Network_In: MCI_wIn8/CAN2_wIn4

Selection list - analog signals	
Output signals of the Drive application:	
50	LA_NCtrl_nMotorFreqAct_a
51	LA_NCtrl_nOutputSpeedCtrl_a Scaling: 16384 ≡ 100 % reference speed (C00011)
52	LA_NCtrl_nMotorSpeedAct_a Scaling: 16384 ≡ 100 % reference speed (C00011)
53	LA_NCtrl_nMotor Voltage_a Scaling: 16384 ≡ 1000 V
54	LA_NCtrl_nDCVoltage_a Scaling: 16384 ≡ 1000 V
55	LA_NCtrl_nMotorCurrent_a Scaling: 16384 ≡ 100 % I_{max_mot} (C00022)
56	LA_NCtrl_nMotorTorqueAct_a Scaling: 16384 ≡ 100 % M_{max} (C00057)
57	LA_NCtrl_nHeatsinktemperature_a Scaling: 0 ... 16384 ≡ 0 ... 80 °C, at sub-zero temperatures, the value "0" is output.
70	LA_NCtrl_wDeviceStateWord
71	LA_NCtrl_wDeviceAuxStateWord
72	LA_NCtrl_wDetermFailNoLow
73	LA_NCtrl_wDetermFailNoHigh
Output signals of "GeneralPurpose" functions:	
160	L_GP_Counter1_wOut

11.2.1.2 Selection list - digital signals

This selection list is relevant for the following parameters:

Parameter	
C00621	Bool sys. conn.
C00701	LA_NCtrl: digital connection list

Selection list - digital signals	
0	Not connected
Frequently used constants:	
1	C_bTrue
Digital terminals:	
10	DigIn_CInh
11	DigIn_bIn1
12	DigIn_bIn2
13	DigIn_bIn3
14	DigIn_bIn4
15	DigIn_bIn5
Free parameters (C00470/1...16):	
20	bPar1
21	bPar2
22	bPar3
23	bPar4
24	bPar5
25	bPar6
26	bPar7
27	bPar8
28	bPar9
29	bPar10
30	bPar11
31	bPar12
32	bPar13
33	bPar14
34	bPar15
35	bPar16
Output signals of the Drive application:	
50	LA_NCtrl_bDriveFail
51	LA_NCtrl_bDriveReady
52	LA_NCtrl_bCInhActive
53	LA_NCtrl_bQSPIsActive
54	LA_NCtrl_bSafeTorqueOff
55	LA_NCtrl_bSafetyIsActive
60	LA_NCtrl_bSpeedCcw
61	LA_NCtrl_bActSpeedEqZero
62	LA_NCtrl_bSpeedSetReached
63	LA_NCtrl_bSpeedActEqSet
64	LA_NCtrl_bNActCompare
65	LA_NCtrl_bImaxActive
66	LA_NCtrl_bHeatSinkWarning
67	LA_NCtrl_bOVDetected
68	LA_NCtrl_bDCBrakeOn
69	LA_NCtrl_bFlyingSyncActive
70	Ain_bCurrentErrorIn1
80	LA_NCtrl_bUVDetected
81	LA_NCtrl_bIxtOverload
82	LA_NCtrl_bI2xtOverload
83	LA_NCtrl_bMMax
84	LA_NCtrl_bNMaxFault
85	LA_NCtrl_bMotorPTCFault
87	LA_NCtrl_bAutoGSBIsActive
88	LA_NCtrl_bClampActive
89	LA_NCtrl_bIMPIsActive
Data received via network (MCI/CAN):	
100	LP_Network_In:MCI_bCtrl_B0/CAN1_bCtrl_B0
101	LP_Network_In:MCI_bCtrl_B1/CAN1_bCtrl_B1
102	LP_Network_In:MCI_bCtrl_B2/CAN1_bCtrl_B2
103	LP_Network_In:MCI_bCtrl_B3/CAN1_bCtrl_B3
104	LP_Network_In:MCI_bCtrl_B4/CAN1_bCtrl_B4
105	LP_Network_In:MCI_bCtrl_B5/CAN1_bCtrl_B5
106	LP_Network_In:MCI_bCtrl_B6/CAN1_bCtrl_B6
107	LP_Network_In:MCI_bCtrl_B7/CAN1_bCtrl_B7
108	LP_Network_In:MCI_bCtrl_B8/CAN1_bCtrl_B8
109	LP_Network_In:MCI_bCtrl_B9/CAN1_bCtrl_B9
110	LP_Network_In:MCI_bCtrl_B10/CAN1_bCtrl_B10
111	LP_Network_In:MCI_bCtrl_B11/CAN1_bCtrl_B11
112	LP_Network_In:MCI_bCtrl_B12/CAN1_bCtrl_B12
113	LP_Network_In:MCI_bCtrl_B13/CAN1_bCtrl_B13
114	LP_Network_In:MCI_bCtrl_B14/CAN1_bCtrl_B14
115	LP_Network_In:MCI_bCtrl_B15/CAN1_bCtrl_B15
120	LP_Network_In:MCI_bIn2_B0/CAN1_bIn2_B0
121	LP_Network_In:MCI_bIn2_B1/CAN1_bIn2_B1
122	LP_Network_In:MCI_bIn2_B2/CAN1_bIn2_B2
123	LP_Network_In:MCI_bIn2_B3/CAN1_bIn2_B3
124	LP_Network_In:MCI_bIn2_B4/CAN1_bIn2_B4
125	LP_Network_In:MCI_bIn2_B5/CAN1_bIn2_B5
126	LP_Network_In:MCI_bIn2_B6/CAN1_bIn2_B6
127	LP_Network_In:MCI_bIn2_B7/CAN1_bIn2_B7
128	LP_Network_In:MCI_bIn2_B8/CAN1_bIn2_B8
129	LP_Network_In:MCI_bIn2_B9/CAN1_bIn2_B9
130	LP_Network_In:MCI_bIn2_B10/CAN1_bIn2_B10
131	LP_Network_In:MCI_bIn2_B11/CAN1_bIn2_B11
132	LP_Network_In:MCI_bIn2_B12/CAN1_bIn2_B12
133	LP_Network_In:MCI_bIn2_B13/CAN1_bIn2_B13
134	LP_Network_In:MCI_bIn2_B14/CAN1_bIn2_B14
135	LP_Network_In:MCI_bIn2_B15/CAN1_bIn2_B15
140	LP_Network_In:MCI_bIn5_B0/CAN2_bIn1_B0
141	LP_Network_In:MCI_bIn5_B1/CAN2_bIn1_B1
142	LP_Network_In:MCI_bIn5_B2/CAN2_bIn1_B2
143	LP_Network_In:MCI_bIn5_B3/CAN2_bIn1_B3
144	LP_Network_In:MCI_bIn5_B4/CAN2_bIn1_B4
145	LP_Network_In:MCI_bIn5_B5/CAN2_bIn1_B5
146	LP_Network_In:MCI_bIn5_B6/CAN2_bIn1_B6

Selection list - digital signals	
147	LP_Network_In:MCI_bIn5_B7/CAN2_bIn1_B7
148	LP_Network_In:MCI_bIn5_B8/CAN2_bIn1_B8
149	LP_Network_In:MCI_bIn5_B9/CAN2_bIn1_B9
150	LP_Network_In:MCI_bIn5_B10/CAN2_bIn1_B10
151	LP_Network_In:MCI_bIn5_B11/CAN2_bIn1_B11
152	LP_Network_In:MCI_bIn5_B12/CAN2_bIn1_B12
153	LP_Network_In:MCI_bIn5_B13/CAN2_bIn1_B13
154	LP_Network_In:MCI_bIn5_B14/CAN2_bIn1_B14
155	LP_Network_In:MCI_bIn5_B15/CAN2_bIn1_B15
Output signals of the Holding brake control:	
200	MCK_bBrkReleaseOut
201	MCK_bBrkReleased
Output signals of "GeneralPurpose" functions:	
210	L_GP_Counter1_bEqual
215	L_GP_Compare1_bOut
220	L_GP_DigitalDelay1_bOut
221	L_GP_DigitalDelay2_bOut
Output signals of the Parameter change-over:	
230	LS_WriteParamList_bDone
231	LS_WriteParamList_bFail
Output signals of "GeneralPurpose" functions:	
240	L_GP_DigitalLogic1_bOut

11.3 Table of attributes

The table of attributes contains information that are required for a communication to the controller via parameters.

How to read the table of attributes:

Column		Meaning	Entry	
Code		Parameter name	Cxxxxx	
Name		Parameter short text (display text)	*Text*	
Index	dec	Index under which the parameter is addressed. The subindex of array variables corresponds to the Lenze subcode number.	24575 - Lenze code number	Is only required for access via a bus system.
	hex		$5FFF_h$ - Lenze code number	
Data	DS	Data structure	E	Single variable (only one parameter element)
			A	Array variable (several parameter elements)
	DA	Number of array elements (subcodes)	*Number*	
	DT	Data type	INTEGER_16	2 bytes with sign
			INTEGER_32	4 bytes with sign
			UNSIGNED_8	1 byte without sign
			UNSIGNED_16	2 bytes without sign
			UNSIGNED_32	4 bytes without sign
			VISIBLE_STRING	ASCII string
	Factor	Factor for data transfer via a bus system, depending on the number of decimal positions	*Factor*	1 ≡ no decimal positions 10 ≡ 1 decimal position 100 ≡ 2 decimal positions 1000 ≡ 3 decimal positions
Access	R	Read access	☑ Reading permitted	
	W	Write access	☑ Writing permitted	
	CINH	Controller inhibit required	☑ Writing is only possible when the controller is inhibited	

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C00002	Device command	24573	5FFD	A	32	UNSIGNED_8	1	☑	☑	
C00003	Status of last device command	24572	5FFC	E	1	UNSIGNED_8	1	☑		
C00005	Application	24570	5FFA	E	1	UNSIGNED_16	1	☑	☑	
C00006	Motor control	24569	5FF9	E	1	UNSIGNED_8	1	☑	☑	☑
C00007	Control mode	24568	5FF8	E	1	UNSIGNED_16	1	☑	☑	
C00010	minimum analog setpoint	24565	5FF5	A	1	INTEGER_16	100	☑	☑	
C00011	Appl.: Reference speed	24564	5FF4	E	1	UNSIGNED_16	1	☑	☑	
C00012	Accel. time - main setpoint	24563	5FF3	E	1	UNSIGNED_32	1000	☑	☑	
C00013	Decel. time - main setpoint	24562	5FF2	E	1	UNSIGNED_32	1000	☑	☑	
C00015	VFC: V/f base frequency	24560	5FF0	E	1	UNSIGNED_16	10	☑	☑	
C00016	VFC: Vmin boost	24559	5FEF	E	1	UNSIGNED_16	100	☑	☑	
C00018	Switching frequency	24557	5FED	E	1	UNSIGNED_8	1	☑	☑	
C00019	Auto-DCB: Threshold	24556	5FEC	E	1	UNSIGNED_16	1	☑	☑	
C00021	Slip comp.	24554	5FEA	E	1	INTEGER_16	100	☑	☑	
C00022	Imax in motor mode	24553	5FE9	E	1	UNSIGNED_16	100	☑	☑	
C00023	Imax in generator mode	24552	5FE8	E	1	INTEGER_16	100	☑	☑	
C00024	Comparison value N_Act	24551	5FE7	E	1	INTEGER_16	100	☑	☑	
C00026	AINx: Offset	24549	5FE5	A	1	INTEGER_16	100	☑	☑	
C00027	AINx: Gain	24548	5FE4	A	1	INTEGER_32	100	☑	☑	
C00028	AINx: Input voltage	24547	5FE3	A	1	INTEGER_16	100	☑		
C00029	AINx: Input current	24546	5FE2	A	1	INTEGER_16	100	☑		

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C00033	AINx: Output value	24542	5FDE	A	1	INTEGER_16	100	☑		
C00034	AINx: Configuration	24541	5FDD	A	1	UNSIGNED_8	1	☑	☑	
C00036	DCB: Current	24539	5FDB	E	1	INTEGER_16	100	☑	☑	
C00039	Fixed setpoint x (L_NSet_1 n-Fix)	24536	5FD8	A	3	INTEGER_16	100	☑	☑	
C00050	MCTRL: Speed setpoint	24525	5FCD	E	1	INTEGER_32	1	☑		
C00051	MCTRL: Actual speed value	24524	5FCC	E	1	INTEGER_32	1	☑		
C00052	Motor voltage	24523	5FCB	E	1	UNSIGNED_16	1	☑		
C00053	DC-bus voltage	24522	5FCA	E	1	UNSIGNED_16	1	☑		
C00054	Motor current	24521	5FC9	E	1	UNSIGNED_16	100	☑		
C00056	Torque	24519	5FC7	A	2	INTEGER_32	100	☑		
C00057	Maximum torque	24518	5FC6	E	1	UNSIGNED_32	100	☑		
C00058	Output frequency	24517	5FC5	E	1	INTEGER_32	100	☑		
C00059	Appl.: Reference frequency C11	24516	5FC4	E	1	UNSIGNED_32	100	☑		
C00061	Heatsink temperature	24514	5FC2	E	1	INTEGER_16	1	☑		
C00064	Device utilisation (Ixt)	24511	5FBF	A	3	INTEGER_16	100	☑		
C00066	Thermal motor load (I²xt)	24509	5FBD	E	1	INTEGER_16	100	☑		
C00073	Vp Imax controller	24502	5FB6	E	1	UNSIGNED_16	100	☑	☑	
C00074	Ti Imax controller	24501	5FB5	E	1	UNSIGNED_16	1	☑	☑	
C00081	Rated motor power	24494	5FAE	E	1	UNSIGNED_16	100	☑	☑	
C00084	Motor stator resistance	24491	5FAB	E	1	UNSIGNED_32	1	☑	☑	
C00085	Motor stator leakage inductance	24490	5FAA	E	1	UNSIGNED_16	100	☑	☑	☑
C00087	Rated motor speed	24488	5FA8	E	1	UNSIGNED_16	1	☑	☑	
C00088	Rated motor current	24487	5FA7	E	1	UNSIGNED_16	100	☑	☑	☑
C00089	Rated motor frequency	24486	5FA6	E	1	UNSIGNED_16	1	☑	☑	☑
C00090	Rated motor voltage	24485	5FA5	E	1	UNSIGNED_16	1	☑	☑	☑
C00091	Motor cosine phi	24484	5FA4	E	1	UNSIGNED_8	100	☑	☑	
C00092	Motor magnetising inductance	24483	5FA3	E	1	UNSIGNED_16	10	☑	☑	☑
C00093	Power section identification	24482	5FA2	E	1	UNSIGNED_16	1	☑		
C00094	Password	24481	5FA1	E	1	INTEGER_32	1	☑	☑	
C00095	Motor magnetising current	24480	5FA0	E	1	UNSIGNED_16	100	☑		
C00097	Rated motor torque	24478	5F9E	E	1	UNSIGNED_32	100	☑		
C00098	Device rated current	24477	5F9D	E	1	UNSIGNED_16	10	☑		
C00099	Firmware version	24476	5F9C	E	1	VISIBLE_STRING		☑		
C00100	Firmware version	24475	5F9B	A	4	UNSIGNED_8	1	☑		
C00105	Deceleration time - quick stop	24470	5F96	E	1	UNSIGNED_32	1000	☑	☑	
C00106	Auto-DCB: Hold time	24469	5F95	E	1	UNSIGNED_32	1000	☑	☑	
C00107	DCB: Hold time	24468	5F94	E	1	UNSIGNED_32	1000	☑	☑	
C00114	DIx inversion	24461	5F8D	E	1	UNSIGNED_16		☑	☑	
C00115	DI1| DI2: Function	24460	5F8C	A	1	UNSIGNED_8	1	☑	☑	
C00118	DOx inversion	24457	5F89	E	1	UNSIGNED_8		☑	☑	
C00120	Motor overload threshold (I²xt)	24455	5F87	E	1	INTEGER_16	100	☑	☑	
C00123	Device utilisat. threshold (Ixt)	24452	5F84	E	1	INTEGER_16	100	☑	☑	
C00129	Value brake resistor	24446	5F7E	E	1	UNSIGNED_16	10	☑	☑	
C00130	Rated power brake resistor	24445	5F7D	E	1	UNSIGNED_16	1	☑	☑	
C00131	Heat capacity brake resistor	24444	5F7C	E	1	UNSIGNED_16	10	☑	☑	
C00133	load brake resistor	24442	5F7A	E	1	UNSIGNED_16	1	☑		
C00134	Ramp rounding - main setpoint	24441	5F79	E	1	UNSIGNED_8	1	☑	☑	
C00136	Communication control words	24439	5F77	A	1	UNSIGNED_16		☑		
C00137	Device state	24438	5F76	E	1	UNSIGNED_16	1	☑		
C00141	Device settings	24434	5F72	A	1	UNSIGNED_8	1	☑	☑	
C00142	Auto-start option	24433	5F71	E	1	UNSIGNED_8		☑	☑	

