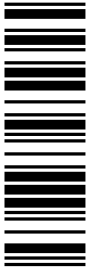
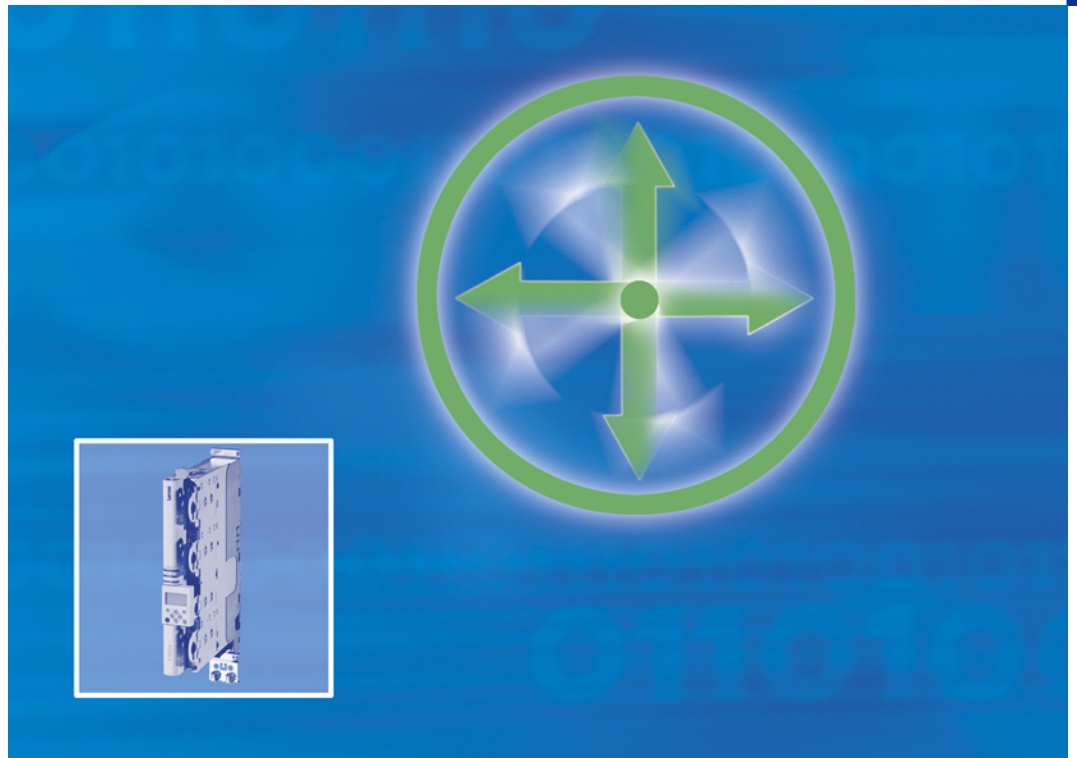


L-force *Runtime Software*



Software Manual

9400



Technology application "CiA402 device profile"
for Servo Drives 9400 HighLine

Lenze

Overview of the technical documentation for 9400 Servo Drives

Project planning, selecting & ordering

- ☐ 9400 Hardware Manual
- ☒ Catalogue / electronic catalogue (DSC - Drive Solution Catalogue)

Mounting & wiring

- ☒ MA 9400 StateLine/HighLine
- ☒ MA for communication module
- ☒ MA for extension module
- ☒ MA for safety module
- ☒ MA for accessories
- ☒ MA for remote maintenance components

Parameter setting

- ☒ BA keypad
- ☐ SW for Lenze »Engineer« software
- ☐ SW for controller (9400 HighLine)
- ☐ SW for power supply/regenerative module
- ☐ KHB for communication module
- ☐ SW for extension module
- ☐ SW for safety module
- ☐ SW for Lenze technology application
- ☐ SW 9400 function library

← This documentation

Configuring

- ☐ SW for Lenze »Engineer« software
- ☐ SW for controller (9400 HighLine)
- ☐ KHB for communication module
- ☐ SW for extension module
- ☐ SW for safety module
- ☐ SW for Lenze technology application
- ☐ SW 9400 function library

← This documentation

Commissioning of the drive

- ☒ Commissioning guide
- ☐ SW for controller (9400 HighLine)
- ☐ Remote Maintenance Manual

Networking

- ☐ KHB for communication medium used

Legend:

- ☒ Printed documentation
- ☐ Online documentation (PDF/Engineer online help)

Abbreviations used:

- BA Operating Instructions
- KHB Communication Manual
- MA Mounting Instructions
- SW Software Manual

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1 About this documentation

This documentation contains information on the technology application "CiA402 device profile" for the 9400 HighLine.



Note!

This documentation completes the mounting instructions delivered with the controller, the hardware manual as well as the software manual of the controller.

The Mounting Instructions contain safety information which must be observed!

The information in this documentation is valid for:

Technology application	Appl. ID	Required runtime software licence
CiA402 device profile	110102102	Motion Control HighLevel or higher

The use of this technology application is permissible with the following basic devices:

Product series	Type designation	As of software version
9400 Servo Drives	E94AxHExxx	V7

Target group

This documentation is directed at qualified personnel according to IEC 364.

Document history

Version			Description
1.0	08/2009	TD05	First edition
1.1	11/2009	TD05	Error corrections & supplements
1.2	03/2010	TD05	Error corrections & supplements

1.1 Conventions used

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

Type of information	Writing	Examples/notes
Numbers		
Decimal separator	Point	The decimal point is always used. Example: 1234.56
Text		
Program name	» «	The Lenze PC software »Engineer«...
Window	<i>Italics</i>	The <i>Message window</i> ... / The <i>Options</i> dialog box...
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 >	Use < 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	<u>Underlined</u>	Optically highlighted reference to another topic. It is activated with a mouse click in this online documentation.
Symbols		
Page reference	<u>(9)</u>	Optically highlighted reference to another page. It is activated with a mouse click in this online documentation.
Step-by-step instructions		Step-by-step instructions are indicated by a pictograph.
Parameter		
Lenze parameters (codes)	C[code]	All parameters which you can use to parameterise or monitor the controller are stored in so-called "codes". The codes are numbered and designated by a prefixed "C" (example: C00002)
	C[code]/[subcode]	For the sake of clarity and shortness, some codes contain so-called "subcodes" in which the parameters are stored. This manual uses a slash "/" as a separator between code and subcode (e.g. "C00118/3").
CiA402 objects	0x[index _{hex}]	The indexes of the CiA402 objects are given in hexadecimal notation with a prefixed "0x" (example: 0x6040).
	0x[index _{hex}]/[subindex]	Some CiA402 objects (of the ARRAY or RECORD object type) contain so-called "subindexes" in which the CiA402 parameters are stored. This manual uses a slash "/" as a separator between index and subindex (example: 0x60FB/7).

1.2 Definition of notes used

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

Safety instructions

Layout of the safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about 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!	Danger of property damage Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

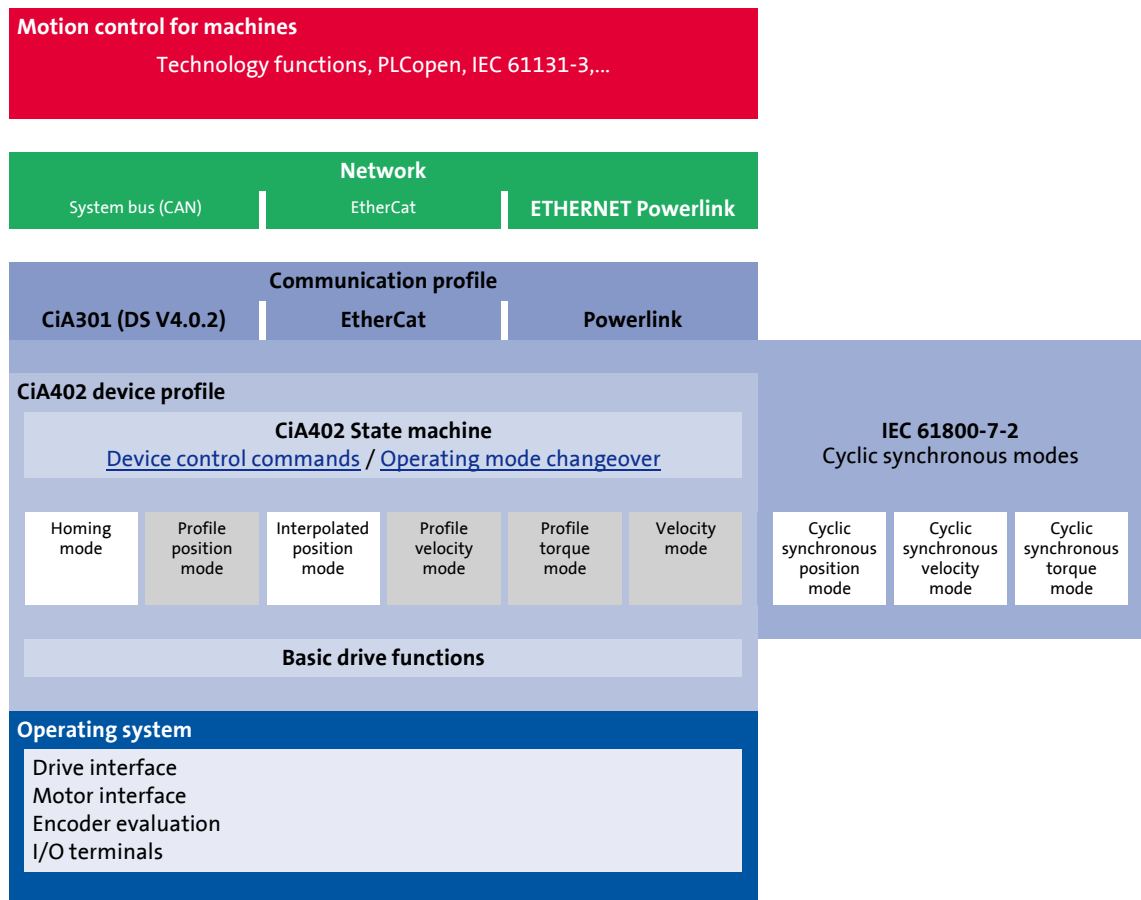
Pictograph	Signal word	Meaning
	Note!	Important note to ensure trouble-free operation
	Tip!	Useful tip for simple handling
		Reference to another document

2 Short description

The device profile CiA402 available as technology application for the 9400 HighLine controller represents a standardised drive behaviour with the corresponding operating modes and objects.

Possible communication profiles for the MotionBus are:

- ▶ CANopen - CiA301 (DS V4.0.2)
- ▶ EtherCat
- ▶ Powerlink



Tip!

The 9400 HighLine controller has two module slots MXI1 and MXI2 for connecting extension modules. This serves to equip the controller with the required communication interface according to the communication profile selected.

- Detailed information on this subject can be found in the Hardware Manual and Communication Manual for the corresponding communication system.

The CiA402 device profile provides the following operating modes:

Homing Mode

In this operating mode, homing can be executed to transmit the measuring system of the machine to the controller within the physically possible travel range.

Interpolated position mode

This operating mode provides a quick position follower with speed and torque/feed force feedforward control.

Cyclic synchronous position mode (IEC 61800-7)

This operating mode provides a quick position follower with speed and torque/feed force feedforward control.

Cyclic synchronous velocity mode (IEC 61800-7)

This operating mode provides a quick speed follower with speed and torque/feed force feedforward control.

Cyclic synchronous torque mode (IEC 61800-7)

This operating mode provides a quick torque/feed force follower with speed limitation.

3 Parameter setting & configuration



Note!

In general, the "Warning locked" error response should not be set for the operation of the CiA402 application with a control because the control cannot distinguish this error response from the "Warning" error response. Therefore, it cannot be acknowledged.



Conventions for CiA402 objects

The indexes of the CiA402 objects are indicated in the online documentation in hexadecimal notation with a prefixed "0x", e.g. "[0x6040](#)".

Some CiA402 objects (of the ARRAY or RECORD object type) contain so-called "subindexes" in which the CiA402 parameters are stored. The slash "/" is used in this online documentation as a separator between the index data and the subindex, e.g. "[0x60FB/7](#)".