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C00144	Switching frequency reduction (temp.)	24431	5F6F	E	1	UNSIGNED_8	1	☑	☑	
C00150	Status word	24425	5F69	E	1	UNSIGNED_16		☑		
C00155	Status word 2	24420	5F64	E	1	UNSIGNED_16		☑		
C00158	Cause of controller inhibit	24417	5F61	E	1	UNSIGNED_16		☑		
C00159	Cause of quick stop QSP	24416	5F60	E	1	UNSIGNED_16		☑		
C00161	Current error	24414	5F5E	A	1	UNSIGNED_32	1	☑		
C00165	Error information	24410	5F5A	A	1	VISIBLE_STRING		☑		
C00166	Error information text	24409	5F59	A	3	VISIBLE_STRING		☑		
C00168	Error number	24407	5F57	A	8	UNSIGNED_32	1	☑		
C00169	Time of error	24406	5F56	A	8	UNSIGNED_32	1	☑		
C00170	Error counter	24405	5F55	A	8	UNSIGNED_8	1	☑		
C00173	Mains voltage	24402	5F52	E	1	UNSIGNED_8	1	☑	☑	☑
C00174	Reduc. brake chopper threshold	24401	5F51	E	1	UNSIGNED_8	1	☑	☑	
C00175	Reaktion brake resistor control	24400	5F50	E	1	UNSIGNED_8	1	☑	☑	☑
C00177	Switching cycles	24398	5F4E	A	2	UNSIGNED_32	1	☑		
C00178	Elapsed-hour meter	24397	5F4D	E	1	UNSIGNED_32	1	☑		
C00179	Power-on time meter	24396	5F4C	E	1	UNSIGNED_32	1	☑		
C00182	S-ramp time PT1	24393	5F49	E	1	INTEGER_16	100	☑	☑	
C00200	Firmware product type	24375	5F37	E	1	VISIBLE_STRING		☑		
C00201	Firmware compile date	24374	5F36	E	1	VISIBLE_STRING		☑		
C00203	Product type code	24372	5F34	A	9	VISIBLE_STRING		☑		
C00204	Serial numbers	24371	5F33	A	7	VISIBLE_STRING		☑		
C00222	L_PCTRL_1: Vp	24353	5F21	E	1	INTEGER_16	10	☑	☑	
C00223	L_PCTRL_1: Tn	24352	5F20	E	1	UNSIGNED_16	1	☑	☑	
C00224	L_PCTRL_1: Kd	24351	5F1F	E	1	UNSIGNED_16	10	☑	☑	
C00225	L_PCTRL_1: MaxLimit	24350	5F1E	E	1	INTEGER_16	100	☑	☑	
C00226	L_PCTRL_1: MinLimit	24349	5F1D	E	1	INTEGER_16	100	☑	☑	
C00227	L_PCTRL_1: Acceleration time	24348	5F1C	E	1	UNSIGNED_32	1000	☑	☑	
C00228	L_PCTRL_1: Deceleration time	24347	5F1B	E	1	UNSIGNED_32	1000	☑	☑	
C00231	L_PCTRL_1: Operating range	24344	5F18	A	4	INTEGER_16	100	☑	☑	
C00234	Oscillation damping influence	24341	5F15	E	1	UNSIGNED_16	100	☑	☑	
C00235	Filter time - oscill. damping	24340	5F14	E	1	UNSIGNED_8	1	☑	☑	
C00242	L_PCTRL_1: Operating mode	24333	5F0D	E	1	UNSIGNED_8	1	☑	☑	
C00243	L_PCTRL_1: Influence acceleration time	24332	5F0C	E	1	UNSIGNED_32	1000	☑	☑	
C00244	L_PCTRL_1: Influence deceleration time	24331	5F0B	E	1	UNSIGNED_32	1000	☑	☑	
C00245	L_PCTRL_1: PID output value	24330	5F0A	E	1	INTEGER_16	100	☑		
C00420	Number of encoder increments	24155	5E5B	A	1	UNSIGNED_16	1	☑	☑	☑
C00425	Encoder scanning time	24150	5E56	A	1	UNSIGNED_8	1	☑	☑	☑
C00443	DIx: Level	24132	5E44	A	2	UNSIGNED_16		☑		
C00444	DOx: Level	24131	5E43	A	2	UNSIGNED_16		☑		
C00445	FreqInxx_nOut_v	24130	5E42	A	1	INTEGER_16	1	☑		
C00446	FreqInxx_nOut_a	24129	5E41	A	1	INTEGER_16	100	☑		
C00463	Keypad: Default parameters	24112	5E30	A	2	INTEGER_32	1000	☑	☑	
C00466	Keypad: Default parameters	24109	5E2D	E	1	INTEGER_32	1	☑	☑	
C00467	Keypad: Default welcome screen	24108	5E2C	E	1	INTEGER_32	1	☑	☑	
C00469	Keypad: STOP key function	24106	5E2A	E	1	INTEGER_32	1	☑	☑	
C00470	LS_ParFree_b	24105	5E29	A	16	UNSIGNED_8	1	☑	☑	
C00471	LS_ParFree	24104	5E28	A	4	UNSIGNED_16		☑	☑	
C00472	LS_ParFree_a	24103	5E27	A	4	INTEGER_16	100	☑	☑	
C00480	LS_DisFree_b	24095	5E1F	E	1	UNSIGNED_8		☑		

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C00481	LS_DisFree	24094	5E1E	A	4	UNSIGNED_16		☑		
C00482	LS_DisFree_a	24093	5E1D	A	4	INTEGER_16	100	☑		
C00495	Speed sensor selection	24080	5E10	E	1	UNSIGNED_8	1	☑	☑	
C00496	Encoder evaluation method	24079	5E0F	E	1	UNSIGNED_8	1	☑	☑	☑
C00497	Nact filter time constant	24078	5E0E	A	1	UNSIGNED_16	10	☑	☑	
C00516	Checksums	24059	5DFB	A	1	UNSIGNED_32	1	☑		
C00517	User menu	24058	5DFA	A	25	INTEGER_32	1000	☑	☑	
C00565	Resp. to mains phase failure	24010	5DCA	E	1	UNSIGNED_8	1	☑	☑	
C00567	Resp. to lim. speed controller	24008	5DC8	E	1	UNSIGNED_8	1	☑	☑	
C00572	Limit brake resistor overload	24003	5DC3	E	1	UNSIGNED_8	1	☑	☑	
C00574	Resp. to overtemp. brake resistance	24001	5DC1	E	1	UNSIGNED_8	1	☑	☑	
C00579	Resp. to speed monitoring	23996	5DBC	E	1	UNSIGNED_8	1	☑	☑	
C00581	Resp. to LS_SetError_x	23994	5DBA	A	2	UNSIGNED_8	1	☑	☑	
C00582	Resp. to heatsink temp. > cut-off temp. -5°C	23993	5DB9	E	1	UNSIGNED_8	1	☑	☑	
C00585	Resp. to motor overtemp. PTC	23990	5DB6	E	1	UNSIGNED_8	1	☑	☑	
C00586	Resp. to encoder open circuit	23989	5DB5	E	1	UNSIGNED_8	1	☑	☑	
C00594	Resp. to control word error	23981	5DAD	A	2	UNSIGNED_8	1	☑	☑	
C00597	Resp. to LP1 motor phase fault	23978	5DAA	E	1	UNSIGNED_8	1	☑	☑	
C00598	Resp. to open circuit AINx	23977	5DA9	A	1	UNSIGNED_8	1	☑	☑	
C00600	Resp. to DC bus undervoltage	23975	5DA7	A	1	UNSIGNED_8	1	☑	☑	
C00601	Del. resp.to fault: DC bus overvoltage	23974	5DA6	A	1	UNSIGNED_16	1000	☑	☑	
C00604	Resp. to device overload (Ixt)	23971	5DA3	E	1	UNSIGNED_8	1	☑	☑	
C00606	Resp. to motor overload (I²xt)	23969	5DA1	E	1	UNSIGNED_8	1	☑	☑	
C00607	Resp. to max. speed reached	23968	5DA0	E	1	UNSIGNED_8	1	☑	☑	
C00620	16-bit system connection	23955	5D93	A	27	UNSIGNED_16	1	☑	☑	
C00621	Bool system connection	23954	5D92	A	77	UNSIGNED_16	1	☑	☑	
C00632	L_NSet_1: Max.InhibitFrq.	23943	5D87	A	3	INTEGER_16	100	☑	☑	
C00633	L_NSet_1: Min.InhibitFrq.	23942	5D86	A	3	INTEGER_16	100	☑	☑	
C00634	L_NSet_1: wState	23941	5D85	E	1	UNSIGNED_16		☑		
C00680	L_Compare_1: Fct.	23895	5D57	E	1	UNSIGNED_8	1	☑	☑	
C00681	L_Compare_1: Hysteresis	23894	5D56	E	1	INTEGER_16	100	☑	☑	
C00682	L_Compare_1: Window	23893	5D55	E	1	INTEGER_16	100	☑	☑	
C00700	LA_NCtrl: Analogue connection list	23875	5D43	A	14	UNSIGNED_16	1	☑	☑	
C00701	LA_NCtrl: digital connection list	23874	5D42	A	29	UNSIGNED_16	1	☑	☑	
C00720	L_DigitalDelay_1 delay	23855	5D2F	A	2	UNSIGNED_32	1000	☑	☑	
C00721	L_DigitalDelay_2: Delay	23854	5D2E	A	2	UNSIGNED_32	1000	☑	☑	
C00725	Current switching frequency	23850	5D2A	E	1	UNSIGNED_8	1	☑		
C00800	L_MPot_1: Upper limit	23775	5CDF	E	1	INTEGER_16	100	☑	☑	
C00801	L_MPot_1: Lower limit	23774	5CDE	E	1	INTEGER_16	100	☑	☑	
C00802	L_MPot_1: Acceleration time	23773	5CDD	E	1	UNSIGNED_16	10	☑	☑	
C00803	L_MPot_1: Deceleration time	23772	5CDC	E	1	UNSIGNED_16	10	☑	☑	
C00804	L_MPot_1: Inactive function	23771	5CDB	E	1	UNSIGNED_8	1	☑	☑	
C00805	L_MPot_1: Init fct.	23770	5CDA	E	1	UNSIGNED_8	1	☑	☑	
C00806	L_MPot_1: Use	23769	5CD9	E	1	UNSIGNED_8	1	☑	☑	
C00820	L_DigitalLogic_1: Function	23755	5CCB	E	1	UNSIGNED_8	1	☑	☑	
C00821	L_DigitalLogic_1: Truth table	23754	5CCA	A	4	UNSIGNED_8	1	☑	☑	
C00830	16-bit analogue input	23745	5CC1	A	14	INTEGER_16	100	☑		
C00831	16-bit common input	23744	5CC0	A	3	UNSIGNED_16		☑		
C00833	8-bit input	23742	5CBE	A	34	UNSIGNED_8	1	☑		
C00876	Network MCI/CAN input words	23699	5C93	A	8	UNSIGNED_16		☑		

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C00877	Output words Network MCI/AN	23698	5C92	A	8	UNSIGNED_16		☑		
C00909	Speed limitation	23666	5C72	A	2	INTEGER_16	100	☑	☑	
C00910	Frequency limitation	23665	5C71	A	2	UNSIGNED_16	1	☑	☑	
C00971	VFC: Limitation V/f encoder	23604	5C34	A	2	UNSIGNED_16	100	☑	☑	
C00972	VFC: Vp V/f +encoder	23603	5C33	E	1	UNSIGNED_16	1000	☑	☑	
C00973	VFC: Ti V/f +encoder	23602	5C32	E	1	UNSIGNED_16	10	☑	☑	
C00975	VFC-ECO: Vp	23600	5C30	E	1	UNSIGNED_16	1000	☑	☑	
C00976	VFC-ECO: Ti	23599	5C2F	E	1	UNSIGNED_16	10	☑	☑	
C00977	VFC-ECO: Minimum voltage V/f	23598	5C2E	E	1	UNSIGNED_8	1	☑	☑	
C00978	VFC-ECO: Motor voltage Sub	23597	5C2D	E	1	INTEGER_16	1	☑		
C00979	Cosine phi	23596	5C2C	A	2	INTEGER_16	100	☑		
C00980	Output power	23595	5C2B	A	2	INTEGER_32	1000	☑		
C00981	Energy display	23594	5C2A	A	2	INTEGER_32	100	☑		
C00982	VFC-ECO: Motor voltage Sub ramp	23593	5C29	E	1	UNSIGNED_8	10	☑	☑	
C00984	Motor flux Add	23591	5C27	E	1	INTEGER_16	100	☑	☑	
C00987	Inverter motor brake: nAdd	23588	5C24	E	1	INTEGER_16	1	☑	☑	
C00990	Flying restart fct.: Activation	23585	5C21	E	1	UNSIGNED_8	1	☑	☑	
C00991	Flying restart fct.: Process	23584	5C20	E	1	UNSIGNED_16	1	☑	☑	
C00992	Flying restart: Start frequency	23583	5C1F	E	1	INTEGER_16	1	☑	☑	
C00994	Flying restart fct.: Current	23581	5C1D	E	1	INTEGER_16	100	☑	☑	
C01082	LS_WriteParamList: Execute Mode	23493	5BC5	E	1	UNSIGNED_8	1	☑	☑	
C01083	LS_WriteParamList: FailState	23492	5BC4	E	1	UNSIGNED_16	1	☑		
C01084	LS_WriteParamList: FailRow	23491	5BC3	E	1	UNSIGNED_8	1	☑		
C01085	LS_WriteParamList: Index	23490	5BC2	A	16	INTEGER_32	1000	☑	☑	
C01086	LS_WriteParamList: WriteValue_1	23489	5BC1	A	16	INTEGER_32	1	☑	☑	
C01087	LS_WriteParamList: WriteValue_2	23488	5BC0	A	16	INTEGER_32	1	☑	☑	
C01100	L_Counter_1: Function	23475	5BB3	A	1	UNSIGNED_8	1	☑	☑	
C01101	L_Counter_1: Comparison	23474	5BB2	A	1	UNSIGNED_8	1	☑	☑	
C01206	Axis data: Mounting direction	23369	5B49	A	2	UNSIGNED_8	1	☑	☑	☑
C01501	Resp. to communication error with MCI	23074	5A22	A	2	UNSIGNED_8	1	☑	☑	
C01503	MCI timeout	23072	5A20	A	1	UNSIGNED_16	1	☑	☑	
C01911	DIP1 switches	22664	5888	E	1	UNSIGNED_8		☑		
C01912	DIP2 switches	22663	5887	E	1	UNSIGNED_8		☑		
C01913	Switch poti.: Analog values	22662	5886	A	3	INTEGER_16	100	☑		
C02580	Holding brake: Operating mode	21995	55EB	E	1	UNSIGNED_8	1	☑	☑	
C02581	Holding brake: Speed thresholds	21994	55EA	A	3	INTEGER_16	100	☑	☑	
C02582	Holding brake: Setting	21993	55E9	E	1	UNSIGNED_8		☑	☑	
C02589	Holding brake: Time system	21986	55E2	A	3	UNSIGNED_16	1	☑	☑	
C02593	Holding brake: Activation time	21982	55DE	A	2	UNSIGNED_32	1000	☑	☑	
C02607	Holding brake: Status	21968	55D0	E	1	UNSIGNED_16		☑		
C02610	MCK: Accel./deceleration time	21965	55CD	A	1	UNSIGNED_32	1000	☑	☑	
C02842	FreqInxx: Offset	21733	54E5	A	1	INTEGER_16	100	☑	☑	
C02843	FreqInxx: Gain	21732	54E4	A	1	INTEGER_16	100	☑	☑	

12 Function library

This chapter describes the function and system blocks that are part of the drive application.