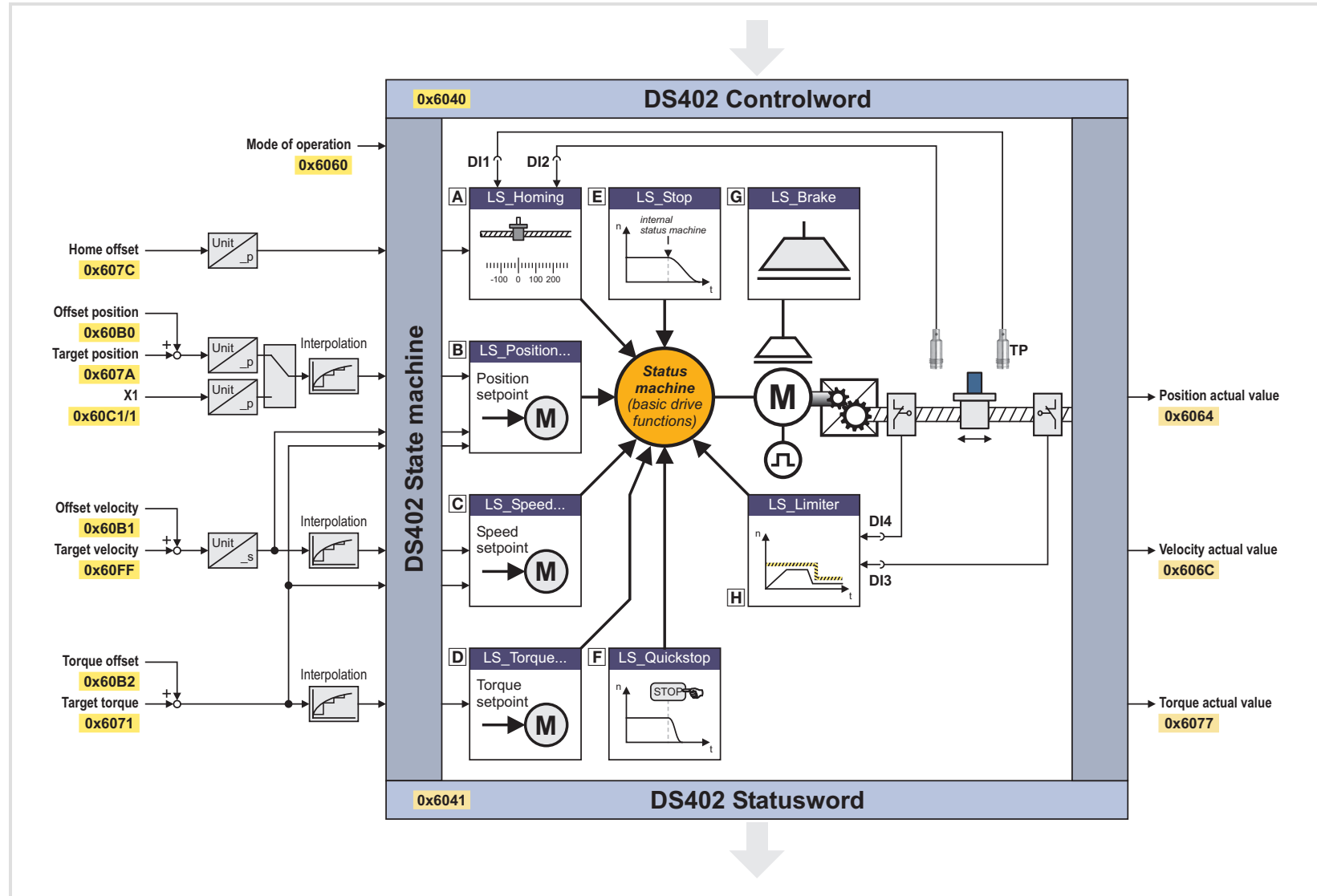
Tip!

For quick reference of a CiA402 object with a certain name simply use the **Index** of this online documentation. In the index, the corresponding CiA402 object is always given in brackets behind the name.

For general information on how to read and change parameters please see the online documentation for the »Engineer«.

3.1 Basic signal flow

The following illustration shows the basic signal flow of the "CiA402 device profile" technology application:



[3-1] Signal flow

Basic drive functions:

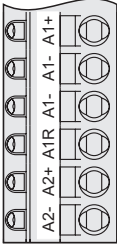
- ☐ A Homing
- ☐ B Position follower
- ☐ C Speed follower
- ☐ D Torque follower
- ☐ E Stop
- ☐ F Quick stop
- ☐ G Brake control
- ☐ H Limiter

3.2 Assignment of the I/O terminals

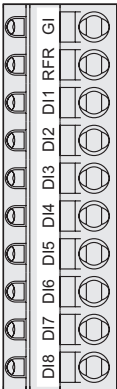
3.2.1 Setpoint and control signals

The following tables contain the Lenze assignment of the analog and digital inputs for the "CiA402 device profile" technology application.

Analog inputs

Terminal X3	Signal (Lenze setting)
	AI1- AI1+ No signal assigned The analog input 1 can be queried by the master control via the manufacturer-specific object 0x550F (Lenze code C02800/1).
	AI2- AI2+ No signal assigned The analogue input 2 can be queried by the master control via the manufacturer-specific object 0x550F (Lenze code C02800/2).

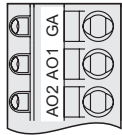
Digital inputs

Terminal X5	Signal (Lenze setting)
	DI1 Connection of touch probe sensor or switching contact for status detection of the brake The DI1 digital input can be queried by the master control via bit 4 of the 0x60FD object (digital inputs).
	DI2 Connection of reference switch The DI2 digital input can also be queried by the master control via bit 2 of the 0x60FD object (digital inputs).
	DI3 Connection of positive travel range limit switch The DI3 digital input can also be queried by the master control via bit 1 of the 0x60FD object (digital inputs).
	DI4 Connection of negative travel range limit switch The DI4 digital input can also be queried by the master control via bit 0 of the 0x60FD object (digital inputs).
	DI5 No signal assigned The DI5 digital input can also be queried by the master control via bit 6 of the 0x60FD object (digital inputs).
	DI6 No signal assigned The DI5 digital input can also be queried by the master control via bit 7 of the 0x60FD object (digital inputs).
	DI7 Connection of the touch probe sensor TP channel 1 for supporting the touch probe functionality. ▶ Touch probe (□ 166)
	DI8 Connection of the touch probe sensor TP channel 2 for supporting the touch probe functionality. ▶ Touch probe (□ 166)

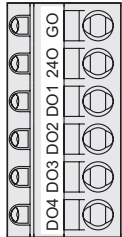
3.2.2 Actual value and status signals

The following tables contain the Lenze assignment of the analog and digital outputs for the "CiA402 device profile" technology application.

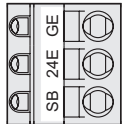
Analog outputs

Terminal X3	Signal (Lenze setting)	Signal configuration
	AO1	No signal assigned
	AO2	No signal assigned

Digital outputs

Terminal X4	Signal (Lenze setting)	Signal configuration
	DO1	Brake control (via contactor)
	DO2	No signal assigned • The DO2 digital output can be set via the master control via bit 1 of the 0x60FE/1 object (physical outputs).
	DO3	No signal assigned • The DO3 digital output can be set via the master control via bit 2 of the 0x60FE/1 object (physical outputs).
	DO4	No signal assigned • The DO4 digital output can be set via the master control via bit 3 of the 0x60FE/1 object (physical outputs).

State bus

Terminal X2	Signal (Lenze setting)
	SB State bus • The state bus can be set to the "Fault" status by the master control via bit 4 of the 0x60FE/1 object (physical outputs). • The state bus status can be queried via bit 5 of the 0x60FD object (digital inputs).

Display elements

User LED	Signal (Lenze setting)
	No signal assigned • The user LED can be controlled by the master control via bit 5 of the 0x60FE/1 object (physical outputs) (0: LED off, 1: LED on).

3.3 Short overview of the CiA402 objects

3.3.1 Object directory

The object directory for the CiA402 device profile is divided into the following subareas:

Object area	Description
Common entries	General objects
Device control	Objects for the drive control
Factor group	Objects for scaling the position, speed, and acceleration
Position control function	Objects for positioning
Homing mode	Objects for homing
Interpolated position mode	Objects for "Interpolated position mode"
Cyclic synchronous position mode (IEC 61800-7)	Objects for controlling the position
Cyclic synchronous torque mode (IEC 61800-7)	Objects for controlling the torque
Cyclic synchronous velocity mode (IEC 61800-7)	Objects for controlling the speed
Touch probe	Objects for the touch probe functionality
Torque limiting	Objects for selecting the torque limit values

3.3.2 CiA402 objects

Index	Name (Subindex: designation)	Data type	Object type
Common entries			
0x6007	Abort connection option code	INTEGER_16	VAR
0x603F	Error code	UNSIGNED_32	VAR
0x6402	Motor type	UNSIGNED_16	VAR
0x6403	Motor catalogue number	VISIBLE_STRING	VAR
0x6404	Motor manufacturer	VISIBLE_STRING	VAR
0x6405	http motor catalogue address	VISIBLE_STRING	VAR
0x6406	Motor calibration date	VISIBLE_STRING	VAR
0x6407	Motor service period	UNSIGNED_32	VAR
0x6410	Motor data	UNSIGNED_32	RECORD
0x6502	Supported drive modes	UNSIGNED_32	VAR
0x6503	Drive catalogue number	VISIBLE_STRING	VAR
0x6504	Drive manufacturer	VISIBLE_STRING	VAR
0x6505	http drive catalogue address	VISIBLE_STRING	VAR
0x6510	Drive data	UNSIGNED_32	RECORD
0x60FD	Digital inputs	UNSIGNED_8	VAR
0x60FE	Digital outputs	UNSIGNED_8	ARRAY
	1: Physical outputs	UNSIGNED_8	
	2: Bit mask	UNSIGNED_8	

Grayed out = read access only

Index	Name (Subindex: designation)	Data type	Object type
Device control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
0x605A	Quick stop option code	INTEGER_16	VAR
0x605B	Shutdown option code	INTEGER_16	VAR
0x605C	Disable operation option code	INTEGER_16	VAR
0x605D	Halt option code	INTEGER_16	VAR
0x605E	Fault reaction option code	INTEGER_16	VAR
0x6060	Mode of operation	INTEGER_8	VAR
0x6061	Mode of operation display	INTEGER_8	VAR
0x6085	Quick stop deceleration	UNSIGNED_32	VAR
Factor group			
0x607E	Polarity	UNSIGNED_32	VAR
0x6089	Position notation index	INTEGER_8	VAR
0x608A	Position dimension index	UNSIGNED_8	VAR
0x608B	Velocity notation index	INTEGER_8	VAR
0x608C	Velocity dimension index	UNSIGNED_8	VAR
0x608D	Acceleration notation index	INTEGER_8	VAR
0x608E	Acceleration dimension index	UNSIGNED_8	VAR
0x608F	Position encoder resolution	UNSIGNED_32	ARRAY
	1: Encoder increments	UNSIGNED_32	
	2: Motor revolutions	UNSIGNED_32	
0x6090	Velocity encoder resolution	UNSIGNED_32	ARRAY
	1: Encoder increments per second	UNSIGNED_32	
	2: Motor revolutions per second	UNSIGNED_32	
0x6091	Gear ratio	UNSIGNED_32	ARRAY
	1: Motor revolutions	UNSIGNED_32	
	2: Shaft revolutions	UNSIGNED_32	
0x6092	Feed constant	UNSIGNED_32	ARRAY
	1: Feed	UNSIGNED_32	
	2: Shaft revolutions	UNSIGNED_32	
0x6093	Position factor	UNSIGNED_32	ARRAY
	1: Numerator	UNSIGNED_32	
	2: Feed constant	UNSIGNED_32	
0x6094	Velocity encoder factor	UNSIGNED_32	ARRAY
	1: Numerator	UNSIGNED_32	
	2: Divisor	UNSIGNED_32	
0x6095	Velocity factor 1	UNSIGNED_32	ARRAY
	1: Numerator	UNSIGNED_32	
	2: Divisor	UNSIGNED_32	
0x6096	Velocity factor 2	UNSIGNED_32	ARRAY
	1: Numerator	UNSIGNED_32	
	2: Divisor	UNSIGNED_32	
Grayed out = read access only			

9400 Technology applications | CiA402 device profile

Parameter setting & configuration

Short overview of the CiA402 objects

Index	Name (Subindex: designation)	Data type	Object type
0x6097	Acceleration factor	UNSIGNED_32	ARRAY
	1: Numerator	UNSIGNED_32	
	2: Divisor	UNSIGNED_32	
Position control functions			
0x6062	Position demand value unit	INTEGER_32	VAR
0x6063	Position actual value intern (increments)	INTEGER_32	VAR
0x6064	Position actual value unit	INTEGER_32	VAR
0x6065	Following error window	UNSIGNED_32	VAR
0x6066	Following error time out	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x6068	Position window time	UNSIGNED_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR
0x60FA	Control effort	INTEGER_32	VAR
0x60FB	Position control parameter set	UNSIGNED_32	RECORD
	1: Load home position	INTEGER_32	
	2: Brake control	UNSIGNED_8	
	3: Brake torque add	INTEGER_32	
	4: Following error reaction	UNSIGNED_16	
	5: Safe IO state	UNSIGNED_8	
	6: Safety module state	UNSIGNED_16	
	7: Homing stop mode	UNSIGNED_32	
0x60FC	Position demand value*	INTEGER_32	VAR
Homing mode			
0x607C	Home position	INTEGER_32	VAR
0x6098	Homing method	INTEGER_8	VAR
0x6099	Homing speeds	UNSIGNED_32	ARRAY
	1: Speed during search for switch	UNSIGNED_32	
	2: Speed during search for zero	UNSIGNED_32	
0x609A	Homing acceleration	UNSIGNED_32	ARRAY
	1: Acc. during search for switch	UNSIGNED_32	
	2: Acc. during search for zero	UNSIGNED_32	
Interpolated position mode			
0x60C0	Interpolation sub mode select	INTEGER_16	VAR
0x60C1	Interpolation data record	INTEGER_32	ARRAY
	1: X1	UNSIGNED_32	
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
	1: ip time units	UNSIGNED_32	
	2: ip time index	UNSIGNED_32	
0x60C3	Interpolation sync definition	UNSIGNED_8	RECORD
	1: Synchronize on group	UNSIGNED_32	
	2: ip sync every n event	UNSIGNED_32	

Grayed out = read access only

Grayed out = read access only

Index	Name (Subindex: designation)	Data type	Object type
0x60C4	Interpolation data configuration	UNSIGNED_32	RECORD
	1: Max. buffer size	UNSIGNED_32	
	2: Actual buffer size	UNSIGNED_32	
	3: Buffer organization	UNSIGNED_32	
	4: Buffer position	UNSIGNED_32	
	5: Size of data record	UNSIGNED_32	
	6: Buffer clear	UNSIGNED_32	
Cyclic synchronous position mode			
0x60B0	Offset position	INTEGER_32	VAR
0x607A	Target position	INTEGER_32	VAR
Cyclic synchronous torque mode			
0x6071	Target torque	INTEGER_32	VAR
0x6072	Max. torque	UNSIGNED_16	VAR
0x6073	Max. current	UNSIGNED_32	VAR
0x6074	Torque demand value	INTEGER_32	VAR
0x6075	Motor rated current	UNSIGNED_32	VAR
0x6076	Motor rated torque	UNSIGNED_32	VAR
0x6077	Torque actual value	INTEGER_32	VAR
0x6078	Current actual value	INTEGER_32	VAR
0x6079	DC link circuit voltage	UNSIGNED_32	VAR
0x6087	Torque slope	UNSIGNED_32	VAR
0x6088	Torque profile type	INTEGER_16	VAR
0x60B2	Torque offset	INTEGER_32	VAR
0x60F6	Torque control parameters	UNSIGNED_32	RECORD
0x60F7	Power stage parameters	UNSIGNED_32	RECORD
Cyclic synchronous velocity mode			
0x606C	Velocity actual value	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR
Touch probe			
0x60B8	Touch probe function	UNSIGNED_16	VAR
0x60B9	Touch probe status	UNSIGNED_16	VAR
0x60BA	Touch probe pos 1 pos value	INTEGER_32	VAR
0x60BB	Touch probe pos 1 neg value	INTEGER_32	VAR
0x60BC	Touch probe pos 2 pos value	INTEGER_32	VAR
0x60BD	Touch probe pos 2 neg value	INTEGER_32	VAR
Torque limiting			
0x60E0	Positive torque limit value	UNSIGNED_16	VAR
0x60E1	Negative torque limit value	UNSIGNED_16	VAR
Grayed out = read access only			



Tip!

All Lenze codes from 0 ... 24575 can be activated as objects by the master control.
The index of a Lenze code is calculated as follows:

$$\text{Index}_{\text{hex}} = 0x5FFF - \text{Lenze code}_{\text{hex}}$$

$$\text{Index}_{\text{dec}} = 24575 - \text{Lenze code}_{\text{dec}}$$

3.4 Drive initialisation

The drive is initialised by the master control and consists of the following parts:

1. Change of the communication status: *PREOPERATIONAL*
 - Required as the controller may be in any communication status after starting.
2. Drive identification
3. Initialisation of communication profile objects
4. PDO mapping
5. Initialisation of device profile objects
6. Initialisation of manufacturer-specific objects

After successful initialisation

...the master control may change to the *OPERATIONAL* communication status. In this status, the SYNC telegram is cyclically transferred by the master control and the process data is exchanged via the PDO channel.

3.4.1 PDO mapping

PDO mapping must be executed during the runtime by the master control in the *PREOPERATIONAL* communication status (according to the CiA DS301 communication profile).

► The following objects can be defined as process data via the PDO channel:

Index	Name	Data type	Object type
Common entries			
0x60FD	Digital inputs	UNSIGNED_8	VAR
0x60FE/1	Physical outputs	UNSIGNED_8	VAR
Device Control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
0x6060	Mode of operation	INTEGER_8	VAR
0x6061	Mode of operation display	INTEGER_8	VAR
Position control functions			
0x6063	Position actual value*	INTEGER_32	VAR
0x6064	Position actual value	INTEGER_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR
0x60FB/5	Safe I/O state	UNSIGNED_8	VAR
0x60FB/6	Safety module state	UNSIGNED_16	VAR
Interpolated position mode			
0x60C1/1	X1	INTEGER_32	VAR
Cyclic synchronous position mode			
0x607A	Target position	INTEGER_32	VAR
Cyclic synchronous torque mode			
0x6071	Target torque	INTEGER_32	VAR
0x6072	Max. torque	UNSIGNED_16	VAR
0x6077	Torque actual value	INTEGER_32	VAR
0x6078	Current actual value	INTEGER_32	VAR
Cyclic synchronous velocity mode			
0x60FF	Target velocity	INTEGER_32	VAR
0x606C	Velocity actual value	INTEGER_32	VAR
Factors for the feedforward control			
0x60B2	Torque offset	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60B0	Offset position	INTEGER_32	VAR
Touch probe			
0x60B8	Touch probe function	UNSIGNED_16	VAR
0x60B9	Touch probe status	UNSIGNED_16	VAR
0x60BA	Touch probe position 1 positive value	INTEGER_32	VAR
0x60BB	Touch probe position 1 negative value	INTEGER_32	VAR
0x60BC	Touch probe position 2 positive value	INTEGER_32	VAR
0x60BD	Touch probe position 2 negative value	INTEGER_32	VAR

Grayed out = read access only

Index	Name	Data type	Object type
Torque limiting			
0x60E0	Positive torque limit value	UNSIGNED_16	VAR
0x60E1	Negative torque limit value	UNSIGNED_16	VAR
Grayed out = read access only			

3.4.2 Example of a typical drive initialisation for CANopen



Detailed information on CANopen is provided in the Lenze library in the "CAN" communication manual.

Basic conditions

- ▶ The communication takes place via the system bus (CANopen).
- ▶ The controller is assigned device address "1".
- ▶ The PDO1-Rx to the controller contains the following objects:
 - [0x6040](#): Controlword
 - [0x60C1/1](#): Interpolation data record/X1
- ▶ The PDO1-Tx from the controller contains the following objects:
 - [0x6041](#): Statusword
 - [0x6064](#): Position actual value
- ▶ The "[Interpolated position mode](#)" operating mode is selected.
- ▶ The synchronisation of the Servo Drive 9400 must be set via code C01120 (sync source).
- ▶ The cycle time of the sync data transmission of the Servo Drive 9400 must be set via code C01121 (sync cycle time).

Sequence

Communication service	Object	Value	Information
Change of the communication status			
NMT	-	-	Switch drive to the <i>PREOPERATIONAL</i> communication status.
Drive identification			
SDO read request	0x1000	-	Check if the drive supports the CiA402 Canopen device profile.
SDO read request	0x1018/1	-	Manufacturer's identification mark
SDO read request	0x1018/2	-	Product identification
SDO read request	0x1018/3	-	Revision number
SDO read request	0x1008	-	Manufacturer's device name
Initialisation of communication profile objects			
SDO read request	0x1010		Manufacturer's software version
SDO write request	0x1005	0x80	Set COB-ID for the SYNC telegram.
SDO write request	0x1014	0x81	Set COB-ID for the EMCY telegram.
PDO mapping			
SDO write request	0x1800/1	0x181	Set COB-ID for the transmit process data (PDO1-Tx).
SDO write request	0x1800/2	1	Set transmission mode for the transmit process data (PDO1-Tx): synchronously for each SYNC telegram.
SDO write request	0x1400/1	0x201	Set COB-ID for the receipt process data (PDO1-Rx).
SDO write request	0x1400/2	1	Set transmission mode for the receipt process data (PDO1-Rx): synchronously for each SYNC telegram.

Communication service	Object	Value	Information
SDO write request	0x1600/0	0	PDO1-Rx does not contain any objects; deactivate mapping.
SDO write request	0x1600/1	0x60400010	Map the 0x6040 object (controlword) to PDO1-Rx.
SDO write request	0x1600/2	0x60C10120	Map the 0x60C1/1 object (interpolation data record/X1) to PDO1-Rx.
SDO write request	0x1600/0	2	PDO1-Rx contains 2 objects; activate mapping.
SDO write request	0x1A00/0	0	PDO1-Tx does not contain any objects; deactivate mapping.
SDO write request	0x1A00/1	0x60410010	Map the 0x6041 object (statusword) to PDO1-Tx.
SDO write request	0x1A00/2	0x60640020	Map the 0x6064 object (position actual value) to PDO1-Tx.
SDO write request	0x1A00/0	2	PDO1-Tx contains 2 objects; activate mapping.
Initialisation of device profile objects			
SDO write request	0x60C2/1	2	Set time base for interpolation of the position setpoint. • Time base = $2 \cdot 10^{-3} \text{ [s]} = 2 \text{ [ms]}$
SDO write request	0x60C2/2	0xFD (-3)	
SDO write request	0x6092/1	0x10000	Set feed constant for position values in [increments]. • One encoder revolution corresponds to 0x10000, since the feed is usually already converted into increments in the master control.
SDO write request	0x6060	7	Select Interpolated position mode .
Initialisation of manufacturer-specific objects			
SDO write request	0x55A4	0x10000	Configure touch probe for Homing mode in C02651. • Touch probe is triggered by motor encoder zero pulse.
SDO write request	0x55AF	2	Select "2" for "Homing mode" operating mode in C02640. <u>Process:</u> 1. Movement in positive direction with profile data set 1. 2. Reversing to positive travel range limit switch. 3. Positive edge of the reference switch activates profile data set 2 for the further reference search. 4. Negative edge of the reference switch enables home position detection. 5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference (0x607C). 6. Absolute positioning to target position (C02643) with profile data set 2 (if 0x60FB/7 = "0").
SDO write request	0x5B9F	1	Write request on the code C01120 (sync source) for axis synchronisation. • Value "1" = CAN on board
SDO write request	0x5B9E	2000	Write request to code C01121 (sync cycle time). • Sync cycle time = 2000 μs
Change of the communication status			
NMT	-	-	Switch drive to the <i>OPERATIONAL</i> communication status.
Cyclic process data exchange			
PDO1-Rx to the drive	-	-	Transmit the process data to the drive according to PDO mapping.
SYNC	-	-	Process data synchronisation
PDO1-Tx from the drive	-	-	Receive process data from the drive according to PDO mapping.

3.4.3 Example of a typical drive initialisation for EtherCAT



Detailed information on EtherCAT is provided in the Lenze library in the "EtherCAT" communication manual.

Basic conditions

- ▶ The communication is carried via an EtherCAT network.
- ▶ For communication, the E94AYCET communication module (EtherCAT) must be plugged into the MXI1 module slot of the Servo Drive 9400.
- ▶ The first EtherCAT slave in the drive compound is assigned with the station address "1001" during initialisation.
- ▶ The PDO1-Rx to the controller contains the following objects:
 - [0x6040](#): Controlword
 - [0x60C1/1](#): Interpolation data record/X1
- ▶ The PDO1-Tx from the controller contains the following objects:
 - [0x6041](#): Statusword
 - [0x6064](#): Position actual value
- ▶ The "[Interpolated position mode](#)" operating mode is selected.
- ▶ The synchronisation of the Servo Drive 9400 must be set via code C01120 (sync source).

Sequence

Communication service	Object	Value	Information
Change of the communication status			
NMT	-	-	Switch drive to the <i>PREOPERATIONAL</i> communication status.
Drive identification			
SDO read request	0x1000	-	Check if the drive supports the CiA402 CANopen device profile.
SDO read request	0x1018/1	-	Manufacturer's identification mark
SDO read request	0x1018/2	-	Product identification
SDO read request	0x1018/3	-	Revision number
SDO read request	0x1008	-	Manufacturer's device name
Initialisation of communication profile objects			
SDO read request	0x1010		Manufacturer's software version
PDO mapping			
SDO write request	0x1600/0	0	PDO1-Rx does not contain any objects; deactivate mapping.
SDO write request	0x1600/1	0x60400010	Map the 0x6040 object (controlword) to PDO1-Rx.
SDO write request	0x1600/2	0x60C10120	Map the 0x60C1/1 object (interpolation data record/X1) to PDO1-Rx.
SDO write request	0x1600/0	2	PDO1-Rx contains 2 objects; activate mapping.
SDO write request	0x1A00/0	0	PDO1-Tx does not contain any objects; deactivate mapping.