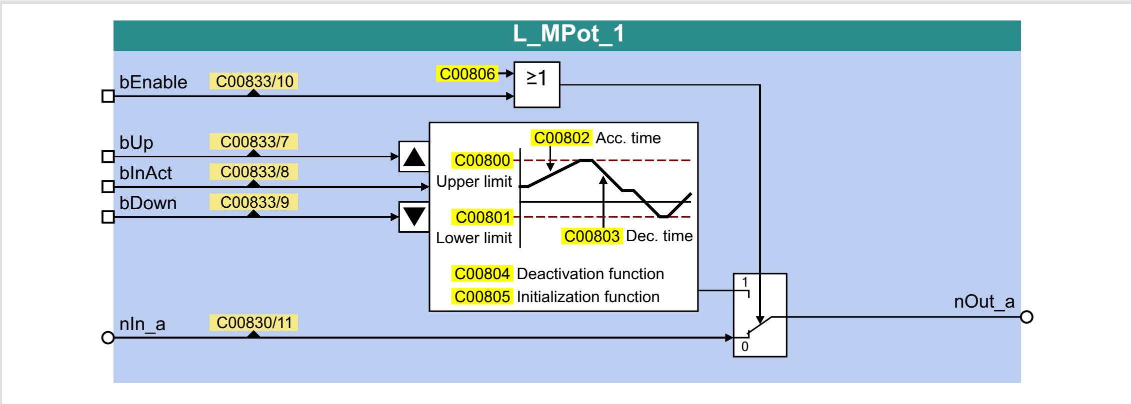
Function block	Function
L_MPot_1	Motor potentiometer (as alternative setpoint source)
L_NSet_1	Setpoint generator
L_PCTRL_1	Process controller
L_RLQ_1	Fail-safe linking of a selected direction of rotation to the quick stop function (QSP)
GP: GeneralPurpose The following "GeneralPurpose" functions are freely available:	
L_GP_Compare1	Analog comparison
L_GP_Counter1	Digital up/down counter
L_GP_DigitalDelay1	Binary delay element (e.g. for debouncing a digital input)
L_GP_DigitalDelay2	
L_GP_DigitalLogic1	From version 02.00.00 Configurable logic operation of two digital input signals

System block	Function
LS_AnalogInput	Interface to the analog input terminals ▸ Analog terminals (📖 137)
LS_DigitalInput	Interface to the digital input terminals ▸ Digital terminals (📖 131)
LS_DigitalOutput	Interface to the digital output terminals ▸ Digital terminals (📖 131)
LS_DisFree	Any four 16-bit signals of the application can be displayed on display codes
LS_DisFree_a	Any four analog signals of the application can be displayed on display codes
LS_DisFree_b	Any eight digital signals of the application can be displayed on a bit-coded display code
LS_DriveInterface	Interface for drive control (DCTRL) ▸ Device control (DCTRL) (📖 31)
LS_ParFix	Output of different constant values
LS_ParFree	Output of 4 parameterisable 16-bit signals
LS_ParFree_a	Output of 4 parameterisable analog signals
LS_ParFree_b	Output of 16 parameterisable digital signals
LS_SetError_1	Parameterisable responses to user-defined events are tripped
LS_WriteParamList	Interface to the basic "Parameter change-over" function ▸ Parameter change-over (📖 172)

12.1 L_MPot_1

This FB replaces a hardware motor potentiometer and can be used as an alternative setpoint source which is controlled via two inputs.

- The signal is output via a ramp function generator with linear ramps.
- The acceleration and deceleration times are set via parameters.
- Constant ramping even with speed limit values changed online.
- The motor potentiometer function can be switched on/off online via parameters or a process signal.



Inputs

Identifier Data type	Information/possible settings	
bEnable BOOL	Switch over motor potentiometer function *bEnable* input and C00806 code are ORed.	
	TRUE	Motor potentiometer function is active, setpoint can be changed via *bUp* and *bDown*. • With switching to TRUE, the value applied to *nIn_a* is automatically transferred to the motor potentiometer.
	FALSE	The value applied to *nIn_a* is output at *nOut_a*.
nIn_a INT	When bEnable = FALSE, the analog input signal nIn_ is switched to the nOut_a output.	
bUp BOOL	Approaching of the upper speed limit value set in C00800.	
	TRUE	The *nOut_a* output signal runs to its upper limit value (*nHighLimit*). • If the *bDown* input is simultaneously set to TRUE, the *nOut_a* output signal is not changed.
bDown BOOL	Approaching of the lower speed limit value set in C00801.	
	TRUE	The *nOut_a* output signal runs to its lower limit value (*nLowLimit*). • If the *bUp* input is simultaneously set to TRUE, the *nOut_a* output signal is not changed.
bInAct BOOL	Deactivate motor potentiometer function • This input has the highest priority. • When the motor potentiometer is deactivated, the *nOut_a* output signal follows the function set with code C00804.	
	TRUE	Motor potentiometer function is deactivated.

Outputs

Identifier Data type	Value/meaning
nOut_a INT	Output signal

Parameter

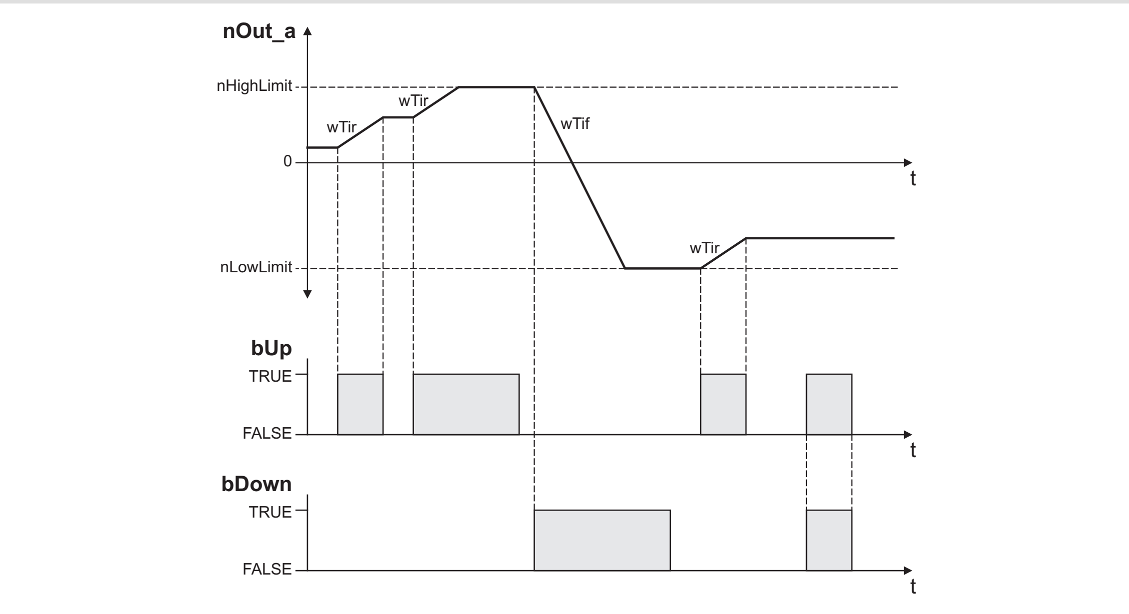
Parameter	Possible settings			Info
C00800	-199.9	%	199.9	Upper limit • Lenze setting: 100.0 %
C00801	-199.9	%	199.9	Lower limit • Lenze setting: -100.0 %
C00802	0.1	s	999.9	Acceleration time • Lenze setting: 10.0 s
C00803	0.1	s	999.9	Deceleration time • Lenze setting: 10.0 s
C00804				Inactive function • Selection of response when deactivating the motor potentiometer via the input *bInAct*.
	0	**Retain value** (Lenze setting)		No further action; *nOut_a* retains its value.
	1	Deceleration to 0		The motor potentiometer returns to 0 % within the deceleration time T_{if}.
	2	Deceleration to lower limit		The motor potentiometer runs to the lower limit value (C00801) within the deceleration time T_{if}.
	3	Without ramp to 0		**Important for the emergency stop function** The motor potentiometer output immediately changes to 0 %
	4	Without ramp to lower limit		The motor potentiometer output immediately changes to the lower limit value (C00801).
	5	Acceleration to upper limit		The motor potentiometer runs to the upper limit value (C00800) within the acceleration time T_{ir}.
C00805				Init function • Selection of response when switching on the device.
	0	**Load last value** (Lenze setting)		The output value being output during mains power-off is saved non-volatilely in the internal memory of the controller. It will be reloaded during mains power-on.
	1	Load lower limit		The lower limit value (C00801) is loaded during mains power-on.
	2	Load 0		An output value = 0 % is loaded during mains power-on.

Parameter	Possible settings		Info
C00806			Use of the motor potentiometer
	0	**No** (Lenze setting)	The motor potentiometer is not used. • The analog value applied to the *nIn_a* input is looped through without any changes to the *nOut_a* output.
	1	Yes	The motor potentiometer is used. • The analog value applied at the *nIn_a* input is led via the motor potentiometer and provided at the *nOut_a* output.

12.1.1 Activate & control motor potentiometer

When *bInAct* is set to FALSE, the motor potentiometer is activated.

- The currently active function depends on the current output signal *nOut_a*, the limit values set and the control signals at *bUp* and *bDown*.
- When the *nOut_a* output signal is outside the limits set, the output signal runs to the next limit with the Ti times set. This process is independent of the control signals at *bUp* and *bDown*.
- When the *nOut_a* output signal is inside the limits set, the output signal changes according to the control signals at *bUp* and *bDown*.

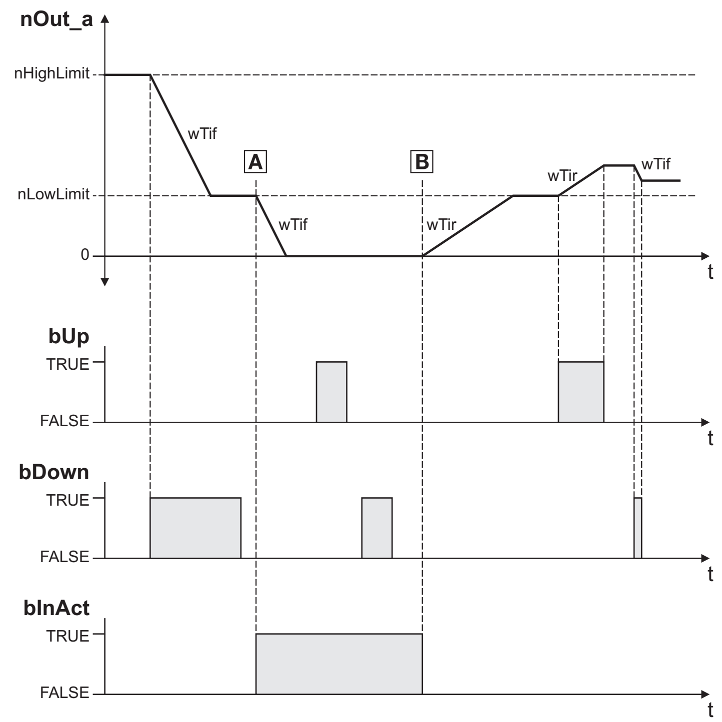


[12-1] Example: Control of the motor potentiometer

bUp	bDown	bInact	Function
FALSE	FALSE	FALSE	The *nOut_a* output signal remains unchanged.
TRUE	FALSE		The *nOut_a* output signal runs to its upper limit value (*nHighLimit*).
FALSE	TRUE		The *nOut_a* output signal runs to its lower limit value (*nLowLimit*).
TRUE	TRUE		The *nOut_a* output signal remains unchanged.
-	-	TRUE	The motor potentiometer function is deactivated. The *nOut_a* output signal responds according to the function selected via *Function*.

12.1.2 Deactivate motor potentiometer

When the motor potentiometer is deactivated by setting *bInAct* to TRUE, the *nOut_a* output signal responds according to the function selected in C00804.



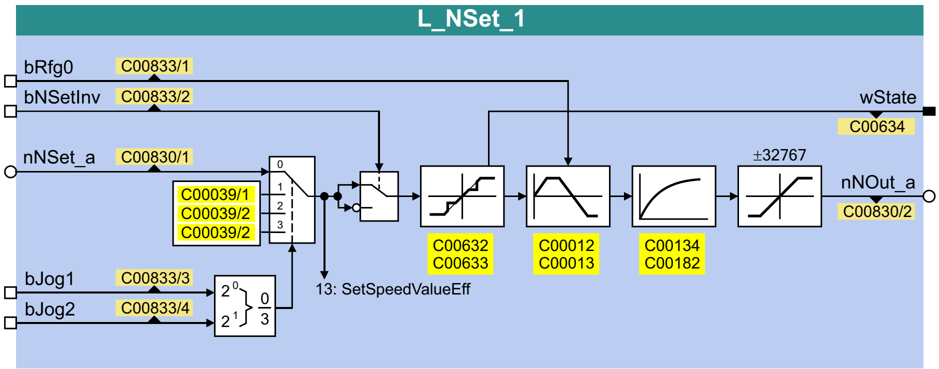
A When the motor potentiometer is deactivated, *nOut_a* is reduced to 0 % with the deceleration time *wTif*.
B If it is activated again, *nOut_a* is increased again to *nLowLimit* with the acceleration time *wTir*.

[12-2] Example: Deactivation of the motor potentiometer if C00804 = "1: Deceleration to 0"

12.2 L_NSet_1

This FB is used for general signal processing of process values and is provided with the following functions:

- Ramp function generator
  - With linear ramps for main setpoint path
  - With S-shaped ramp (PT1 rounding)
- Internal limitation of the input signal
- 3 adjustable blocking zones
- 3 fixed setpoints (JOG setpoints)



Inputs

Identifier Data type	Information/possible settings	
bRfg0 BOOL	Leading the main setpoint integrator to 0 within the current Ti times	
	TRUE	The current value of the main setpoint integrator is led to "0" within the Ti time set.
bNSetInv BOOL	Signal inversion for the main setpoint	
	TRUE	Main setpoint signal is inverted.
nNset_a INT	Main setpoint signal • Scaling: 16384 ≡ 100 % • Other signals are also permitted	
bJog1 / bJog2 BOOL	Selection inputs for fixed changeover setpoints (JOG setpoints) for the main setpoint • Selection inputs are binary coded.	

Outputs

Identifier Data type	Value/meaning	
nNOut_a INT	Speed setpoint output signal • Scaling: 16384 ≡ 100 %	
wState WORD	Bit-coded status word • Bits that are not listed are reserved for future extensions.	
	Bit 0	No blocking zone active
	Bit 1	Blocking zone 1 active
	Bit 2	Blocking zone 2 active
	Bit 3	Blocking zone 3 active
	Bit 4	Jog in blocking zone
	Bit 5	MaxLimit active
	Bit 6	MinLimit active

Parameter

Parameter	Possible settings			Info
C00012	0.0	s	999.9	Acceleration time T_{ir} for the main setpoint • Lenze setting: 2.0 s
C00013	0.0	s	999.9	Deceleration time T_{if} for the main setpoint • Lenze setting: 2.0 s
C00039/1	-199.9	%	199.9	Fixed setpoint 1 (JOG setpoint 1) • Lenze setting: 40.0 %
C00039/2	-199.9	%	199.9	Fixed setpoint 2 (JOG setpoint 2) • Lenze setting: 60.0 %
C00039/3	-199.9	%	199.9	Fixed setpoint 3 (JOG setpoint 3) • Lenze setting: 80.0 %
C00134				Activates ramp rounding with PT1 behaviour for the main setpoint • The corresponding S-ramp time must be set in C00182. • Lenze setting: 0 (deactivated)
	0	Off		
	1	PT1 behaviour		
C00182	0.01	s	50.00	S-ramp time PT1 • Lenze setting: 20.00 s
C00632/1...3	0.0	%	199.9	Maximum limit values for the speed blocking zones • Selection of the maximum limit values for the blocking zones in which the speed must not be constant. • Lenze setting: 0.0 %
C00633/1...3	0.0	%	199.9	Minimum limit values for the speed blocking zones • Selection of the minimum limit values for the blocking zones in which the speed must not be constant. • Lenze setting: 0.0 %

Parameter	Possible settings		Info
C00634			Status (bit-coded) • Bits that are not listed are reserved for future extensions.
	Bit 0	No blocking zone active	
	Bit 1	Blocking zone 1 active	
	Bit 2	Blocking zone 2 active	
	Bit 3	Blocking zone 3 active	
	Bit 4	Jog in blocking zone	
	Bit 5	MaxLimit active	
	Bit 6	MinLimit active	

12.2.1 Main setpoint path

- The signals in the main setpoint path are limited to a value range of ±32767.
- The signal at *nNSet_a* is first led via the JOG selection function.
- A selected JOG value switches the *nNSet_a* input inactive. Then, the subsequent signal conditioning operates with the JOG value.

12.2.2 JOG setpoints

In addition to the direct main setpoint selection via the input *nNSet_a*, so-called JOG setpoints can be set under C00039/1...3.

- The JOG setpoints are binary-coded and can be called using the *bJog1* and *bJog8* selection inputs:

Selection inputs		Used main setpoint
bJog2	**bJog1**	
FALSE	FALSE	*nNset_a*
FALSE	TRUE	C00039/1
TRUE	FALSE	C00039/2
TRUE	TRUE	C00039/3

- The number of selection inputs to be assigned depends on the number of JOG setpoints required.

12.2.3 Setpoint inversion

The output signal of the JOG function is led via an inverter.

The sign of the setpoint changes if *bNSetInv* is set to TRUE.

12.2.4 Skip frequency function

If the speed setpoints in speed-variable drives are linearly increasing, for instance, the frequency/speed range is divided into a number of equal time segments. Therefore, there may be speeds during acceleration time which must be bridged very fast (e.g. natural resonant frequencies).

The skip frequency function offers the opportunity to select a range in which the initial speed is maintained. If the speed setpoint leaves that range, the drive will be accelerated to reach the desired speed.

Note!

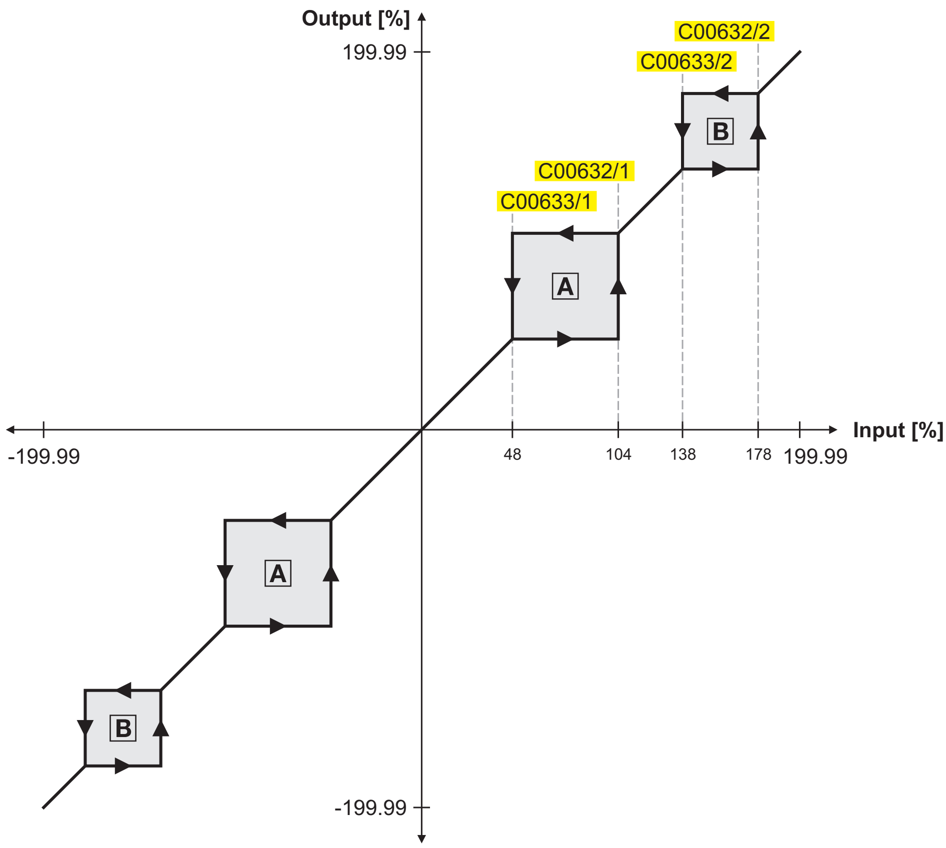
- Skip frequencies only affect main setpoints.
- It is not possible to exclude "0" speed if there is a sign reversal of the speed setpoint.

Definition of the blocking zones

The subcodes of codes C00632 and C00633 can be used to define three zones which are to be skipped by the output setpoint and which are to be passed as fast as possible by the ramp function generator.

The example below shows the parameter setting of two blocking zones:

Parameter	Blocking zone 1		Blocking zone 2		Blocking zone 3	
Minimum limit value	C00633/1:	48 %	C00633/2:	138 %	C00633/3:	0 %
Maximum limit value	C00632/1:	104 %	C00632/2:	178 %	C00632/3:	0 %



A Blocking zone 1
B Blocking zone 2

[12-3] Zone masking by means of parameterisable blocking zones

- The parameterised blocking zones have the same effect on negative input signals.
- A blocking zone is deactivated by entering identical limit values (in our example: Blocking zone 3).

Overlapping of blocking zones

If blocking zones overlap, the lowest and highest value of the overlapping zones form a new zone.

In this case, the status display (output *wState* or display parameter C00634) only indicates one zone (the lower of the two original zones).

Abutting blocking zones

If two blocking zones abut (e.g. 20 ... 30 % and 30 ... 40 %), the limit value between the two zones (in this example 30 %) is also passed through.

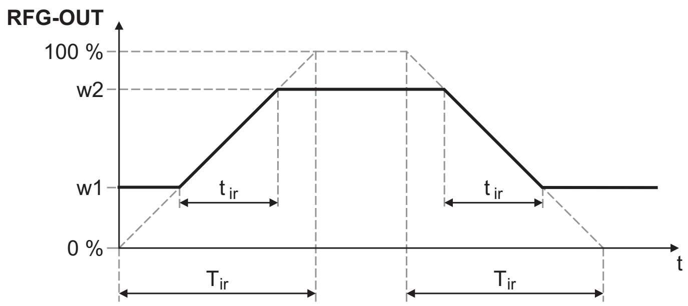
The same applies to a limit range of 0 ... xx %. During zero crossing of the speed setpoint, "0" speed is output as setpoint. It is possible to exclude "0" speed. However, in this case, the output speed will remain on the upper limit value when the input setpoint becomes "0".

Tip!

As described above, the acceleration phase starts after the blocking zones have been passed through. The ramp function generator integrated in the **L_Nset** function block limits the progression of the speed. For this reason, the time values set for the integrated ramp function generator should be as low as possible whereas the setpoint for the **L_NSet** function block should be generated by a ramp function generator with higher time values (e.g. L_MPot function block).

12.2.5 Ramp function generator for the main setpoint

The setpoint is now led via a ramp function generator with linear characteristic. The ramp function generator converts setpoint step-changes at the input into a ramp.



w1, w2 = change of the main setpoint as a function of t_{ir} and t_{if}
RFG-OUT = output of the ramp function generator

[12-4] Acceleration and deceleration times

- t_{ir} and t_{if} are the desired times for changing between w1 and w2.
- The ramps for acceleration and deceleration can be set individually.
  - C00012: Acceleration time T_{ir}
  - C00013: Deceleration time T_{if}
- The t_{ir}/t_{if} values are converted into the required Ti times according to the following formula:

$$T_{ir} = t_{ir} \cdot \frac{100\,\%}{w2 - w1} \qquad T_{if} = t_{if} \cdot \frac{100\,\%}{w2 - w1}$$

- When the *bRfg0* output is set to TRUE, the ramp function generator brakes to 0 along its deceleration ramp.

12.2.6 S-shaped ramp

A PT1 element is connected downstream of the linear ramp function generator. This arrangement implements an S-shaped ramp for a nearly jerk-free acceleration and deceleration.

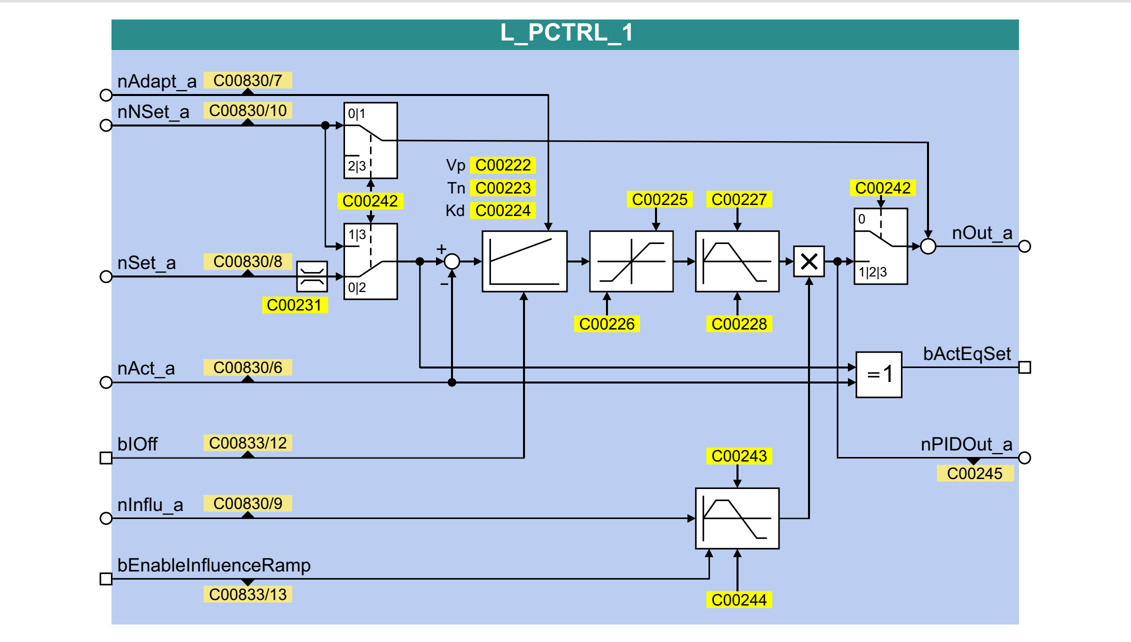
- The PT1 element can be switched on/off via C00134.
- The corresponding S-ramp time can be set under C00182.

12.3 L_PCTRL_1

This FB is a PID controller and can be used for various control tasks (e.g. as dancer position controller, tension controller, or pressure controller).

The FB is provides with the following functions:

- Adjustable control algorithm (P, PI, PID)
- Ramp function generator for preventing setpoint step-changes at the input
- Limitation of the controller output
- Factorisation of the output signal
- Vp adaptation
- Integral action component can be switched off



Inputs

Identifier Data type	Information/possible settings
nAdapt_a INT	Adaptation of gain Vp set in C00222 in percent • Internal limitation to ± 199.9 % • Changes can be done online. • Display parameter: C00830/7
nNset_a INT	Speed setpoint • Scaling: 16384 ≡ 100 % • Internal limitation to ± 199.9 % • Display parameter: C00830/10
nSet_a INT	Sensor and process setpoint for operating modes 2, 4 and 5 • Scaling: 16384 ≡ 100 % • Internal limitation to ± 199.9 % • Display parameter: C00830/8

Identifier Data type	Information/possible settings	
nAct_a INT	Speed or actual sensor value (actual process value) • Scaling: 16384 ≡ 100 % • Internal limitation to ± 199.9 % • Display parameter: C00830/6	
bIOff BOOL	Switch off I-component of process controller • Changes can be done online. • Display parameter: C00833/12	
	TRUE	I-component of the process controller is switched off.
nInflu_a INT	Limitation of the influencing factor in percent • *nInflu_a* serves to limit the influencing factor of the PID controller contained in the FB to a required value (- 199.9 % ... + 199.9 %). • Scaling: 16384 ≡ 100 % • Internal limitation to ± 199.9 % • Display parameter: C00830/9	
bEnableInfluenceRamp BOOL	Activate ramp for influencing factor • Display parameter: C00833/13	
	TRUE	Influencing factor of the PID controller is ramped up to the *nInflu_a* value.
	FALSE	Influencing factor of the PID controller is ramped down to "0".

Outputs

Identifier Data type	Value/meaning	
nOut_a INT	Output signal • Internal limitation to ±32767 (±199.9 %) • Scaling: 16384 ≡ 100 %	
bActEqSet INT	Status output "Setpoint and actual value are identical"	
	TRUE	Setpoint and actual value are identical, i.e. no system deviation available.
nPIDOut_a INT	PID controller output with influencing factor *nInflu_a* • There is no connection with the additive input *nNSet_a*. • Scaling: 16384 ≡ 100 % • Display parameter: C00245	

Parameter

Parameter	Possible settings			Info
C00222	0.1		500.0	Gain Vp • Lenze setting: 1.0
C00223	20	ms	6000	Reset time Tn • Lenze setting: 400 ms
C00224	0.0		5.0	Differential component Kd • Lenze setting: 0.0
C00225	-199.9	%	+199.9	Maximum value of the PID operating range • Lenze setting: 199.9 %
C00226	-199.9	%	+199.9	Minimum value of the PID operating range • Lenze setting: -199.9 %

Parameter	Possible settings			Info
C00227	0.0	s	999.9	Acceleration time for the ramp at the PID output (should be set as steep as possible) • Lenze setting: 0.1 s
C00228	0.0	s	999.9	Deceleration time for the ramp at the PID output • Lenze setting: 0.1 s
C00231/1 (Pos. Maximum) C00231/2 (Pos. Minimum) C00231/3 (Neg. Minimum) C00231/4 (Neg. Maximum)	0.0	%	199.9	Operating range • Determination of the operating range for the PID process controller by limiting the input signal *nSet_a*. • Lenze setting: No limitation (-199.9 % ... +199.9 %)
C00242				Operating mode
	0	**Off** (Lenze setting)		The input setpoint *nNSet_a* is output without any changes at the output *nOut_a*.
	1	Additive + feedforward control		*nNSet_a* and *nAct_a* are used as PID input values. The arriving *nNSet_a* is additively linked to the value output by the PID element.
	2	PID as setpoint generator.		*nSet_a* and *nAct_a* are used as PID input values. The input *nNSet_a* is not considered.
	3	PID setpoint from L_NSet_1		*nNSet_a* and *nAct_a* are used as PID input values. The input *nSet_a* is not considered.
C00243	0.0	s	999.9	Influence acceleration time • Acceleration time T_{ir} for the influencing factor. • Lenze setting: 5.0 s
C00244	0.0	s	999.9	Influence deceleration time • Deceleration time T_{if} for the influencing factor. • Lenze setting: 5.0 s
C00245	-199.9	%	+199.9	Display of PID output value *nPIDOut_a*

12.3.1 Control characteristic

The PI algorithm is active in the Lenze setting.

Gain (P component)

The input value is controlled by a linear characteristic. The slope of the characteristic is determined by the controller gain Vp.

The controller gain Vp is set under C00222.

- The controller gain can be adapted via the input *nAdapt_a* (also possible in online mode).
- The input value *nAdapt_a* has a direct effect on the controller gain:

$$P = \text{nAdapt\_a} \cdot \text{C00222}$$

Example: With the parameterised controller gain Vp = 2.0 and *nAdapt_a* = 75 %, the resulting gain factor is as follows:

$$P = \frac{75\ [\%]}{100\ [\%]} \cdot 2.0 = 1.5$$

Integral action component (I component)

The I component of the controller can be deactivated by setting the input *bIOff* to TRUE.

- Setting the adjustment time Tn to the maximum value of "6000 ms" also deactivates the I component.
- The I component can be switched on and off online.

Adjustment time

The adjustment time Tn is set under C00223.