Communication service	Object	Value	Information
SDO write request	0x1A00/1	0x60410010	Map the 0x6041 object (statusword) to PDO1-Tx.
SDO write request	0x1A00/2	0x60640020	Map the 0x6064 object (position actual value) to PDO1-Rx.
SDO write request	0x1A00/0	2	PDO1-Tx contains 2 objects; activate mapping.
SDO write request	0x1C12/1		Selection of the PDO-Rx source
SDO write request	0x1C13/1		Selection of the PDO-Tx source
Initialisation of device profile objects			
SDO write request	0x60C2/1	2	Set time base for interpolation of the position setpoint. • Time base = 2×10^{-3} [s] = 2 [ms]
SDO write request	0x60C2/2	0xFD (-3)	
SDO write request	0x6092/1	0x10000	Set feed constant for position values in [increments]. • One encoder revolution corresponds to 0x10000, since the feed is usually already converted into increments in the master control.
SDO write request	0x6060	7	Select the "Interpolated position mode" operation mode.
Initialisation of manufacturer-specific objects			
SDO write request	0x55A4	0x10000	Configure touch probe for the "homing mode" operation mode in C02651. • Touch probe is triggered by motor encoder zero pulse.
SDO write request	0x55AF	2	Select "2" for "Homing mode" operating mode in C02640. <u>Process:</u> 1. Movement in positive direction with profile data set 1. 2. Reversing to positive travel range limit switch. 3. Positive edge of the reference switch activates profile data set 2 for the further reference search. 4. Negative edge of the reference switch enables home position detection. 5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference (0x607C). 6. Absolute positioning to target position (C02643) with profile data set 2 (if 0x60FB/7 = "0").
SDO write request	0x5B9F	4	Write request on the code C01120 (sync source) for axis synchronisation. • Value "4" = module in MXI1
Change of the communication status			
NMT	-	-	Switch drive to the <i>OPERATIONAL</i> communication status.
Cyclic process data exchange			
PDO1-Rx to the drive	-	-	Transmit the process data to the drive according to PDO mapping.
SYNC	-	-	Process data synchronisation
PDO1-Tx from the drive	-	-	Receive process data from the drive according to PDO mapping.

3.5 Structure of the object descriptions

Each CiA402 object is described in the parameters list in tabular form (similar to the parameters) which consists of the following three areas:

Table header

The table header contains the following general notes:

- ▶ Index and – if available – subindex of the object
- ▶ Object name (display text in the »Engineer« and in the keypad)
- ▶ [Data type](#)
- ▶ Assigned parameter in the parameters list

Table contents

The table contains further general explanations & notes on the object and the possible settings whose representation depends on the object type:

- ▶ [Objects with read-only access](#)
- ▶ [Objects with write access](#)

Table footer

The table footer contains the [Object attributes](#).

3.5.1 Data type

The following data types are available for objects:

Data type	Meaning
INTEGER_8	8-bit value with sign
INTEGER_16	16-bit value with sign
INTEGER_32	32-bit value with sign
INTEGER_64	64-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
UNSIGNED_64	64-bit value without sign
FLOATING_POINT	32-bit floating point number
VISIBLE_STRING	String of printable characters
OCTET_STRING	String of arbitrary characters
BITFIELD_8	8-bit value, bit coded
BITFIELD_16	16-bit value, bit-coded
BITFIELD_32	32-bit value, bit coded

3.5.2 Objects with read-only access

Objects for which the "write access" attribute has not been set can only be read and not be changed by the user.

Description structure

Index Name: ____ _____	Data type: _____ Code: _____
Description	
Display area (min. value unit max. value)	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

3.5.3 Objects with write access

Only objects with a check mark (☑) in front of the "write access" attribute can be changed by the user. The Lenze setting for these objects is **printed in bold**.

- ▶ The settings are either selected by means of a selection list or through direct value entry.
- ▶ Values outside the valid setting range are represented in red in the »Engineer«.

3.5.3.1 Objects with setting range

Description structure

Index Name:		Data type: _____
_____ _____		Code: _____
Description		
Setting range (min. value unit max. value)		Lenze setting
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

3.5.3.2 Objects with selection list

Description structure

Index Name:		Data type: _____
_____ _____		Code: _____
Description		
Selection list (Lenze setting printed in bold)		
1		
2		
3		
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

3.5.3.3 Objects with bit coded setting

Description structure

Index Name:		Data type: _____
_____ _____		Code: _____
Description		
Value is bit-coded:		
Bit 0		
...		
Bit 31		
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

3.5.4 Object attributes

Attribute	Meaning
☒ Read access	Read access to object possible.
☒ Write access	Write access to object possible. • Please also observe the following attributes:
	☒ CINH Access only possible when controller is inhibited
	☒ PLC STOP Access only possible when the application has stopped.
☒ PDO_MAP_RX	Mapping of the object in an Rx-PDO is possible.
☒ PDO_MAP_TX	Mapping of the object in a Tx-PDO is possible.

3.6 Common entries

This chapter describes the general CiA402 parameters.

3.6.1 Object description

All objects correspond to the CiA402 specification, but some of them have only a restricted value range.

Objects described in this chapter:

Index	Name	Data type	Object type
0x6007	Abort connection option code	INTEGER_16	VAR
0x603F	Error code	UNSIGNED_32	VAR
0x6402	Motor type	UNSIGNED_16	VAR
0x6403	Motor catalogue number	VISIBLE_STRING	VAR
0x6404	Motor manufacturer	VISIBLE_STRING	VAR
0x6405	http motor catalogue address	VISIBLE_STRING	VAR
0x6406	Motor calibration date	VISIBLE_STRING	VAR
0x6407	Motor service period	UNSIGNED_32	VAR
0x6410	Motor data	UNSIGNED_32	RECORD
0x6502	Supported drive modes	UNSIGNED_32	BITFIELD
0x6503	Drive catalogue number	VISIBLE_STRING	VAR
0x6504	Drive manufacturer	VISIBLE_STRING	VAR
0x6505	http drive catalogue address	VISIBLE_STRING	VAR
0x6510	Drive data	UNSIGNED_32	RECORD
0x60FD	Digital inputs	UNSIGNED_8	VAR
0x60FE	Digital outputs	UNSIGNED_8	ARRAY

Grayed out = read access only

0x6007 - Abort connection option code

Index Name:	0x6007 Abort connection option code		Data type: INTEGER_16
			Code: C03519
Response to abortion of the communication link.			
3 = activate quick stop. ▶ quick stop			
Setting range (min. value unit max. value)		Lenze setting	
3		3	3
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x603F - Error code

Index Name: 0x603F Error code			Data type: UNSIGNED_32 Code: C00394
Error number			
Display area (min. value unit max. value)			
0		4294967295	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

The following table contains all possible error numbers and their meaning:

Error number		Meaning
[dez]	[hex]	
0	0x0000	Ok, no error
4096	0x1000	An error has occurred in the controller (system fault, fault, trouble, or warning).
33024	0x8100	Communication error (warning)
33072	0x8130	Network monitoring function "Node guarding" or "Heartbeat" has tripped.
33296	0x8210	PDO length is lower than expected.
33312	0x8220	PDO length is higher than expected.
34560	0x8700	Monitoring of the sync telegram has tripped.

0x6402 - Motor type

Index | Name: **0x6402 | Motor type**

Data type: UNSIGNED_16
Code: [C03503](#)

Motor type

Selection list (Lenze setting printed in bold)	
0	Non-standard motor
1	Phase modulated DC motor
2	Frequency controlled DC motor
3	PM synchronous motor
4	FC synchronous motor
5	Switched reluctance motor
6	Wound rotor induction motor
7	Squirrel cage induction motor
8	Stepper motor
9	Micro-step stepper motor
10	Sinusoidal PM BL motor
11	Trapezoidal PM BL motor

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

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0x6403 - Motor catalogue number

Index Name:	Data type: VISIBLE_STRING
0x6403 Motor catalogue number	Code: C03504
Motor catalogue number	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6404 - Motor manufacturer

Index Name:	Data type: VISIBLE_STRING
0x6404 Motor manufacturer	Code: C03505
Motor manufacturer	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6405 - http motor catalogue address

Index Name:	Data type: VISIBLE_STRING
0x6405 http motor catalogue address	Code: C03506
http motor catalogue address	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6406 - Motor calibration date

Index Name:	Data type: VISIBLE_STRING
0x6406 Motor calibration date	Code: C03507
Motor calibration date	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6407 - Motor service period

Index Name:	Data type: UNSIGNED_32
0x6407 Motor service period	Code: C03508
Motor service interval in hours	
Setting range (min. value unit max. value)	Lenze setting
0	4294967295 0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6410 - Motor data

Index Name:	Data type: UNSIGNED_32
0x6410 Motor data	Code: C03509
Motor parameters	
Display area (min. value unit max. value)	
0	0
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6502 - Supported drive modes

Index | Name:

0x6502 | Supported drive modes

Data type: UNSIGNED_32

Code: [C03521](#)

Bit coded display in which operating modes the drive can be operated.

0: operating mode is not supported.

1: operating mode is supported.

Value is bit-coded:

Bit 0	Profile position mode
Bit 1	Velocity mode
Bit 2	Profile velocity mode
Bit 3	Profile torque mode
Bit 4	Reserved
Bit 5	Homing mode
Bit 6	Interpolated position mode
Bit 7	Cyclic synchronous position mode
Bit 8	Cyclic synchronous velocity mode
Bit 9	Cyclic synchronous torque mode
Bit 10	Reserved
Bit 11	Reserved
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Reserved
Bit 15	Reserved
Bit 16	Reserved
Bit 17	Reserved
Bit 18	Reserved
Bit 19	Reserved
Bit 20	Reserved
Bit 21	Reserved
Bit 22	Reserved
Bit 23	Reserved
Bit 24	Reserved
Bit 25	Reserved
Bit 26	Reserved
Bit 27	Reserved
Bit 28	Reserved
Bit 29	Reserved
Bit 30	Reserved
Bit 31	Reserved

☒ Read access
 ☐ Write access
 ☐ CINH
 ☐ PLC-STOP
 ☐ PDO_MAP_RX
 ☐ PDO_MAP_TX

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Common entries

0x6503 - Drive catalogue number

Index Name: 0x6503 Drive catalogue number	Data type: VISIBLE_STRING Code: C03522
Drive catalogue number	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6504 - Drive manufacturer

Index Name: 0x6504 Drive manufacturer	Data type: VISIBLE_STRING Code: C03512
Drive manufacturer	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6505 - http drive catalogue address

Index Name: 0x6505 http drive catalogue address	Data type: VISIBLE_STRING Code: C03513
http drive catalogue address	
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6510 - Drive data

Index Name: 0x6510 Drive data	Data type: UNSIGNED_32 Code: C03514
Drive parameters	
Display area (min. value unit max. value)	
0	0
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x60FD - Digital inputs

Index Name: 0x60FD Digital inputs	Data type: UNSIGNED_8 Code: C03515
States of the digital inputs. 0: LOW level 1: HIGH level	
Value is bit-coded:	Information
Bit 0	Negative limit switch
Bit 1	Positive limit switch
Bit 2	Home switch
Bit 3	Interlock
Bit 4	Brake applied
Bit 5	State bus in
Bit 6	DI5
Bit 7	DI6
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX	

0x60FE - Digital outputs

Index | Name: **0x60FE | Digital outputs** Data type: UNSIGNED_8
Code: [C03516](#)

Data structure for the digital outputs.

Subindex	Name
▸ 0x60FE/1	Physical outputs
▸ 0x60FE/2	Bit mask

Index | Name: **0x60FE/1 | Physical outputs** Data type: UNSIGNED_8
Code: [C03517](#)

Status of the digital outputs.

0: LOW level

1: HIGH level

Value is bit-coded:	Information
Bit 0 Reserved	-
Bit 1 DO2	Digital output 2
Bit 2 DO3	Digital output 3
Bit 3 DO4	Digital output 4
Bit 4 State bus out	Output signal - state bus
Bit 5 User LED	User LED
Bit 6 Reserved	-
Bit 7 Reserved	-

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX

Index | Name: **0x60FE/2 | Bit mask** Data type: UNSIGNED_8
Code: [C03518](#)

Bit masking of the digital outputs.

0: output is inhibited.

1: output is enabled.

Value is bit-coded:	Information
Bit 0 Reserved	-
Bit 1 DO2	Digital output 2
Bit 2 DO3	Digital output 3
Bit 3 DO4	Digital output 4
Bit 4 State bus out	Output signal - state bus
Bit 5 User LED	User LED
Bit 6 Reserved	-
Bit 7 Reserved	-

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

3.6.2 Motor data

The motor data are set via the Lenze parameters of the motor control.

3.7 Device control

The objects described in this chapter serve to control the states of the controller and select the operating mode.

3.7.1 Object description

All objects correspond to the CiA402 specification, but some of them have only a restricted value range.

Objects described in this chapter:

Index	Name	Data type	Object type
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
0x605A	Quick stop option code	INTEGER_16	VAR
0x605B	Shutdown option code	INTEGER_16	VAR
0x605C	Disable operation option code	INTEGER_16	VAR
0x605D	Halt option code	INTEGER_16	VAR
0x605E	Fault reaction option code	INTEGER_16	VAR
0x6060	Mode of operation	INTEGER_8	VAR
0x6061	Mode of operation display	INTEGER_8	VAR
0x6085	Quick stop deceleration	UNSIGNED_32	VAR

Grayed out = read access only

0x6040 - Control word

Index | Name:

0x6040 | Control word

Data type: UNSIGNED_16

Code: C03530

Control word for the drive.

► [Device control commands](#)

Value is bit-coded:	Information
Bit 0	Switch on
Bit 1	Enable voltage
Bit 2	Quick stop
Bit 3	Enable operation
Bit 4	Start homing or enable operation mode
Bit 5	Reserved
Bit 6	Reserved
Bit 7	Fault reset
Bit 8	Stop
Bit 9	Reserved
Bit 10	Reserved
Bit 11	Load home position
Bit 12	Reset home position
Bit 13	Reserved
Bit 14	Reserved
Bit 15	Reserved

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX

0x6041 - Status word

Index | Name:

0x6041 | Status word

Data type: UNSIGNED_16

Code: [C03531](#)

Status word from the drive.

► [Device states](#)

Value is bit-coded:		Information
Bit 0	Ready to switch on	Device state "Device is ready to start"
Bit 1	Switched on	Device state "Device is switched on"
Bit 2	Operation enabled	Device state "Operation"
Bit 3	Fault	Device state "Fault"
Bit 4	Voltage enabled	DC-bus voltage available
Bit 5	Quick stop	Quick stop active
Bit 6	Switch on disabled	Switch on inhibit is active
Bit 7	Warning	Warning active
Bit 8	Following error	Following error The difference between position setpoint and actual position value is higher than the window set in 0x6065.
Bit 9	Remote	Drive can receive commands via the fieldbus.
Bit 10	Target reached	Drive has reached target position. The actual position value is in the position window set in 0x6067.
Bit 11	Reserved	
Bit 12	Homing attained or operation mode active	Operating mode-dependent status bit: - Homing mode: homing executed. - Other operating modes: operating mode is active.
Bit 13	Homing error	Operating mode-dependent status bit: - Homing mode: fault during homing. - Other operating modes: reserved.
Bit 14	Home position available	Home position available
Bit 15	Reserved	

☒ Read access
☐ Write access
☐ CINH
☐ PLC-STOP
☐ PDO_MAP_RX
☒ PDO_MAP_TX

0x605A - Quick stop option code

Index | Name:

0x605A | Quick stop option code

Data type: INTEGER_16

Code: [C03534](#)

Response to request for quick stop.

2 = activate quick stop. ▶ [quick stop](#)

Setting range (min. value unit max. value)		Lenze setting	
2		2	2
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x605B - Shutdown option code

Index Name: 0x605B Shutdown option code		Data type: INTEGER_16 Code: C03532	
Response to request for drive shutdown. 0 = set controller inhibit.			
Setting range (min. value unit max. value)		Lenze setting	
0		0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x605C - Disable operation option code

Index | Name:

0x605C | Disable operation option code

Data type: INTEGER_16

Code: [C03533](#)

Response to deselection of the operating mode.

0 = set controller inhibit.

Setting range (min. value unit max. value)		Lenze setting
0		0 0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x605D - Halt option code

Index | Name:

0x605D | Halt option code

Data type: INTEGER_16
Code: [C03535](#)

Response to halt command.

2 = activate quick stop. ▶ [quick stop](#)

Setting range (min. value unit max. value)			Lenze setting
2		2	2
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x605E - Fault reaction option code

Index | Name:
0x605E | Fault reaction option code

Data type: INTEGER_16
Code: C03536

Response to drive fault.
2 = activate quick stop. ▶ quick stop

Setting range (min. value unit max. value)		Lenze setting
2		2 2
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x6060 - Mode of operation

Index | Name:

0x6060 | Mode of operation

Data type: INTEGER_8

Code: [C03537](#)

Selection of operating mode.

- The current operating mode is displayed in [0x6061](#).

▸ [Operating mode changeover](#)

Selection list (Lenze setting printed in bold)		Information
0	No mode	Standstill
6	Homing mode	▸ Homing mode
7	Interpolated position mode	▸ Interpolated position mode
8	Cyclic synchronous position mode	▸ Cyclic synchronous position mode
9	Cyclic synchronous velocity mode	▸ Cyclic synchronous velocity mode
10	Cyclic synchronous torque mode	▸ Cyclic synchronous torque mode
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX		

0x6061 - Mode of operation display

Index | Name:

0x6061 | Mode of operation display

Data type: INTEGER_8

Code: [C03538](#)

Display of the current mode of operation.

- The mode of operation is selected in [0x6060](#).

▸ [Operating mode changeover](#)

Selection list (display only)		Information
0	No mode	Standstill
6	Homing mode	▸ Homing mode
7	Interpolated position mode	▸ Interpolated position mode
8	Cyclic synchronous position mode	▸ Cyclic synchronous position mode
9	Cyclic synchronous velocity mode	▸ Cyclic synchronous velocity mode
10	Cyclic synchronous torque mode	▸ Cyclic synchronous torque mode
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX		

0x6085 - Quick stop deceleration

Index | Name:

0x6085 | Quick stop deceleration

Data type: UNSIGNED_32

Code: C00105

Time between quick stop activation and standstill plus relative S-ramp time (C00106).

▸ [Quick stop](#)

Setting range (min. value unit max. value)			Lenze setting
0.000	s	999.999	0.000 s
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX Scaling factor: 1000			

3.7.2 Device control commands

Via the [0x6040](#) object (control word) "Device Control" commands can be activated to set the controller to a certain device state:

Device control command	Bit pattern in control word							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
Shutdown	0	X	X	X	X	1	1	0
Switch on	0	X	X	X	0	1	1	1
Enable operation	0	X	X	X	1	1	1	1
Quick stop	0	X	X	X	X	0	1	X
Disable operation	0	X	X	X	0	1	1	1
Disable voltage	0	X	X	X	X	X	0	X
Reset fault	0 ↗ 1	X	X	X	X	X	X	X

X = status is not important



Tip!

The operating-mode-dependent control bits 4 ... 6 listed in the table are not important for the tripping of commands but only provide a better readability of the bit patterns.

Detailed information on the different commands can be obtained from the following subchapters.

3.7.2.1 Shutdown

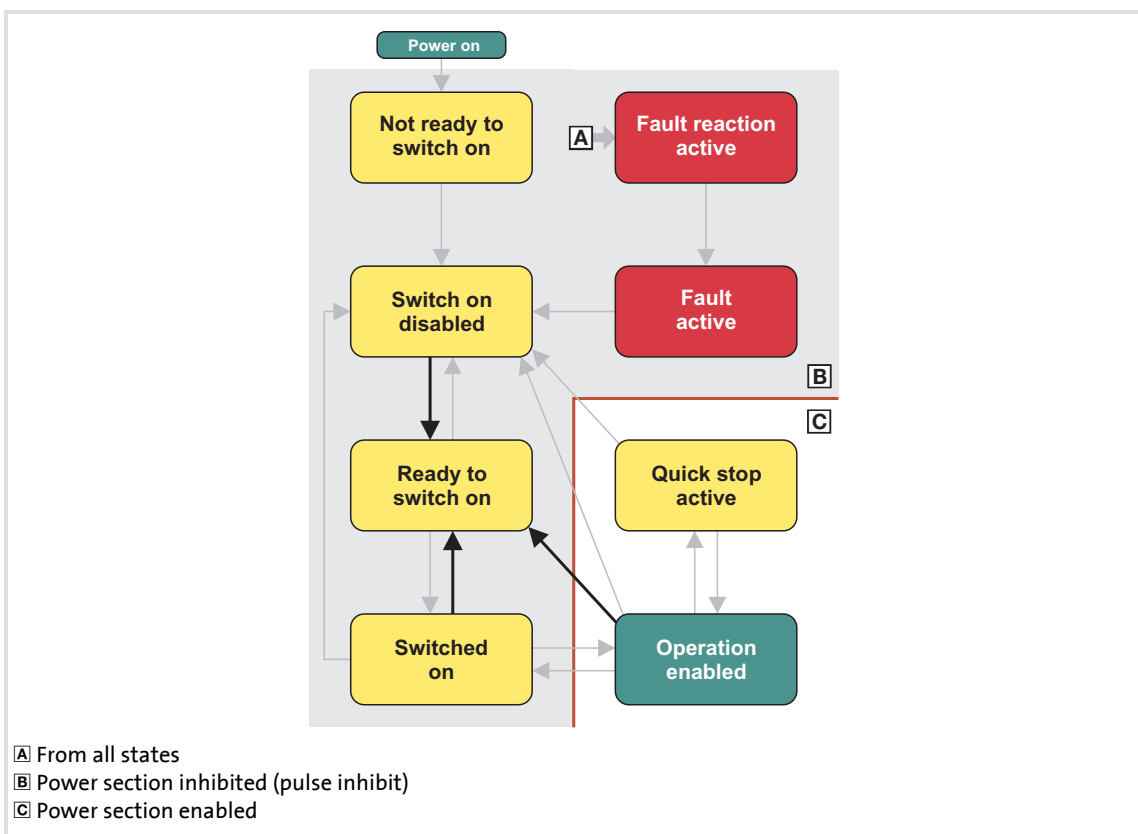
Bit pattern for "Shutdown" command in [0x6040](#) (control word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
0	X	X	X	X	1	1	0

This command changes the device status from "[Switch on disabled](#)" to "[Ready to switch on](#)".

If the pulse inhibit has already been deactivated and the device status of the controller is "[Operation enabled](#)", this command can be used to set the pulse inhibit again.

- If automatic brake operation is activated, the parameterised brake closing time is observed: The system waits until the brake is applied before the pulse inhibit is set.
- The motor becomes torqueless and coasts if it is not braked.
- The device state "[Switched on](#)" or "[Operation enabled](#)" changes back to the device state "[Ready to switch on](#)".



[3-2] Possible state changes through "Shutdown" command

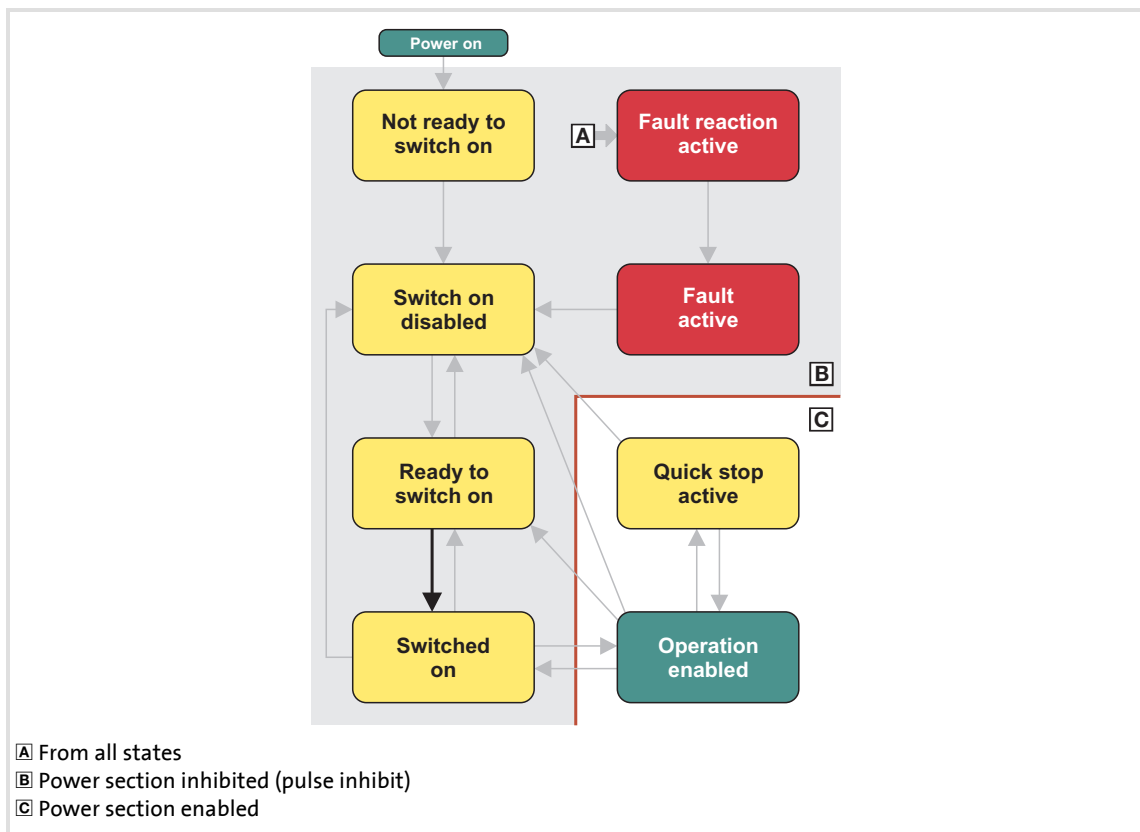
3.7.2.2 Switch on

Bit pattern for "Switch on" command in [0x6040](#) (control word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
0	X	X	X	X	1	1	1

This command serves to deactivate the switch on inhibit which is active after switch on or after the reset (acknowledgement) of an error.