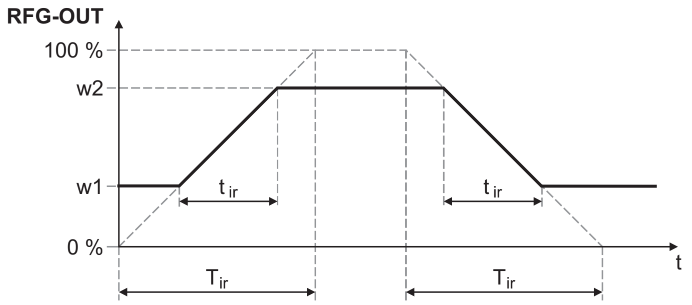
Differential component Kd (D component)

The differential component Kd is set under C00224.

- The setting "0.0 s" deactivates the D component (Lenze setting). In this way, the PID controller becomes a PI controller or P controller, if the I component has been deactivated as well.

12.3.2 Ramp function generator

The PID output is led via a ramp function generator with linear characteristic. This serves to transfer setpoint step-changes at the PID output into a ramp which should be as steep as possible.



w1, w2 = change of the main setpoint as a function of t_{ir} and t_{if}
RFG-OUT = output of the ramp function generator

[12-5] Acceleration and deceleration times

- t_{ir} and t_{if} are the desired times for changing between w1 and w2.
- The ramps for acceleration and deceleration can be set individually.
  – C00227: Acceleration time T_{ir}
  – C00228: Deceleration time T_{if}
- The t_{ir}/t_{if} values are converted into the required Ti times according to the following formula:

$$T_{ir} = t_{ir} \cdot \frac{100\,\%}{w2 - w1} \qquad T_{if} = t_{if} \cdot \frac{100\,\%}{w2 - w1}$$

- The ramp function generator is immediately set to "0" by setting *bInAct* to TRUE.

12.3.3 Operating range of the PID process controller

The value range of the input signal *nSet_a* and thus the operating range of the PID process controller can be limited with the following parameters:

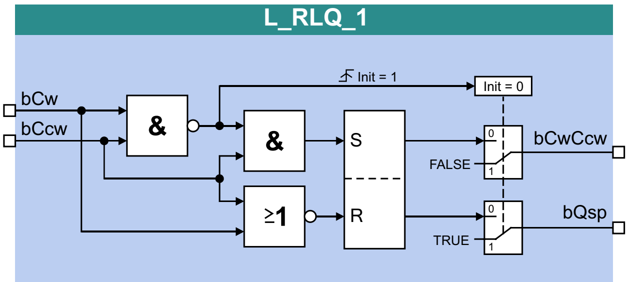
- C00231/1: Pos. maximum (default setting: 199.9 %)
- C00231/2: Pos. minimum (default setting: 0.0 %)
- C00231/3: Neg. minimum (default setting: 0.0 %)
- C00231/4: Neg. maximum (default setting: 199.9 %)

12.3.4 Evaluation of the output signal

After the limitation, the output signal is evaluated with the influencing factor *nInflu_a*. The evaluation is activated/suppressed along a ramp when the input *bEnableInfluenceRamp* is set to TRUE. The ramp times are set with the parameters "Acceleration time influence" (C00243) and "Deceleration time influence" (C00244).

12.4 L_RLQ_1

This FB links a selected direction of rotation to the quick stop function with wire-break protection.



Inputs

Identifier Data type	Information/possible settings
bCw BOOL	Input • TRUE = CW rotation
bCCw BOOL	Input • TRUE = CCW rotation

Outputs

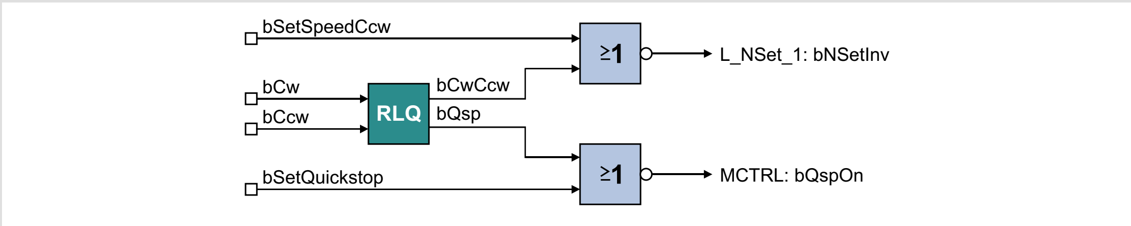
Identifier Data type	Value/meaning
bQSP BOOL	Output signal for quick stop (QSP)
bCwCcw BOOL	Output signal for CW/CCW rotation • TRUE = CCW rotation

Function

Inputs		Outputs		Notes
bCw	**bCCw**	**bCwCcw**	**bQSP**	
TRUE	TRUE	FALSE	TRUE	The inputs have this state only if a TRUE signal is being applied to both inputs at the moment of switch-on! See also FB illustration above, "Init" = 1.
If *one* of the inputs has the TRUE state, the following truth table applies:				
FALSE	FALSE	FALSE	TRUE	See also FB illustration above, "Init" = 0.
TRUE	FALSE	FALSE	FALSE	
FALSE	TRUE	TRUE	FALSE	
TRUE	TRUE	X (save)		

[12-6] Truth table of the FB L_RLQ, 0 = FALSE, 1 = TRUE

Wiring in the application

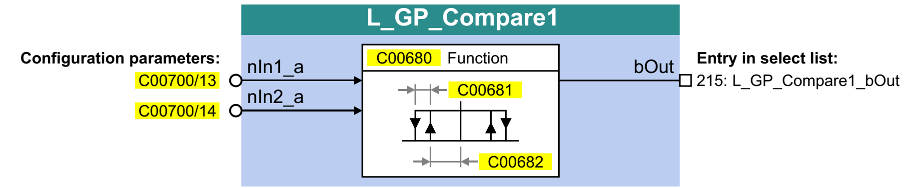


[12-7] Internal wiring

12.5 L_GP_Compare1

This FB compares two analog signals and can be used e.g. to implement a trigger.

▶ Comparison operation, hysteresis and window size can be parameterised.



Tip!

The FB is freely available as "GeneralPurpose" function.

- The inputs can be linked to other output signals via the given configuration parameters.
- The output, in turn, can be selected in the configuration parameters of other inputs.

Inputs

Identifier / Data type	Information/possible settings
nIn1_a INT	Input signal 1
nIn2_a INT	Input signal 2

Outputs

Identifier / Data type	Value/meaning	
bOut BOOL	Status signal "Comparison statement is true"	
	TRUE	The statement of the selected comparison mode is true.

Parameter

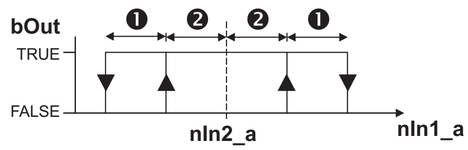
Parameter	Possible settings		Info
C00680			Function selection
	1	nIn1 = nIn2	
	2	nIn1 > nIn2	
	3	nIn1 < nIn2	
	4	|nIn1| = |nIn2|	
	5	|nIn1| > |nIn2|	
	6	|nIn1| < |nIn2|	

Parameter	Possible settings			Info
C00681	0.0	%	100.0	Hysteresis • Lenze setting: 0.5 %
C00682	0.0	%	100.0	Window • Lenze setting: 2.0 %

12.5.1 Function 1: nIn1 = nIn2

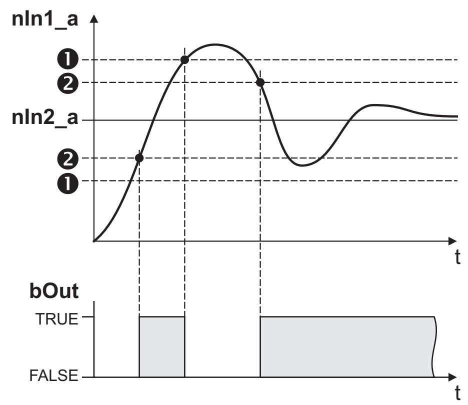
This function compares two signals with regard to equality. It can, for instance, provide the comparison "actual speed equals setpoint speed " ($n_{act} = n_{set}$).

- Use C00682 to set the window within which the equality is to apply.
- Use C00681 to set a hysteresis if the input signals are not stable and the output oscillates.



❶ C00681: Hysteresis
❷ C00682: Window

[12-8] Function 1: Switching performance

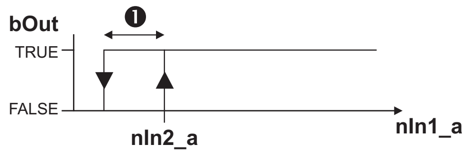


❶ C00681: Hysteresis
❷ C00682: Window

[12-9] Function 1: Example

12.5.2 Function 2: nIn1 > nIn2

This function serves, for instance, to implement the comparison "actual speed is higher than a limit value" ($n_{act} > n_x$) for one direction of rotation.

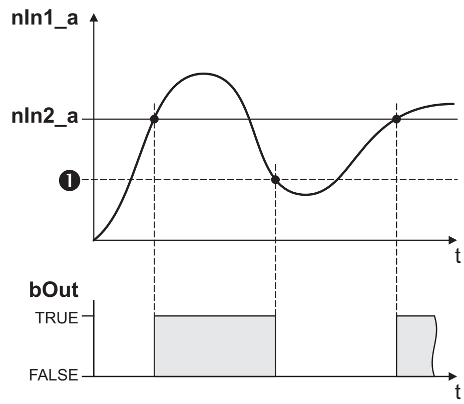


❶ C00681: Hysteresis

[12-10] Function 2: Switching performance

Functional sequence

1. If the value at *nIn1_a* exceeds the value *nIn2_a*, *bOut* changes from FALSE to TRUE.
2. Only if the signal at *nIn1_a* falls below the value of *nIn2_a* - *hysteresis* again, *bOut* changes back from TRUE to FALSE.

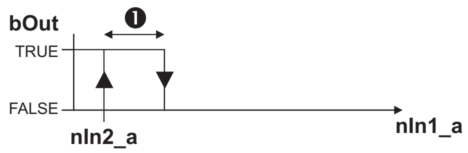


❶ C00681: Hysteresis

[12-11] Function 2: Example

12.5.3 Function 3: nIn1 < nIn2

This function serves, for instance, to implement the comparison "actual speed is lower than a limit value" ($n_{act} < n_x$) for one direction of rotation.

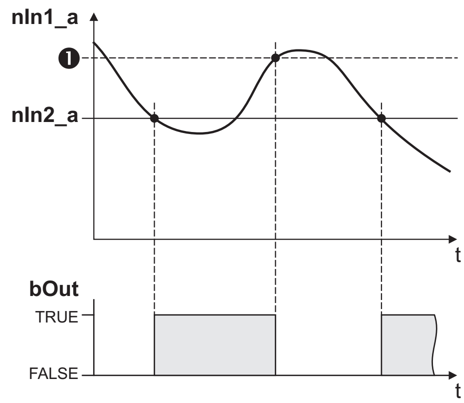


❶ C00681: Hysteresis

[12-12] Function 3: Switching performance

Functional sequence

1. If the value at *nIn1_a* falls below the value at *nIn2_a*, *bOut* changes from FALSE to TRUE.
2. Only if the signal at *nIn1_a* exceeds the value of *nIn2_a - hysteresis* again, *bOut* changes back from TRUE to FALSE.



❶ C00681: Hysteresis

[12-13] Function 3: Example

12.5.4 Function 4: |nIn1| = |nIn2|

This function serves to implement e.g. the comparison "n_{act} = 0". This function is similar to function 1. However, the amount is generated by the input signals before signal processing (without sign).

▸ Function 1: nIn1 = nIn2

12.5.5 Function 5: |nIn1| > |nIn2|

This function serves, for instance, to implement the comparison "$|n_{act}| > |n_x|$" independently of the direction of rotation. This function is similar to function 2. However, the amount of the input signals is generated before signal processing (without sign).

▸ Function 2: nIn1 > nIn2

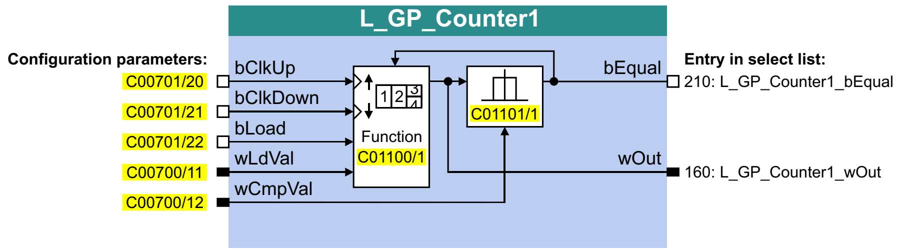
12.5.6 Function 6: |nIn1| < |nIn2|

This function serves to implement the comparison "$|n_{act}| < |n_x|$" independent of the direction of rotation. This function is similar to function 3. However, the amount is generated by the input signals before signal processing (without sign).

▸ Function 3: nIn1 < nIn2

12.6 L_GP_Counter1

This FB is a digital upcounter and downcounter with a parameterisable comparison operation.



Tip!

The FB is freely available as "GeneralPurpose" function.

- The inputs can be linked to other output signals via the given configuration parameters.
- The outputs, in turn, can be selected in the configuration parameters of other inputs.

Inputs

Identifier Data type	Information/possible settings
bClkUp BOOL	Clock input • With each edge, the module counts up by "1". • Only FALSE-TRUE edges are evaluated. Note: The static state "1" is not permissible at this input.
bClkDown BOOL	Clock input • With each edge, the module counts down by "1". • Only FALSE-TRUE edges are evaluated. Note: The static state "1" is not permissible at this input.
bLoad BOOL	Load input • The input has the highest priority. TRUE: Accept starting value *wLdVal*.
wLdVal WORD	Starting value • Assigned value is internally interpreted as "INT" data type (-32767 ... +32767), i.e. the most significant bit determines the sign.
wCmpVal WORD	Comparison value • Assigned value is internally interpreted as "INT" data type (-32767 ... +32767), i.e. the most significant bit determines the sign.

Outputs

Identifier Data type	Value/meaning	
bEqual BOOL	Status signal "Comparison statement is true" • The TRUE output is active in the Lenze setting if the current counter content is greater than or equal to the comparison value *wCmpVal*.	
	TRUE	The statement of the comparison mode selected in C01101/1 is true.
wOut WORD	Counter content • Internal limitation to ± 32767 • The most significant bit determines the sign!	

Parameter

Parameter	Possible settings		Info
C01100/1			Function selection • Lenze setting: Normal counting
	0	Normal counting	
	1	Auto reset	
	2	Manual reset	
C01101/1			Selection of comparison operation • Lenze setting: Counter content ≥ comparison value
	0	Counter content ≥ comparison value	
	1	Counter content ≤ comparison value	
	2	Counter content = comparison value	

General function

- Every FALSE/TRUE edge at the *bClkUp* input causes the block to count upwards by "1".
- Every FALSE/TRUE edge at the *bClkDown* input causes the block to count downwards by "1".

Function "Normal counting"

If the statement of the comparison mode selected in C01101/1 is true, the *bCompare* output is set to TRUE.

Function "Auto reset"

If the statement of the comparison mode selected in C01101/1 is true, the *bCompare* output is set to TRUE for 1 ms and the counter is reset to the *wLdVal* starting value.

Function "Manual reset"

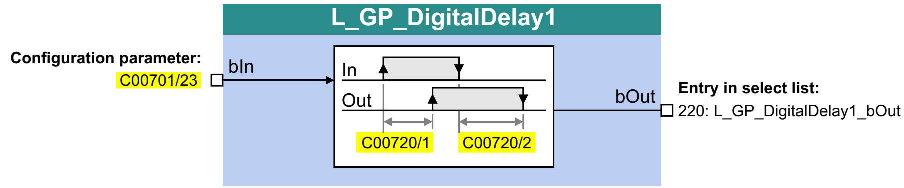
If the statement of the comparison mode selected in C01101/1 is true, the *bCompare* output is set to TRUE and the counter stops.

- Edges at *bClkUp* and *bClkDown* are ignored.
- The counter must be reset via the *bLoad* input.

12.7 L_GP_DigitalDelay1

This FB delays binary signals.

▶ ON and OFF delay can be parameterised separately.



Tip!

The FB is freely available as "GeneralPurpose" function.

- The input can be linked to another output signal via the given configuration parameter.
- The output, in turn, can be selected in the configuration parameters of other inputs.