► It is changed to the device state "[Switched on](#)":



[3-3] Possible state changes through "Switch on" command

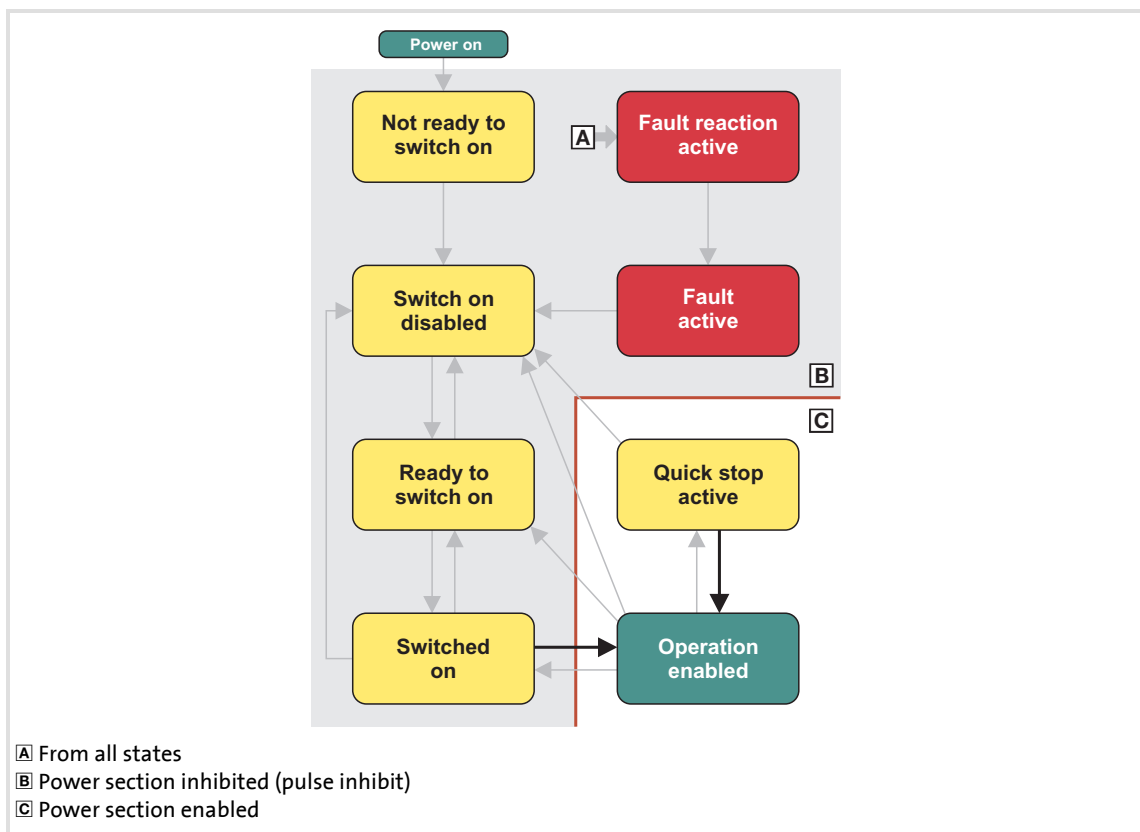
3.7.2.3 Enable operation

Bit pattern for "Enable operation" command in [0x6040](#) (control word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
0	X	X	X	1	1	1	1

This command serves to enable the operation and stop an active quick stop again.

- It is changed to the device state "[Operation enabled](#)".



[3-4] Possible state change through "Enable operation" command

3.7.2.4 Quick stop

Bit pattern for "quick stop" command in [0x6040](#) (control word):

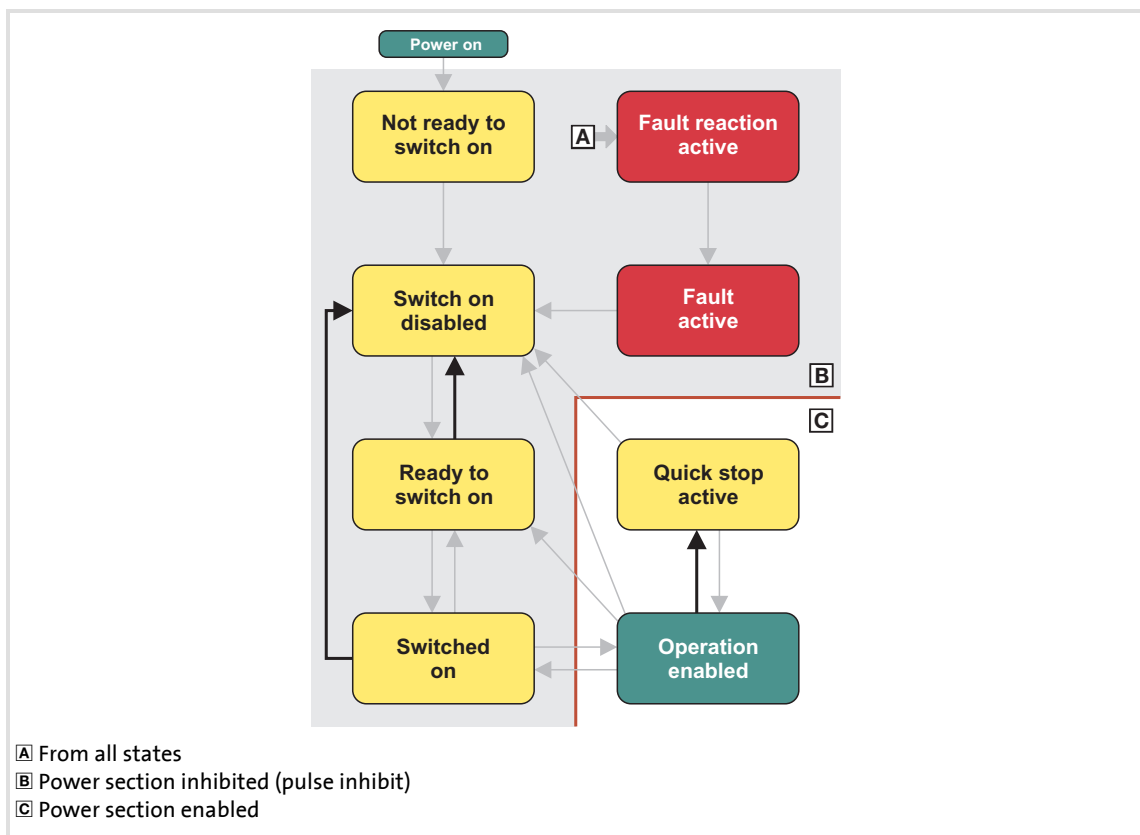
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
0	X	X	X	X	0	1	X

This command serves to activate [Quick stop](#) when the operation is enabled.

- The drive is braked to standstill irrespective of the defined setpoint within the deceleration time set for [Quick stop](#).
- It is changed to the device state "[Quick stop active](#)".

If the operation is not enabled yet, this command will cause the switch on inhibit to be set again instead.

- At the same time the pulse inhibit is set (unless it is set already), i.e. the pulses of the controller are inhibited.
- If automatic brake operation is activated, the parameterised brake closing time is observed: The system waits until the brake is applied before the pulse inhibit is set.
- The motor becomes torqueless and coasts if it is not braked.
- It is changed back to the device state "[Switch on disabled](#)".



[3-5] Possible state changes through "Quick stop" command

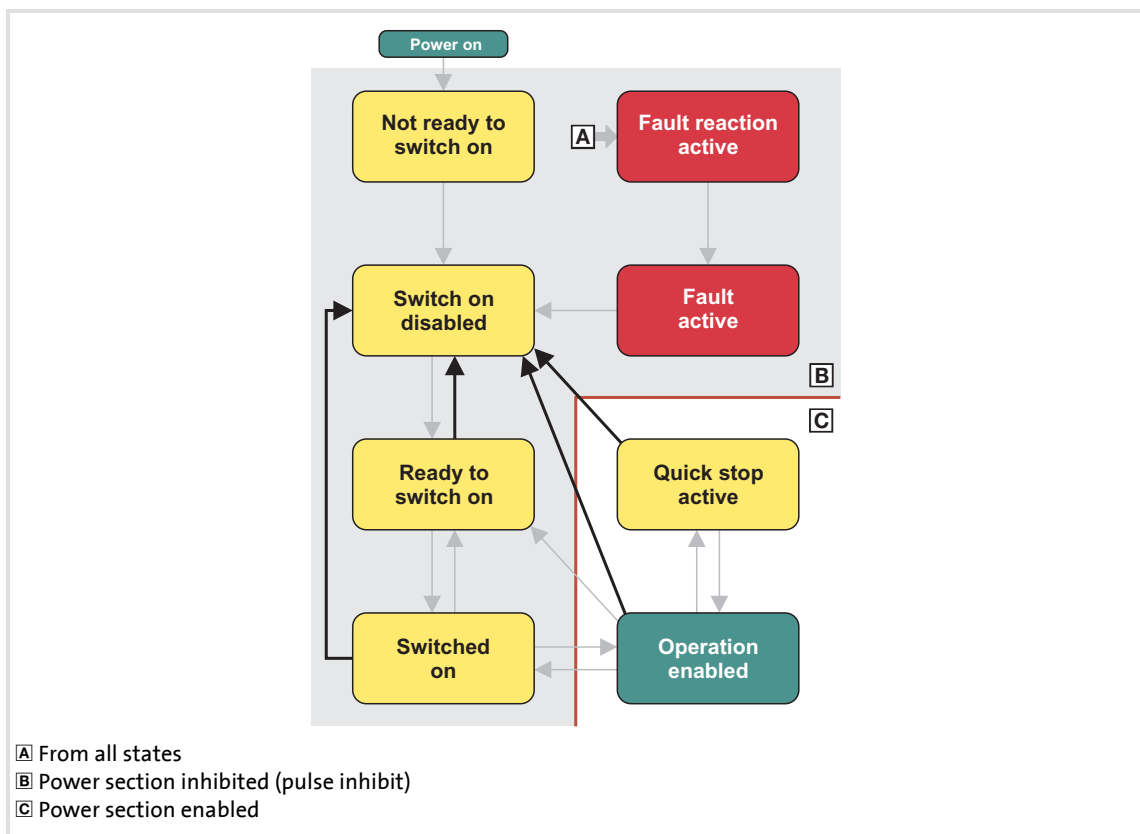
3.7.2.6 Disable voltage

Bit pattern for "Disable voltage" command in [0x6040](#) (control word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
0	X	X	X	X	X	0	X

This command serves to inhibit the output stages of the controller again.

- The pulse inhibit is set (unless they are set already), i.e. the pulses of the controller are inhibited.
- The motor becomes torqueless and coasts if it is not braked.
- The switch on inhibit is set again.
- It is changed back to the device state "[Switch on disabled](#)".



[3-7] Possible state change through "Disable voltage" command

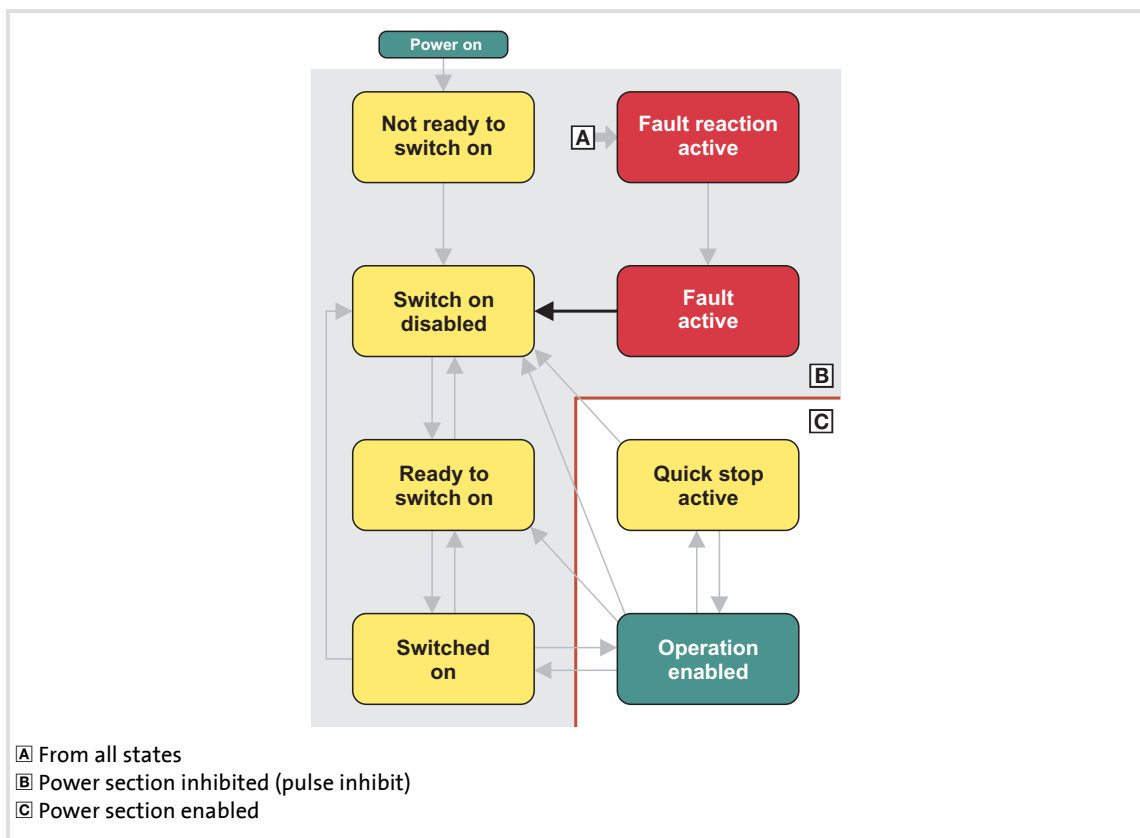
3.7.2.7 Reset fault

Bit pattern for "Reset fault" command in [0x6040](#) (control word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset fault	Operating mode-dependent control bits			Enable operation	Quick stop	Enable voltage	Switch on
0 ↗ 1	X	X	X	X	X	X	X

This command serves to acknowledge an existing error message if the cause of the error has been eliminated.

- The pulse inhibit remains set.
- It is changed to the device state "[Switch on disabled](#)", i.e. the switch on inhibit is active.



[3-8] Possible state changes through "Reset fault" command

3.7.3 Device statuses

The current device state of the drive can be read via the [0x6041](#) object (status word):

Device control commands	Bit pattern in the status word							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
Not ready to switch on	X	0	X	X	0	0	0	0
Switch on disabled	X	1	X	X	0	0	0	0
Ready to switch on	X	0	1	X	0	0	0	1
Switched on	X	0	1	X	0	0	1	1
Operation enabled	X	0	1	X	0	1	1	1
Quick stop active	X	0	0	X	0	1	1	1
Fault response active	X	0	X	X	1	1	1	1
Fault	X	0	X	X	1	0	0	0

X = status is not important



Tip!

Bit 4 ("Voltage enabled") and bit 7 ("Warning") listed in the table are not important for the device state but only provide a better readability of the bit patterns.

Detailed information on the different device states can be obtained from the following subchapters.

3.7.3.1 Not ready to switch on

Bit pattern for "Not ready to switch on" device state in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	X	X	0	0	0	0

This is the controller status directly after switching on the supply voltage.

- ▶ In this device state the operating system is initialised.
- ▶ The monitorings are not active yet.
- ▶ Communication is not possible yet.
- ▶ The controller cannot be parameterised yet and no device commands can be executed.
- ▶ The motor brake, if available, is closed.
- ▶ The operation is inhibited.



Note!

When the device initialisation is completed, the device state is automatically changed to "[Switch on disabled](#)".

3.7.3.2 Switch on disabled

Bit pattern for device state "Switch on disabled" in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	1	X	X	0	0	0	0

This is the controller's status after the device has been initialised successfully.

- ▶ The process data monitoring is active.
- ▶ Communication is possible.
- ▶ DC-bus voltage is available.
- ▶ The controller can be parameterised.
- ▶ The motor brake, if available, is closed.
- ▶ The operation is inhibited.

3.7.3.3 Ready to switch on

Bit pattern for "Ready to switch on" device state in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	1	X	0	0	0	1

This is the device status of the controller after the device has been initialised successfully and after the controller has received the "[Shutdown](#)" command.

- ▶ The process data monitoring is active.
- ▶ Communication is possible.
- ▶ DC-bus voltage is available.
- ▶ The controller can be parameterised.
- ▶ The motor brake, if available, is closed.
- ▶ The operation is inhibited.



Note!

It is also changed to this device state if in the device states "[Switched on](#)" or "[Operation enabled](#)" the "[Shutdown](#)" command is tripped.

The change to the sequential state "[Switched on](#)" is caused by the tripping of the "[Switch on](#)" command.

3.7.3.4 Switched on

Bit pattern for the "Switched on" device state in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	1	X	0	0	1	1

This is the controller's status after being in the "[Ready to switch on](#)" device state and receiving the "[Switch on](#)" command.

- ▶ Process data monitoring is active.
- ▶ Communication is possible.
- ▶ DC-bus voltage is available.
- ▶ The controller can be parameterised.
- ▶ The motor brake, if available, is closed.
- ▶ The operation is inhibited.

**Note!**

The change to the device state "[Operation enabled](#)" and thus the enable of the operation is caused by the tripping of the "[Enable operation](#)" command.

3.7.3.5 Operation enabled

Bit pattern for the "Operation enabled" device state in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	1	X	0	1	1	1

This device state represents the normal operation, i.e. the operation mode selected is enabled and no errors occur.

- ▶ Only the parameters of the controller can be changed which do not require controller inhibit.
- ▶ The motor brake, if available, is opened.
- ▶ The motor has torque.

3.7.3.6 Quick stop active

Bit pattern for device state "Quick stop active" in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	0	X	0	1	1	1

This device state is active if [Quick stop](#) is executed or active.

- ▶ Only the parameters of the controller can be changed which do not require controller inhibit.
- ▶ The motor brake, if available, is opened.
- ▶ The motor has torque.



Note!

The "[Enable operation](#)" command serves to deactivate an active quick stop again.

3.7.3.7 Fault response active

Bit pattern for "Fault response active" device command in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	X	X	1	1	1	1

If a minor error occurs, i.e. the drive is still able to operate the motor in a controlled manner, this device state becomes active and the drive is braked to standstill irrespective of the defined setpoint within the deceleration time set in [Quick stop](#).

- ▶ Only the parameters of the controller can be changed which do not require controller inhibit.
- ▶ The motor brake, if available, is opened.
- ▶ The operation is enabled, the motor has torque.



Note!

After the "[Quick stop](#)" basic function has been executed, i.e. the drive is at standstill, it is automatically changed to the "[Fault](#)" device state.

The "[Fault](#)" device state can only be left using the "[Reset fault](#)" command if the error cause is removed.

3.7.3.8 Fault

Bit pattern for the "Fault" device state in [0x6041](#) (status word):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on
X	0	X	X	1	0	0	0

If a grave error occurs, i.e. the drive is not able to operate the motor in a controlled manner anymore, the drive is switched off immediately and this device state becomes active.

- ▶ The pulse inhibit is set, i.e. the pulses of the controller are inhibited.
- ▶ The motor is torqueless.
- ▶ The motor brake, if available, is closed.
- ▶ The operation is inhibited.
- ▶ The controller can be parameterised.

**Note!**

This device state can only be left using the "[Reset fault](#)" command if the error cause is removed.

3.7.4 Operating mode changeover

The drive behaviour depends on the operating mode selected. The operating mode changeover is executed via the [0x6060](#) object (mode of operation) in the communication states *PREOPERATIONAL* or *OPERATIONAL* by the master control. Access is possible via SDO or PDO.

- ▶ Only one operating mode at a time can be active.
- ▶ Except for the "Homing Mode" the operating modes differ in the way the setpoints are selected.
- ▶ The following table shows the permissible operating modes with the corresponding object value:

Operating mode	Object value	Setpoint selection
Homing mode	6	- (Homing function)
Interpolated position mode	7	Position
Cyclic synchronous position mode (IEC 61800-7)	8	Position
Cyclic synchronous velocity mode (IEC 61800-7)	9	Speed
Cyclic synchronous torque mode (IEC 61800-7)	10	Torque
-	All other values	- (Standstill)



Tip!

The currently set operating mode can be read via the [0x6061](#) object (mode of operation display). Here, access is also possible via SDO or PDO.

Except for the source of the setpoint selection, the operating mode "[Interpolated position mode](#)" corresponds to the operating mode "Cyclic synchronous position mode".

3.7.5 Stop

The standard stop of the drive will be automatically activated by the internal state machine if the operating mode selected in the [0x6060](#) object (mode of operation) is deactivated again and the drive is not yet at standstill.

- ▶ The drive is braked to standstill via a parameterisable deceleration ramp.
 - While the drive is braked to standstill, C02530 displays the "Drive is stopped" function state.
 - If meanwhile another basic drive function is activated, this basic function will take over control of the drive from the current speed on and the function state "Drive is stopped" is abandoned.
 - If the drive is at standstill, C02530 will display the basic state "Drive at standstill".
- ▶ An acceleration phase active at the time of activating the stopping process is considered by the standard stop, i.e. the current acceleration is first led to "0" with the parameterised S-ramp time before the real deceleration process starts.
- ▶ If the controller is enabled while the shaft is coasting (controller inhibit and pulse inhibit are deactivated), the drive will be braked from the current speed to standstill.

Lenze parameters for the "Stop" basic function:

Parameter		Lenze setting	
		Value	Unit
C02610	Deceleration time for stop	0.000	s
C02612	Ref. for decel. time of stop	Motor reference speed (C00011)	

3.7.6 Quick stop

Unlike the [Stop](#) function, quick stop (QSP) is required for a stop in the event of an error. If quick stop is activated, the drive will be braked to standstill irrespective of the defined setpoint within the deceleration time set.



Note!

During quick stop, the drive carries out the setpoint generation and does not follow the setpoint anymore defined by the master control!

If several drives carry out a coordinated motion by means of actual value transfer, the quick stop function should only be used for the motion master (master drive) in order to maintain the coordination.



Tip!

The quick stop can be set for many monitoring functions as an error response as well ("quick stop by trouble").

The source which activated the quick stop function is shown bit-coded in C00159.

Activation of quick stop by the master control

Quick stop can be activated by the master control using the "[Quick stop](#)" command when the operation is enabled.

- ▶ The device state "[Operation enabled](#)" is changed to device state "[Quick stop active](#)".
- ▶ The active quick stop function can be deactivated again using the "[Enable operation](#)" command.

Lenze parameters for the "Quick stop" basic function:

Parameter		Lenze setting	
		Value	Unit
C00105	Quick stop decel. time	0.000	s
C00106	Quick stop S-ramp time	0.00	%
C00107	Ref. - quick stop decel. time	Motor reference speed (C00011)	

3.7.7 Controller inhibit

Setting the controller inhibit inhibits the power stages in the controller and resets the speed, current, and position controller of the motor control.

- ▶ The controller can be inhibited by different sources, e.g.
 - by the master control using the "[Shutdown](#)" command.
 - using the RFR digital input.
 - using the C00002 = "41: Inhibit controller" device command.
- ▶ The bit code under C00158 shows the source that inhibited the controller.

3.8 Factor group

The objects described in this chapter serve to scale physical values.

3.8.1 Object description

Objects described in this chapter:

Index	Name	Data type	Object type
0x607E	Polarity	UNSIGNED_32	VAR
0x6089	Position notation index	INTEGER_8	VAR
0x608A	Position dimension index	UNSIGNED_8	VAR
0x608B	Velocity notation index	INTEGER_8	VAR
0x608C	Velocity dimension index	UNSIGNED_8	VAR
0x608D	Acceleration notation index	INTEGER_8	VAR
0x608E	Acceleration dimension index	UNSIGNED_8	VAR
0x608F	Position encoder resolution	UNSIGNED_32	ARRAY
0x6090	Velocity encoder resolution	UNSIGNED_32	ARRAY
0x6091	Gear ratio	UNSIGNED_32	ARRAY
0x6092	Feed constant	UNSIGNED_32	ARRAY
0x6093	Position factor	UNSIGNED_32	ARRAY
0x6094	Velocity encoder factor	UNSIGNED_32	ARRAY
0x6095	Velocity factor 1	UNSIGNED_32	ARRAY
0x6096	Velocity factor 2	UNSIGNED_32	ARRAY
0x6097	Acceleration factor	UNSIGNED_32	ARRAY

0x607E - Polarity

Index Name:	Data type: UNSIGNED_8
0x607E Polarity	Code: C03583

Mounting directions

Subindex	Name
▸ 0x607E/1	Polarity of motor
▸ 0x607E/2	Polarity of load

Index Name:	Data type: UNSIGNED_32
0x607E/1 Polarity of motor	Code: C02527

Motor mounting direction

- Direct mapping of the Lenze code C02527 (motor mounting direction).

Setting range (min. value unit max. value)	Lenze setting
0 1	1
☒ Read access ☒ Write access ☒ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index Name:	Data type: UNSIGNED_32
0x607E/2 Polarity of load	Code: C02529

Position encoder mounting dir.

- Direct mapping of the Lenze code C02529 (position encoder mounting direction).