Inputs

Identifier Data type	Information/possible settings
bIn BOOL	Input signal

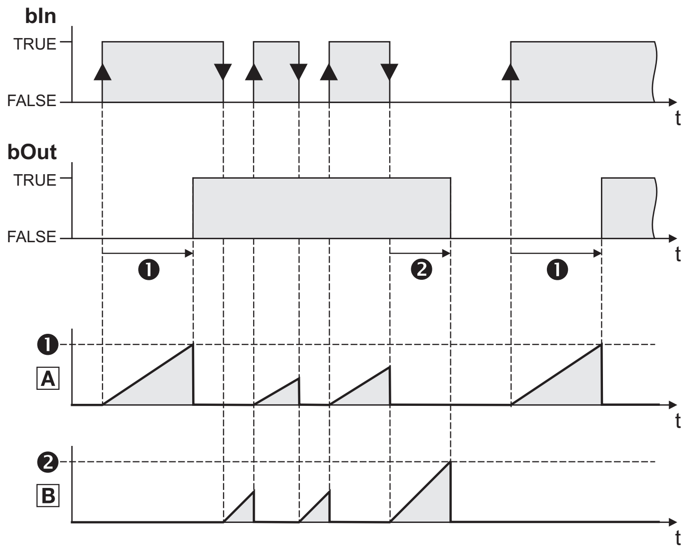
Outputs

Identifier Data type	Value/meaning
bOut BOOL	Output signal (time-delayed input signal)

Parameter

Parameter	Possible settings			Info
C00720/1	0.0	s	3600.0	ON delay • Lenze setting: 0.0 s
C00720/2	0.0	s	3600.0	OFF delay • Lenze setting: 0.0 s

Function



❶ ON delay
❷ OFF delay
A Internal timing element for ON delay (retriggerable)
B Internal timing element for OFF delay (retriggerable)

1. A FALSE-TRUE edge at b*In* starts the internal timing element for the ON delay.
2. After the defined ON delay, the input signal *bIn* is output at *bOut*.
3. A TRUE-FALSE edge at b*In* starts the internal timing element for the OFF delay.
4. After the defined OFF delay, the input signal *bIn* is output at *bOut*.

12.7.1 Application example: Debouncing a digital input

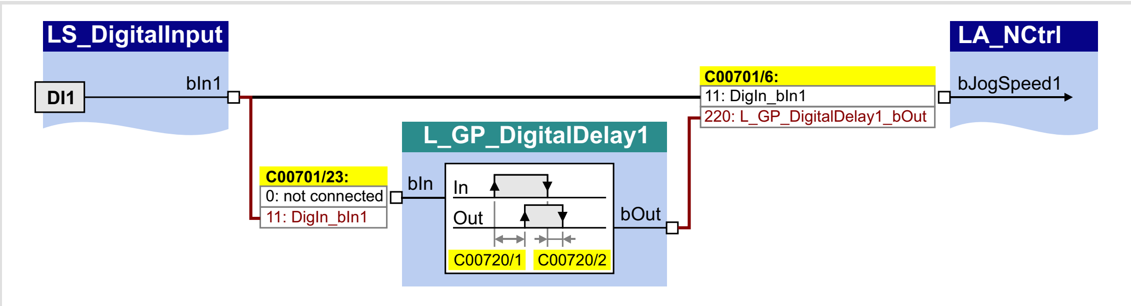
In this application example, the digital input DI1 is to be debounced.

- In the Lenze setting, the digital input DI1 is linked with the application input *bJogSpeed1*.
- By changing the following configuration parameters, the binary delay element is inserted in this signal path:

Configuration parameters		Lenze setting	Required change
C00701/6	LA_NCtrl: bJogSpeed1	11: DigIn_bIn1	220: L_GP_DigitalDelay1_bOut
C00701/23	L_GP_DigitalDelay1: bIn	0: Not connected	11: DigIn_bIn1

- The delay times can be set via the following parameters:

Setting parameters		Lenze setting	Required change
C00720/1	ON delay	0.0 s	0.2 s
C00720/2	OFF delay	0.0 s	0.1 s

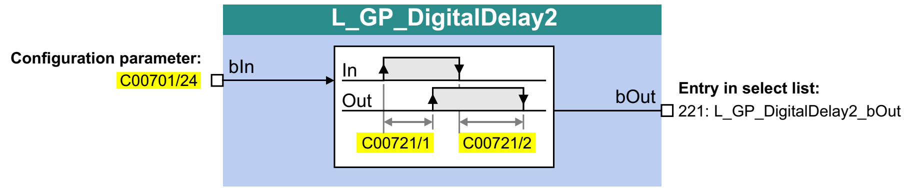


[12-14] Example: Inserting the binary delay element in the signal path

12.8 L_GP_DigitalDelay2

This FB delays binary signals.

- ON and OFF delay can be parameterised separately.



Inputs

Identifier Data type	Information/possible settings
bIn BOOL	Input signal

Outputs

Identifier Data type	Value/meaning
bOut BOOL	Output signal (time-delayed input signal)

Parameter

Parameter	Possible settings			Info
C00721/1	0.0	s	3600.0	ON delay • Lenze setting: 0.0 s
C00721/2	0.0	s	3600.0	OFF delay • Lenze setting: 0.0 s

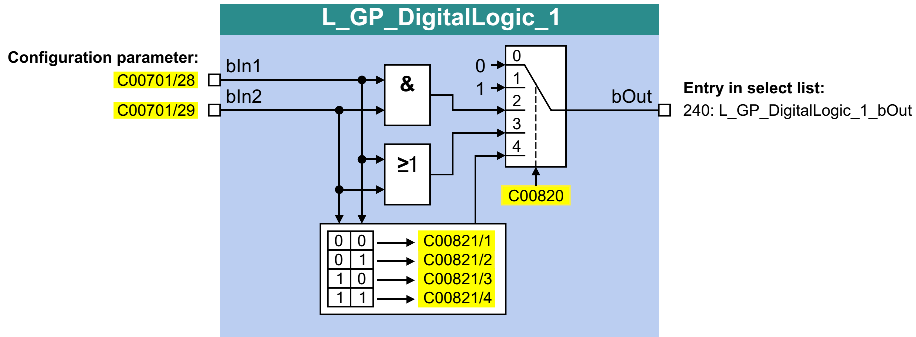
For a detailed functional description see L_GP_DigitalDelay1.

12.9 L_GP_DigitalLogic1

This function extension is available from version 02.00.00!

This FB provides a binary output signal created by a logic operation of the input signals. Optionally, one of the constant binary values independent from the input signals can be output.

- Output of a constant binary value
- AND operation of the inputs
- OR operation or the inputs
- Output depending on the combination of the input signals



Tip!

The FB is freely available as "GeneralPurpose" function.

- The inputs can be linked to other output signals via the given configuration parameters.
- The output, in turn, can be selected in the configuration parameters of other inputs.

Inputs

Identifier Data type	Information/possible settings
bIn1 BOOL	Input signal 1
bIn2 BOOL	Input signal 2

Outputs

Identifier Data type	Value/meaning
bOut BOOL	Output signal

Parameter

Parameter	Possible settings		Info
C00820			Function selection
	0	bOut = 0	Constant value "FALSE"
	1	bOut = 1	Constant value "TRUE"
	2	bOut = bIn1 AND bIn2	AND operation
	3	bOut = bIn1 OR bIn2	OR operation
	4	bOut = f (truth table)	The output value depends on the parameterised truth table
C00821	see truth table		Truth table Each of the 4 possible input combinations can be assigned to the output value FALSE or TRUE.

Truth table for C00820 = 4

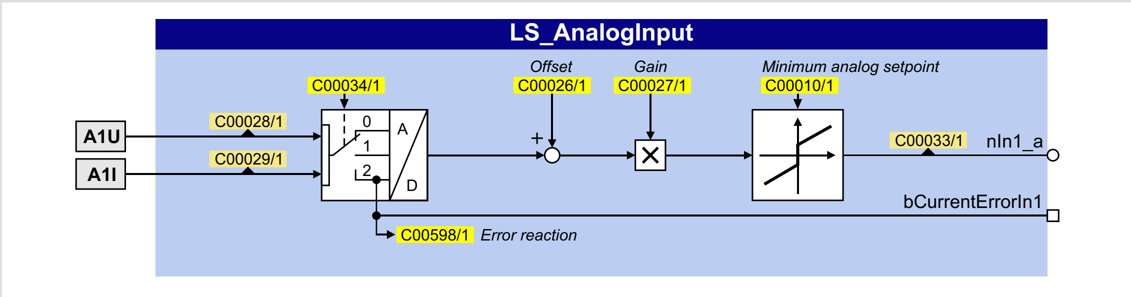
bIn2	bIn1	Output signal bOut
FALSE	FALSE	C00821/1 (FALSE or TRUE)
FALSE	TRUE	C00821/2 (FALSE or TRUE)
TRUE	FALSE	C00821/3 (FALSE or TRUE)
TRUE	TRUE	C00821/4 (FALSE or TRUE)

Example: If in case of the signal combination *bIn1* = FALSE and *bIn2* = TRUE the output signal *bOut* is to be TRUE, "TRUE" has to be selected in C00821/3:

bIn2	bIn1	Output signal bOut
TRUE	FALSE	C00821/3 (TRUE)

12.10 LS_AnalogInput

The **LS_AnalogInput** system block displays the analog input in the application on I/O level.



Outputs

Identifier Data type	Value/meaning	
nIn1_a C00033/1 | INT	Analog input 1 • Scaling: $\pm 2^{14} \equiv \pm 10$ V for use as voltage input $+2^{14} \equiv +20$ mA for use as current input	
bCurrentErrorIn1 BOOL	Status signal "Current input error" • Only when analog input 1 is used as current input. • Application: Cable-breakage monitoring of the 4 ...20 mA circuit.	
	TRUE	$\lvert I_{AIN1} \rvert < 4$ mA

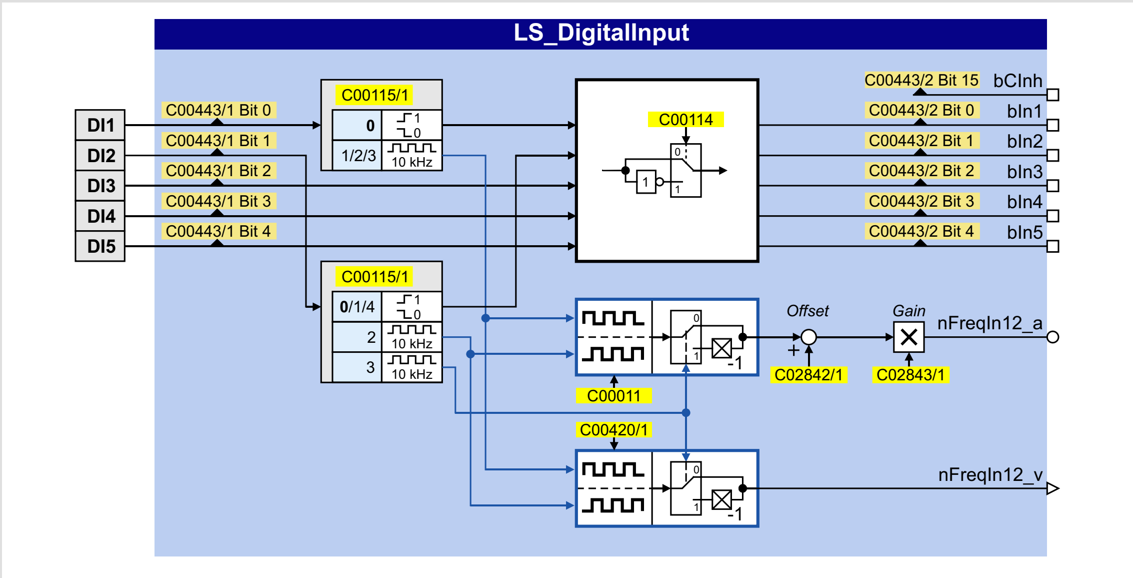
Related topics:

▶ Analog terminals (📖 137)
▶ Electrical data (📖 145)

12.11 LS_DigitalInput

The **LS_DigitalInput** system block displays the digital input terminals in the application on I/O level.

- From version 02.00.00, the internal processing function of the digital input terminals DI1 and DI2 can be reconfigured in C00115/1 if required:



Outputs

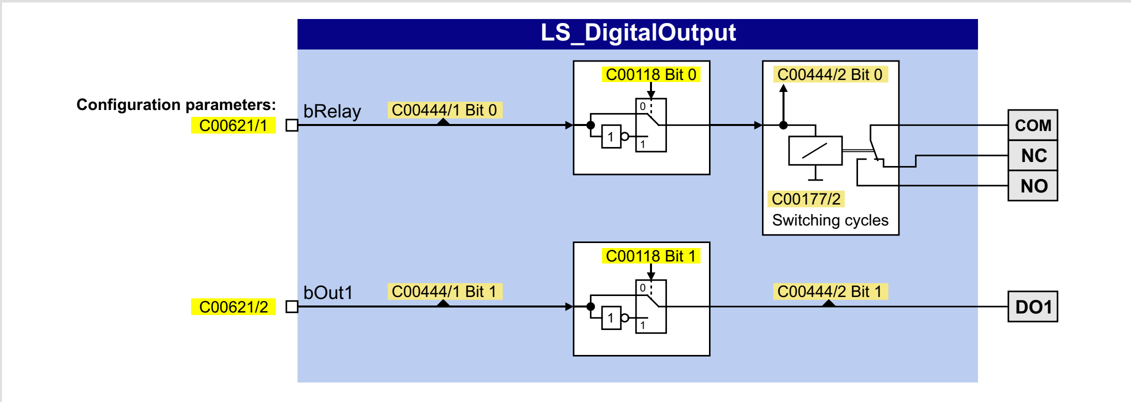
Identifier DIS code | data type	Value/meaning
bCInh C00443/2 | BOOL	RFR digital input (controller enable)
bIn1 ... bIn5 C00443/2 | BOOL	Digital input DI1 ... DI5
nFreqIn12_a C00446/1 | INT (from version 02.00.00)	Output frequency as scaled analog signal in [%] ▸ Configuring DI1 and DI2 as frequency inputs (📖 134)
nFreqIn12_v C00445/1 | INT (from version 02.00.00)	Output frequency as speed signal in [inc/ms] ▸ Configuring DI1 and DI2 as frequency inputs (📖 134)

Related topics:

▸ Digital terminals (📖 131)
▸ Electrical data (📖 145)

12.12 LS_DigitalOutput

The **LS_DigitalInput** system block displays the digital output terminals in the application on I/O level.



Inputs

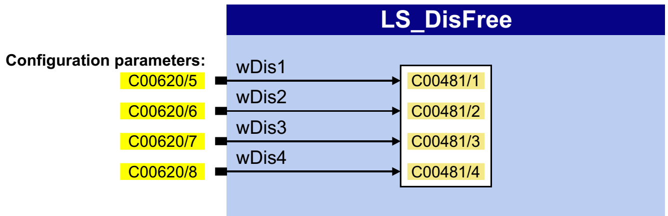
Identifier DIS code | data type	Information/possible settings
bRelay C00444/1 | BOOL	Relay output (potential-free two-way switch)
bOut1 C00444/1 | BOOL	Digital output DO1

Related topics:

- Digital terminals (📖 131)
- Electrical data (📖 145)

12.13 LS_DisFree

This system block displays any four 16-bit signals of the application on display codes. The signals to be displayed are selected via the given configuration parameters.



Inputs

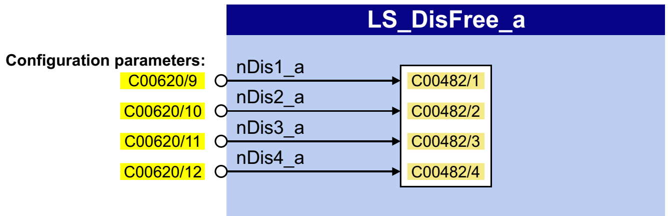
Identifier Data type	Information/possible settings
wDis1 ... wDis4 WORD	Inputs for any 16-bit signals of the application

Parameter

Parameter	Possible settings			Info
C00481/1...4	0x0000		0xFFFF	Display of the 16-bit signals at the *wDis1* ... *wDis4* inputs
C00620/5...8	See selection list - analog signals			Configuration parameters for the inputs *wDis1* ... *wDis4*

12.14 LS_DisFree_a

This system block displays any four analog signals of the application on display codes. The signals to be displayed are selected via the given configuration parameters.



Inputs

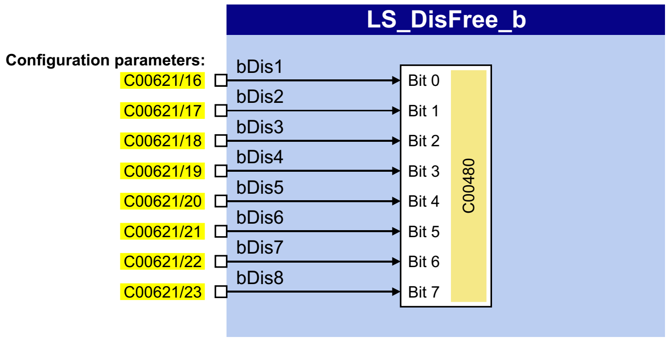
Identifier Data type	Information/possible settings
nDis1_a ... nDis4_a INT	Inputs for any analog signal of the application

Parameter

Parameter	Possible settings			Info
C00482/1...4	-199.9 %		199.9 %	Display of the analog signals which are applied at the *nDis1_a ... nDis4_a* inputs.
C00620/9...12	See selection list - analog signals			Configuration parameters for the inputs *nDis1_a ... nDis4_a*

12.15 LS_DisFree_b

This system block displays any eight digital signals of the application on a bit-coded display code. The signals to be displayed are selected via the given configuration parameters.



Inputs

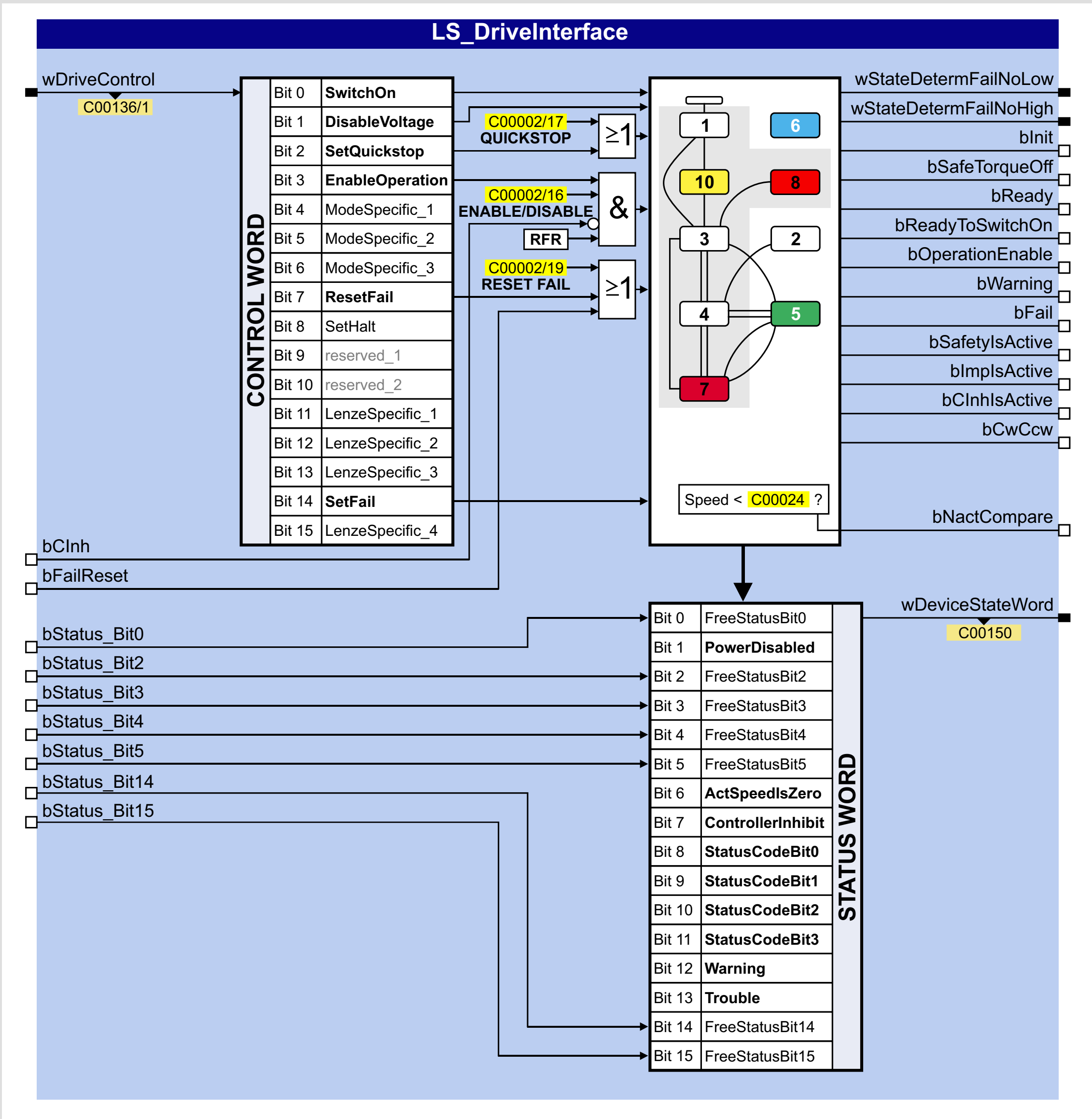
Identifier Data type	Information/possible settings
bDis1 ... bDis8 BOOL	Inputs for any digital signal of the application

Parameter

Parameter	Possible settings		Info
C00480	0x0000	0xFFFF	Display of the digital signals applied at the *bDis1* ... *bDis8* inputs in the form of hexadecimal values
	Bit 0	Signal level at the *bDis1* input	
	Bit 1	Signal level at the *bDis2* input	
	Bit 2	Signal level at the *bDis3* input	
	...	...	
	Bit 7	Signal level at the *bDis8* input	
C00621/16...23	See selection list - digital signals		Configuration parameters for the inputs *bDis1* ... *bDis8*

12.16 LS_DriveInterface

The **LS_DriveInterface** system block displays the device control in the application.



Inputs

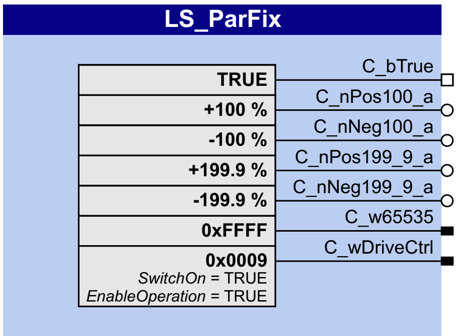
Identifier DIS code | data type	Information/possible settings	
wDriveControl C00136/1 | WORD	Control word via communication interface • In the control mode "40: Network (MCI/CAN)", the controller controlled by a master control (e.g. IPC) receives its control word via the communication interface (MCI/CAN). The process data word is provided at this input by the upstream port block LP_Network_In. • See the "wDriveControl control word" chapter for a detailed description of the individual control bits.	
bCInh C00833/14 | BOOL	Enable/Inhibit controller	
	FALSE	Enable controller: The controller switches to the "OperationEnabled" device state, if no other source of a controller inhibit is active. • C00158 provides a bit coded representation of all active sources/ triggers of a controller inhibit.
	TRUE	Inhibit controller (controller inhibit): The controller switches to the "SwitchedON" device state.
bFailReset C00833/15 | BOOL	Reset of error message In the Lenze setting this input is connected to the digital input controller enable so that a possibly existing error message is reset together with the controller enable (if the cause for the fault is eliminated).	
	TRUE	The current error is reset.
bStatus_Bit0 bStatus_Bit2 bStatus_Bit3 bStatus_Bit4 bStatus_Bit5 bStatus_Bit14 bStatus_Bit15 C00833/16 ... 22 | BOOL	Freely assignable bits in the status word of the controller. • You can use these bits for returning information to the master control (e.g. IPC).	
	Pre-assignment in the Lenze setting:	
	Bit0	- (not connected)
	Bit2	Current setpoint inside the limitation
	Bit3	Speed setpoint reached
	Bit4	Actual speed value has reached the setpoint within one hysteresis band
	Bit5	During open-loop operation: Speed setpoint < Comparison value (C00024)
		During closed-loop operation: Actual speed value < Comparison value (C00024)
	Bit14	Current direction of rotation: 0 ≡ Clockwise rotation (Cw) 1 ≡ Counter-clockwise rotation (Ccw)
	Bit15	Drive is ready for operation

Outputs

Identifier DIS code | data type	Value/meaning	
wDeviceStateWord C00150 | WORD	Status word of the controller (based on DSP-402) • The status word contains information on the currents status of the drive controller. • In control mode "40: Network (MCI/CAN)" the status word is transmitted to the master control as process data word via the port block LP_Network_Out. • For a detailed description of each status bit see chapter "wDeviceStateWord status word".	
wStateDetermFailNoLow WORD	Display of the status determining error (LOW word)	
wStateDetermFailNoHigh WORD	Display of the status determining error (HIGH word)	
bInit BOOL	TRUE	"Init" device state is active
bSafeTorqueOff BOOL	TRUE	"SafeTorqueOff" device state is active
bReady BOOL	TRUE	"SwitchedON" device state is active
bReadyToSwitchOn BOOL	TRUE	"ReadyToSwitchON" device state is active
bOperationEnable BOOL	TRUE	"OperationEnabled" device state is active
bWarning BOOL	TRUE	A warning exists
bFail BOOL	TRUE	"Fault" device state is active
bSafetyIsActive BOOL	TRUE	In preparation
bImpIsActive BOOL	TRUE	Pulse inhibit is active
bCInhIsActive BOOL	TRUE	Controller inhibit is active
bCwCcw BOOL	FALSE	Direction of rotation to the right (Cw)
	TRUE	Direction of rotation to the left (Ccw)
bNactCompare BOOL	TRUE	During open-loop operation: Speed setpoint < Comparison value (C00024)
		During closed-loop operation: Actual speed value < Comparison value (C00024)

12.17 LS_ParFix

This system block outputs various fixed values (constants) to be used in the interconnection. The constants can be assigned to other inputs via configuration parameters.



Outputs

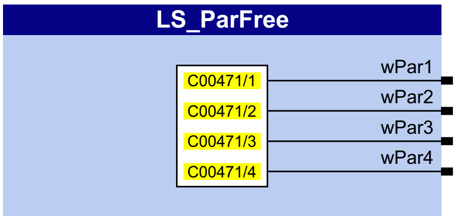
Identifier Data type	Value/meaning
C_bTrue BOOL	1 ≡ TRUE
C_nPos100_a INT	16384 ≡ + 100 %
C_nNeg100_a INT	-16384 ≡ - 100 %
C_nPos199_9_a INT	32767 ≡ + 199.9 %
C_nNeg199_9_a INT	-32767 ≡ - 199.9 %
C_w65535 WORD	65535 ≡ 0xFFFF
wDriveCtrl WORD	9 ≡ 0x0009 • Bit 0, SwitchOn = TRUE • Bit 3, EnableOperation = TRUE • All others: FALSE See also: ▶ wDriveControl control word (📖 160)

Related topics:

▶ User-defined terminal assignment (📖 139)

12.18 LS_ParFree

This system block outputs 4 parameterisable 16-bit signals. The 16-bit signals can be assigned to other inputs via configuration parameters.



Outputs

Identifier Data type	Value/meaning
wPar1 ... wPar4 WORD	Output of the 16-bit signals parameterised in C00471/1...4

Parameter

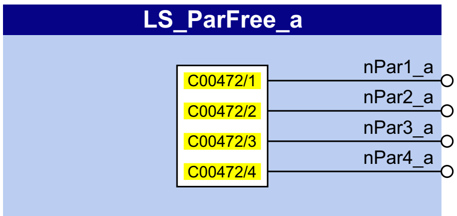
Parameter	Possible settings			Info
C00471/1...4	0x0000		0xFFFF	Setting of the 16-bit signals to be output

Related topics:

- User-defined terminal assignment (📖 139)

12.19 LS_ParFree_a

This system block outputs 4 parameterisable analog signals. The analog signals can be assigned to other inputs via configuration parameters.



Outputs

Identifier Data type	**Value/meaning**
nPar1_a ... nPar4_a INT	Output of the analog signals parameterised in C00472/1...4

Parameter

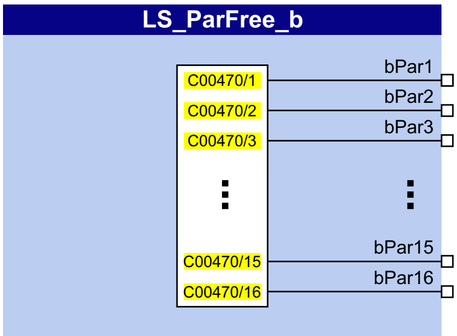
Parameter	**Possible settings**			**Info**
C00472/1...4	-199.9	%	+199.9	Selection of analog signals to be output

Related topics:

- User-defined terminal assignment (📖 139)

12.20 LS_ParFree_b

This system block outputs 16 parameterisable digital signals. The digital signals can be assigned to other inputs via configuration parameters.



Outputs

Identifier Data type	Value/meaning
bPar1 ... bPar16 BOOL	Output of the signals levels (FALSE/TRUE) parameterised in C00470/1...16

Parameter

Parameter	Possible settings		Info
C00470/1...16			Selection of signal levels to be output • Bit 0 ... 15 = *bPar1* ... *bPar16*
	0	"FALSE" signal is output	
	1	"TRUE" signal is output	

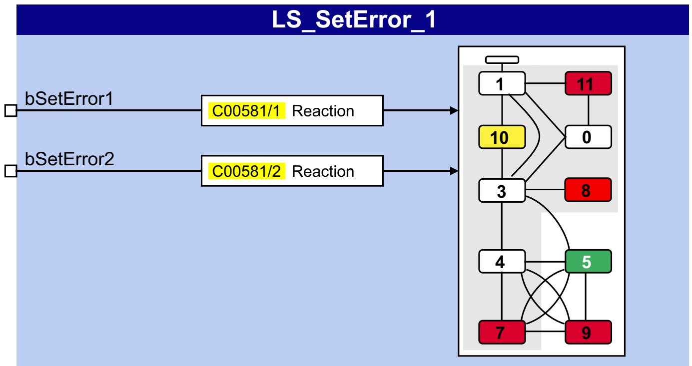
Related topics:

- User-defined terminal assignment (📖 139)

12.21 LS_SetError_1

This system block is used for error handling within the application.

- The application can trip up to two different user error messages with parameterisable error response via the two boolean inputs.
- If both inputs are set to TRUE at the same time, the *bSetError1* inputs trips the error message.



Inputs

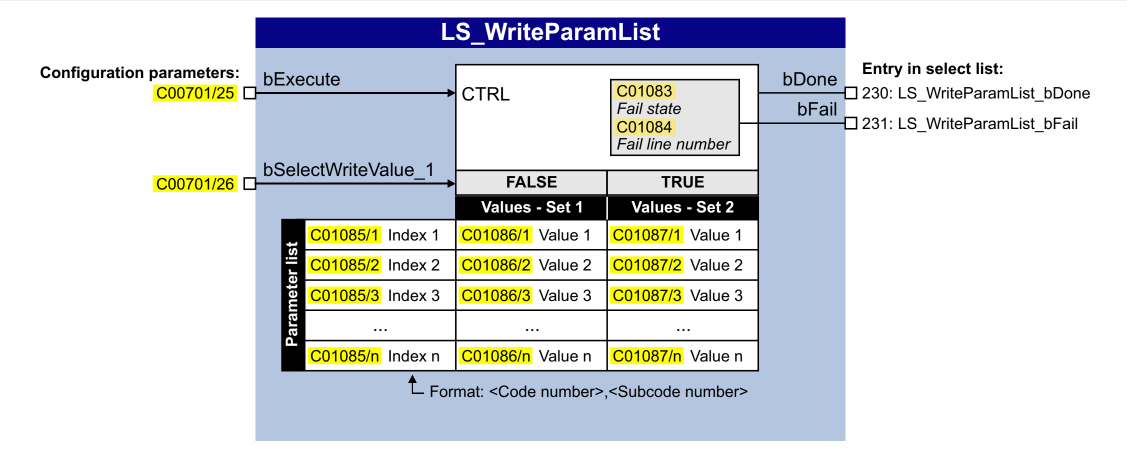
Identifier Data type	Information/possible settings
bSetError1 BOOL	Input for tripping "US01: User error 1" • Error subject number: 980 • Error number: (C00581/1 x 0x0400000) + (980 x 0x10000)
bSetError2 BOOL	Input for tripping "US02: User error 2" • Error subject number: 981 • Error number: (C00581/2 x 0x0400000) + (981 x 0x10000)

Parameter

Parameter	Possible settings		Info
C00581/1...2			Response for user error 1 ... 2 • lenze setting: "Fault"
	0	No response	
	1	Fault (pulse inhibit)	
	2	Trouble	
	4	WarningLocked	

12.22 LS_WriteParamList

The **LS_WriteParamList** system block provides the internal interfaces to the basic "Parameter change-over" function:



Inputs

Identifier Data type	Information/possible settings	
bExecute BOOL	FALSE↗TRUE	With Execute Mode (C01082) = "0: by Execute": Activate writing of the parameter list
bSelectWriteValue_1 BOOL	Parameter change-over • Binary-coded selection of the value set to be used	
	FALSE	Value set 1 (C01086/1 ... n)
	TRUE	Value set 2 (C01087/1 ... n)

Outputs

Identifier Data type	Value/meaning	
bDone BOOL	"Writing of the parameter list completed" status signal • The output is automatically reset to FALSE if writing via *bExecute* is activated again.	
	TRUE	Writing of the parameter list successfully completed.
	FALSE	The FALSE status can have the following meanings: 1. There is no active writing of the parameter list. 2. Writing of the parameter list has not been completed yet. 3. An error has occurred (if *bFail* = TRUE).
bFail BOOL	"Error" status	
	TRUE	An error has occurred (group signal). • See display parameter (C01083) for details.

For a detailed functional description see basic function "Parameter change-over". (🕮 172)

13 Application examples

This chapter contains different application examples for the 8400 motec.

Tip!

The required parameters can be easily set in the »Engineer« via the **All parameters**. In the "parameter list" category all parameters of the 8400 motec are listed.

13.1 Sequence control

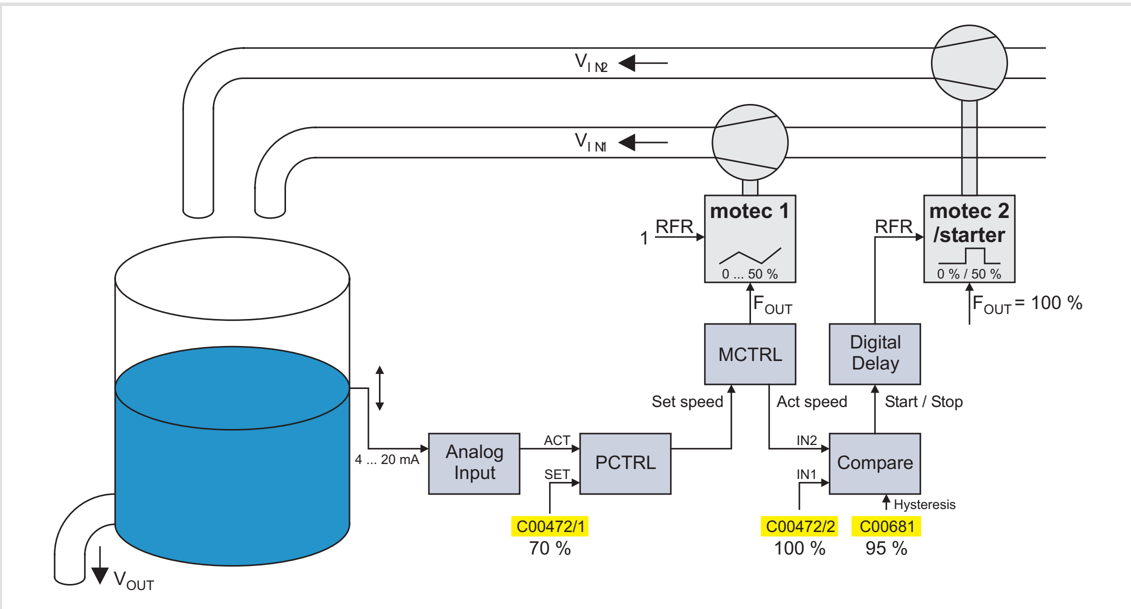
Task:

Two pumps are to keep the water level in a reservoir constant. The second pump is to be switched off if the consumption allows it.

Solution:

Pump 1 controls the water level and, if required, switches pump 2.

- For the control, the (L_PCTRL_1) process controller is used.
- For switching on pump 2, the GP function "Analog comparison" (L_GP_Compare1) is used. In order to prevent the permanent switching on and off of pump 2, a high hysteresis (95 %) is set for comparison.
- The GP function "Binary delay element" (L_GP_DigitalDelay1) prevents short runtimes and a short switch-off time of pump 2.

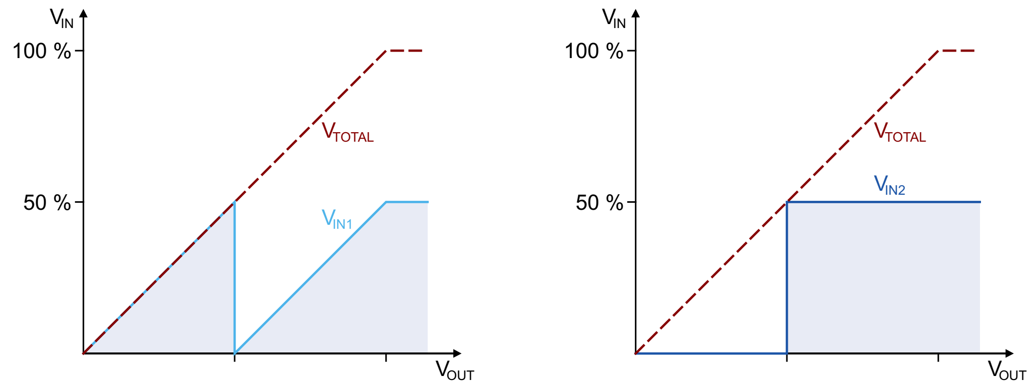


[13-1] Standard signal flow

Special features:

In partial-load operational range, (e.g. during the night), it can be operated with a small unit and thus energy can be saved.

For pump 2, both a second 8400 motec and a starter or contactor can be used.



V_{IN1} (pump 1) = 0 ... 50 %
V_{IN2} (pump 2) = 0 % / 50 %

[13-2] Level curve

Example parameter setting:

Parameter	Info	Setting	Info
Settings for motor control and device control			
C00006	Motor control	8: VFCplus: V/f quadr	▸ V/f characteristic control (VFCplus)
C00141	Auto-start option	0x01	Starting performance of the controller: Inhibit after mains connection. ▸ Auto-start option "Inhibit at power-on"
C00019	Auto-DCB: Threshold	100 rpm	▸ Automatic DC-injection braking (Auto-DCB)
C00106	Auto-DCB: Hold time	0.0 s	DC-injection braking deactivated.
Assignment of the input/output terminals			
C00007	Control mode	10: Terminals 0	The pre-assignment is changed through the following parameter setting.
C00621/1	LS_DigitalOutput:bRelay	220: L_GP_DigitalDelay1_bOut	The relay is triggered by the binary delay element. The relay causes pump 2 to be released (delayed).
C00701/5	LA_NCtrl: bSetSpeedCcw	0: Not connected	Now, a reversal or rotation via digital input DI4 is not possible anymore.
Analog input			▸ Analog terminals
C00034	AINx: Configuration	2: 4...+20mA	Input signal is current signal 4 mA ... 20 mA.
C00598	Resp. to open circuit AINx	0: No Reaction	Open-circuit monitoring is deactivated.
Setpoint generator			▸ L_NSet_1
C00012	Acceleration time - main setpoint	20 s	
C00013	Deceleration time - main setpoint	20 s	

Parameter	Info	Setting	Info
Process controller			▸ L_PCTRL_1
C00222	L_PCTRL_1: Vp	1.0	**Note!** Adapt control mode of the PID process controller to the concrete application!
C00223	L_PCTRL_1: Tn	1000 ms	
C00224	L_PCTRL_1: Kd	0.0	
C00225	L_PCTRL_1: MaxLimit	105.0 %	Maximum level of pump 1.
C00226	L_PCTRL_1: MinLimit	0.0 %	No reversal of direction of the pump.
C00242	L_PCTRL_1: Operating mode	2: PID as setpoint generator.	As PID input values, the process setpoint (*nSet_a*) and the actual process value (*nAct_a*) are used. The speed setpoint (*nNSet_a*) is not considered.
C00700/7	LA_NCtrl: nPIDActValue_a	10: AIn1_Out	The actual process value (*nAct_a*) is detected via the analog input 1. (Actual process value = current water level)
C00700/9	LA_NCtrl: nPIDSetValue_a	20: nPar1_a	The process setpoint (*nSet_a*) is defined via the free parameter C00472/1.
C00472/1	LS_ParFree_a: Value 1	70.0 %	Selection of the process setpoint. (Process setpoint = desired water level)
GP function "Analog comparison"			▸ L_GP_Compare1
C00680	L_Compare_1: Fct.	6: |In1| < |In2|	Comparison operation: |C00472/2| < |Actual speed value|
C00681	L_Compare_1: Hysteresis	95.0 %	Hysteresis for comparison
C00700/13	L_GP_Compare1: nIn1_a	21: nPar2_a	The comparison value 1 is selected via the free parameter C00472/2.
C00700/14	L_GP_Compare1: nIn2_a	52: LA_NCtrl_nMotorSpeedAct_a	Comparison value 2 is the actual speed value. • 100 % ≡ reference speed (C00011)
C00472/2	LS_ParFree_a: Value 2	100.0 %	Selection of the comparison value 1.
GP function "Binary delay element"			▸ L_GP_DigitalDelay1
C00720/1	L_DigitalDelay_1: On delay	30 s	Switch-on delay for pump 2
C00720/2	L_DigitalDelay_1: Off delay	120 s	Switch-off delay for pump 2
C00701/23	L_GP_DigitalDelay1: bIn	215: L_GP_Compare1_bOut	Input value of the delay element is the result of comparison.

13.2 Delayed disconnection in partial-load operation ("Sleep Mode")

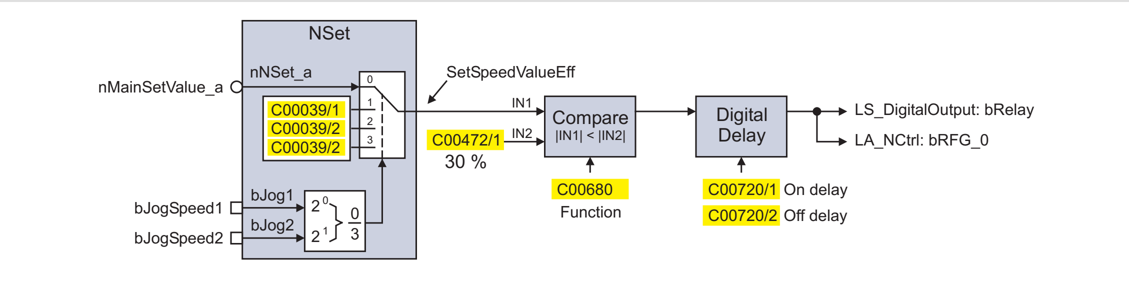
Task:

If the drive remains below a minimum load threshold for a longer period of time, the drive is to be switched off for saving energy. If the setpoint exceeds the minimum load threshold, the drive is to start again.

Solution:

The GP function "Analog comparison" (L_GP_Compare1) serves to monitor the setpoint speed. As soon as it falls below the set switch-off threshold, the switch-off delay starts. After the set delay time has expired, the drive switches off itself.

- The switch-off delay is implemented with the GP function "Binary delay element" (L_GP_DigitalDelay1).
- As soon as the setpoint exceeds the switch-off threshold again, the drive restarts.



[13-3] Standard signal flow

Example parameter setting:

Parameter	Info	Setting	Info
Settings for device control			
C00141	Auto-start option	0x00	Starting performance of the controller: No inhibit after mains connection.
Assignment of the input/output terminals			
C00621/1	LS_DigitalOutput:bRelay	220: L_GP_DigitalDelay1_ bOut	The relay is triggered by the binary delay element.
GP function "Analog comparison"			▸ L_GP_Compare1
C00680	L_Compare_1: Fct.	6: |In1| < |In2|	Comparison operation: |AIn1_Out| < |C00472/1|
C00700/13	L_GP_Compare1: nIn1_a	13: SetSpeedValueEff	Comparison value 1 is the input value of the setpoint generator L_NSet_1 selected via the JOG inputs.
C00700/14	L_GP_Compare1: nIn2_a	20: nPar1_a	The comparison value 2 is selected via the free parameter C00472/1.
C00472/1	LS_ParFree_a: Value 1	30.0 %	Selection of the comparison value 2 (switch-off threshold).

Parameter	Info	Setting	Info
GP function "Binary delay element"			▶ L_GP_DigitalDelay1
C00720/1	L_DigitalDelay_1: On delay	10 s	Switch-on delay (= switch-off delay for the drive)
C00720/2	L_DigitalDelay_1: Off delay	1 s	Switch-off delay (= switch-on delay for the drive)
C00701/23	L_GP_DigitalDelay1: bIn	215: L_GP_Compare1_ bOut	Input value of the delay element is the result of comparison.
Control signals for application			▶ Drive application
C00701/12	LA_NCtrl: bRFG_0	220: L_GP_DigitalDelay1_ bOut	The binary delay element serves to lead the main setpoint integrator via the current Ti times to "0".

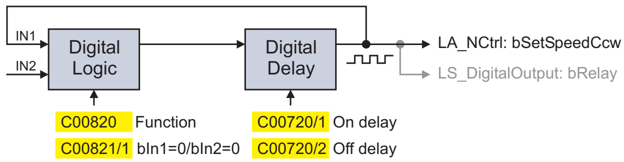
13.3 Motor load test

Task:

In order to verify a motor design, the motor is to be loaded by cyclic reversing in a long-term test.

Solution:

The GP function "Binary logic" (L_GP_DigitalLogic1) serves to configure the logic function "NOT". This inverts the output of the delay element (L_GP_DigitalDelay1) and thus generates an alternating signal. The alternating signal in turn is connected to the application input for change of direction of rotation (*bSetSpeedCcw*) and causes an alternating direction of rotation of the motor.



[13-4] Standard signal flow

Example parameter setting:

Parameter	Info	Setting	Info
Assignment of the input/output terminals			
C00621/1	LS_DigitalOutput:bRelay	220: L_GP_DigitalDelay1_bOut	For test purposes: The relay is also triggered with the alternating signal of the binary delay element.
GP function "Binary logic"			▸ L_GP_DigitalLogic1
C00820	L_DigitalLogic_1: Function	4: bOut = f(truth table)	The truth table parameterised in C00821 is used.
C00821/1	L_DigitalLogic_1: bIn1=0/bIn2=0	1: True	Truth table for logic "NOT" function.
C00701/28	L_GP_DigitalLogic1: bIn1	220: L_GP_DigitalDelay1_bOut	Input 1 is connected to the output of the delay element.
C00701/29	L_GP_DigitalLogic1: bIn2	0: Not connected	Input 2 is not required.
GP function "Binary delay element"			▸ L_GP_DigitalDelay1
C00720/1	L_DigitalDelay_1: On delay	5 s	Switch-on delay
C00720/2	L_DigitalDelay_1: Off delay	5 s	Switch-off delay
C00701/23	L_GP_DigitalDelay1: bIn	240: L_GP_DigitalLogic1_bOut	Input value of the delay element is the result of the binary logic.
Control signals for application			▸ Drive application
C00701/5	LA_NCtrl: bSetSpeedCcw	220: L_GP_DigitalDelay1_bOut	The direction of rotation is changed with the alternating signal of the binary delay element.

14 Index

D

E

M

FEEDBACK

Your opinion is important to us

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

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

feedback-docu@Lenze.de

Thank you for your support.

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