Setting range (min. value unit max. value)	Lenze setting
0 1	1
☒ Read access ☒ Write access ☒ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6089 - Position notation index

Index Name:	Data type: INTEGER_8
0x6089 Position notation index	Code: C03550

Multiplier for position values (10 exp value, decimal point)

Setting range (min. value unit max. value)	Lenze setting
0 0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x608A - Position dimension index

Index Name:	Data type: UNSIGNED_8
0x608A Position dimension index	Code: C03551

Unit for position values

Setting range (min. value unit max. value)	Lenze setting
0 0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

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Parameter setting & configuration

Factor group

0x608B - Velocity notation index

Index Name:		Data type: INTEGER_8	
0x608B Velocity notation index		Code: C03552	
Multiplier for speed values (10 exp value, decimal point)			
Setting range (min. value unit max. value)		Lenze setting	
0		0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x608C - Velocity dimension index

Index Name:		Data type: UNSIGNED_8	
0x608C Velocity dimension index		Code: C03553	
Unit for speed values			
Setting range (min. value unit max. value)		Lenze setting	
0		0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x608D - Acceleration notation index

Index Name:		Data type: INTEGER_8	
0x608D Acceleration notation index		Code: C03554	
Multiplier for acceleration values (10 exp value, decimal point)			
Setting range (min. value unit max. value)		Lenze setting	
0		0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x608E - Acceleration dimension index

Index Name:		Data type: UNSIGNED_8	
0x608E Acceleration dimension index		Code: C03555	
Unit for acceleration values			
Setting range (min. value unit max. value)		Lenze setting	
0		0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x608F - Position encoder resolution

Index Name:	Data type: UNSIGNED_32
0x608F Position encoder resolution	Code: C03556

Resolution of the position encoder

Subindex	Name
▸ 0x608F/1	Encoder increments
▸ 0x608F/2	Motor revolution

Index Name:	Data type: UNSIGNED_32
0x608F/1 Encoder increments	Code: C03557

Incremental encoder pulses

Setting range (min. value unit max. value)	Lenze setting
65536 inc 65536	65536 inc
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index Name:	Data type: UNSIGNED_32
0x608F/2 Motor revolution	Code: C03558

Number of motor revolutions

Setting range (min. value unit max. value)	Lenze setting
1 rev 1	1 rev
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6090 - Velocity encoder resolution

Index Name:	Data type: UNSIGNED_32
0x6090 Velocity encoder resolution	Code: C03559

Resolution of the speed encoder

Subindex	Name
▸ 0x6090/1	Encoder increments per second
▸ 0x6090/2	Motor revolutions per second

Index Name:	Data type: UNSIGNED_32
0x6090/1 Encoder increments per second	Code: C03560

Incremental encoder pulses per second

Setting range (min. value unit max. value)	Lenze setting
65536 inc/s 65536	65536 inc/s
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index Name:	Data type: UNSIGNED_32
0x6090/2 Motor revolutions per second	Code: C03561

Number of motor revolutions per second

Setting range (min. value unit max. value)	Lenze setting
1 rev/s 1	1 rev/s
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

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Parameter setting & configuration

Factor group

0x6091 - Gear ratio

Index Name: 0x6091 Gear ratio		Data type: UNSIGNED_32 Code: C03562
Gearbox factor		
Subindex	Name	
▶ 0x6091/1	Motor revolutions	
▶ 0x6091/2	Shaft revolutions	

Index Name: 0x6091/1 Motor revolutions			Data type: UNSIGNED_32 Code: C02520
Number of drive shaft revolutions			
• Direct mapping of the Lenze code C02520 (gearbox factor numerator: motor).			
Setting range (min. value unit max. value)			Lenze setting
1	rev	2147483647	1 rev
☒ Read access ☒ Write access ☒ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index Name: 0x6091/2 Shaft revolutions			Data type: UNSIGNED_32 Code: C02521	
Number of output shaft revolutions				
• Direct mapping of the Lenze code C02521 (gearbox factor denominator: motor).				
Setting range (min. value unit max. value)			Lenze setting	
1	rev	2147483647	1 rev	
☒ Read access	☒ Write access	☒ CINH	☐ PLC-STOP	☐ PDO_MAP_RX
☐ PDO_MAP_TX				

0x6092 - Feed constant

Index | Name:

0x6092 | Feed constant

Data type: UNSIGNED_32

Code: [C03565](#)

Feed constant

- The feed constant corresponds to the motion of the machine at one revolution of the gearbox output shaft.

Subindex	Name
► 0x6092/1	Feed
► 0x6092/2	Shaft revolutions

Index | Name:

0x6092/1 | Feed

Data type: UNSIGNED_32

Code: C02524

Feed

- Direct mapping of the Lenze code C02524 (feed constant).

Setting range (min. value unit max. value)			Lenze setting
1	pos unit	2147483647	65536 pos unit
☒ Read access ☒ Write access ☒ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index | Name:

0x6092/2 | Shaft revolutions

Data type: UNSIGNED_32

Code: [C03567](#)

Number of output shaft revolutions

Setting range (min. value unit max. value)			Lenze setting
1	rev	1	1 rev
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

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Parameter setting & configuration

Factor group

0x6093 - Position factor

Index Name: 0x6093 Position factor		Data type: UNSIGNED_32 Code: C03568	
Factor for position conversions			
• Application unit → internal unit • Internal unit → application unit			
Subindex	Name		
▶ 0x6093/1	Numerator		
▶ 0x6093/2	Divisor		

Index Name: 0x6093/1 Numerator		Data type: UNSIGNED_32 Code: C03569	
Setting range (min. value unit max. value)		Lenze setting	
1		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index Name: 0x6093/2 Divisor		Data type: UNSIGNED_32 Code: C03570	
Setting range (min. value unit max. value)		Lenze setting	
1		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6094 - Velocity encoder factor

Index Name: 0x6094 Velocity encoder factor		Data type: UNSIGNED_32 Code: C03571	
Factor for speed conversions			
• Application unit → internal unit • Internal unit → application unit			
Subindex	Name		
▶ 0x6094/1	Numerator		
▶ 0x6094/2	Divisor		

Index Name: 0x6094/1 Numerator		Data type: UNSIGNED_32 Code: C03572	
Setting range (min. value unit max. value)		Lenze setting	
1		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index Name: 0x6094/2 Divisor		Data type: UNSIGNED_32 Code: C03573	
Setting range (min. value unit max. value)		Lenze setting	
1		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6095 - Velocity factor 1

Index | Name: **0x6095 | Velocity factor 1** Data type: UNSIGNED_32
Code: [C03574](#)

Factor for speed conversions

- Application unit → internal unit
- Internal unit → application unit

Subindex	Name
▸ 0x6095/1	Numerator
▸ 0x6095/2	Divisor

Index | Name: **0x6095/1 | Numerator** Data type: UNSIGNED_32
Code: [C03575](#)

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index | Name: **0x6095/2 | Divisor** Data type: UNSIGNED_32
Code: [C03576](#)

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6096 - Velocity factor 2

Index | Name: **0x6096 | Velocity factor 2** Data type: UNSIGNED_32
Code: [C03577](#)

Factor for speed conversions

- Application unit → internal unit
- Internal unit → application unit

Subindex	Name
▸ 0x6096/1	Numerator
▸ 0x6096/2	Divisor

Index | Name: **0x6096/1 | Numerator** Data type: UNSIGNED_32
Code: [C03578](#)

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index | Name: **0x6096/2 | Divisor** Data type: UNSIGNED_32
Code: [C03579](#)

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

0x6097 - Acceleration factor

Index | Name: **0x6097 | Acceleration factor** Data type: UNSIGNED_32
Code: [C03580](#)

Factor for acceleration conversions

- Application unit → internal unit
- Internal unit → application unit

Subindex	Name
▸ 0x6097/1	Numerator
▸ 0x6097/2	Divisor

Index | Name: **0x6097/1 | Numerator** Data type: UNSIGNED_32
Code: [C03581](#)

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index | Name: **0x6097/2 | Divisor** Data type: UNSIGNED_32
Code: [C03582](#)

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

3.9 Homing mode

In this operating mode, homing can be executed to transmit the measuring system of the machine to the controller within the physically possible travel range.



Danger!

During homing operations, specially assigned profile parameters are effective. If these parameters are not set correctly, the drive may execute uncontrolled movements!



Note!

Normally homing is only required once during commissioning of systems for which the machine cycle can be represented in the display area of the encoder, e.g. if multiturn absolute value encoders or singleturn absolute value encoders/resolvers are used during the machine cycle on one motor revolution.

- The encoder position is stored safe against mains failure in the memory module and is therefore known to the drive control even after the mains has been switched.
- Another reference setting is only required in the case of another commissioning or in the event of service (e.g. when drive components are replaced).

Selection of operating mode

The "Homing" operating mode is selected via the [0x6060](#) object (mode of operation) using the value "6".

3.9.1 Input and output data

Input data

Index	Name	Data type	Object type
0x6040	Control word	UNSIGNED_16	VAR
0x6098	Homing method	INTEGER_8	VAR
0x55AF	Homing mode	UNSIGNED_32	VAR
0x607C	Home offset	UNSIGNED_32	VAR
0x6099	Homing speeds	UNSIGNED_32	ARRAY
0x609A	Homing acceleration	UNSIGNED_32	ARRAY
0x60FB/7	Homing stop mode	UNSIGNED_32	VAR

Output data

Index	Name	Data type	Object type
0x6041	Status word	UNSIGNED_16	VAR

Grayed out = read access only

3.9.2 Object description

- ▶ All objects are Lenze-specific.
- ▶ The [0x609A](#) object (homing acceleration) is executed as an array according to the [0x6099](#) object (homing speeds).
- ▶ All CiA402 homing modes are supported.
- ▶ The homing modes of the "Homing" basic function are supported 1:1.

Objects described in other chapters:

Index	Name	Data type	Object type
▶ Device control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
▶ Position control function			
0x60FB	Position control parameter set	UNSIGNED_32	RECORD
	1: Load home position	INTEGER_32	
	7: Homing stop mode	UNSIGNED_32	
Grayed out = read access only			

Objects described in this chapter:

Index	Name	Data type	Object type
0x607C	Home offset	UNSIGNED_32	VAR
0x6098	Homing method	INTEGER_8	VAR
0x6099	Homing speeds	UNSIGNED_32	VAR
0x609A	Homing acceleration	UNSIGNED_32	VAR

0x607C - Home position

Index Name: 0x607C Home position			Data type: INTEGER_32 Code: C02642
Position which is set as current position during a reference search in the home position or when setting the reference.			
Direct illustration of the Lenze code C02642 (reference position).			
Setting range (min. value unit max. value)			Lenze setting
-2147483647	pos unit	2147483647	0 pos unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6098 - Homing method

Index | Name:

0x6098 | Homing method

Data type: INTEGER_8

Code: C03601

All CiA402 homing methods are supported.

If "0" is selected, the homing modes will be selected via the 0x55AF (Lenze code C02640) manufacturer-specific object instead.

Selection list (Lenze setting printed in bold)		Information
-2	Lenze cw_Trq_Lim	"Homing to limit stop" (Lenze homing mode 14)
-1	Lenze ccw_Trq_Lim	"Homing to limit stop" (Lenze homing mode 15)
0	Lenze homing mode	The homing is done according to the Lenze homing mode selected in 0x55AF (Lenze code C02640)
1	Homing method 01 acc. to DS401	Homing methods according to CiA402
...	Homing method ... acc. to DS401	
35	DS401 homing method 35	

☒ Read access
 ☒ Write access
 ☐ CINH
 ☐ PLC-STOP
 ☐ PDO_MAP_RX
 ☐ PDO_MAP_TX

0x6099 - Homing speeds

Index | Name:

0x6099 | Homing speeds

Data type: UNSIGNED_32

Code: [C03612](#)

For the reference search two speeds can be parameterised to reduce homing time and increase accuracy:

Subindex	Name
▶ 0x6099/1	Speed during search for switch
▶ 0x6099/2	Speed during search for zero

Index | Name:

0x6099/1 | Speed during search for switch

Data type: UNSIGNED_32

Code: C02644

Speed 1 which causes a quick approach of the limit switch/reference switch (depending on the mode selected).

- Direct mapping of the Lenze code C02644 (homing: speed 1).

Setting range (min. value unit max. value)			Lenze setting
0	vel unit	2147483647	0 vel unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index | Name:

0x6099/2 | Speed during search for zero

Data type: UNSIGNED_32

Code: C02646

Speed 2 which causes the touch probe sensor to be approached slower (but more precisely) after reversing on the limit switch/enabling the reference switch and the subsequent positioning to the target position.

- With "0" setting, the reference search is only executed with speed 1/acceleration 1.
- Direct mapping of the Lenze code C02646 (homing: speed 2).

Setting range (min. value unit max. value)			Lenze setting
0	vel unit	2147483647	0 vel unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x609A - Homing acceleration

Index | Name: **0x609A | Homing acceleration** Data type: UNSIGNED_32
Code: [C03615](#)

For the reference search two accelerations (and decelerations) can be parameterised to reduce homing time and increase accuracy:

Subindex	Name
▸ 0x609A/1	Acc. during search for switch
▸ 0x609A/2	Acc. during search for zero

Index | Name: **0x609A/1 | Acc. during search for switch** Data type: UNSIGNED_32
Code: C02645

Acceleration 1 (and deceleration 1) which causes a quick approach of the limit switch/reference switch (depending on the mode selected).

- Direct mapping of the Lenze code C02645 (homing: acceleration 1).

Setting range (min. value unit max. value)			Lenze setting
0	acc unit	2147483647	0 acc unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index | Name: **0x609A/2 | Acc. during search for zero** Data type: UNSIGNED_32
Code: C02647

Acceleration 2 (and deceleration 2) which causes the touch probe sensor to be approached slower (but more precisely) after reversing on the limit switch/enabling the reference switch and the subsequent positioning to the target position.

- Direct mapping of the Lenze code C02647 (homing: acceleration 2).

Setting range (min. value unit max. value)			Lenze setting
0	acc unit	2147483647	0 acc unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

3.9.3 Behaviour of the home position after mains switching

If the reference position/information is to remain available after mains switching, the setting C02652 = "1: Received" must be selected. Furthermore, the max. permissible angle of rotation of the encoder, which can be adjusted in C02653, must be observed.



Note!

When resolvers or single-turn absolute value encoders are used and the mains is switched off (24 V supply off), the encoder may only be moved by ½ revolution since otherwise the home position will get lost due to the ambiguity of the encoder information.

3.9.4 Homing mode

The reference (e.g. zero position of the drive axis in the machine measuring system) can be defined by reference search or reference setting.

- ▶ In the event of a reference search, the drive travels according to the defined homing mode to detect the reference in the measuring system independently.
- ▶ During reference setting, the motor can be homed manually also when the motor is at standstill. The measuring system is set according to the reference position parameterised in the object [0x607C](#) (home offset).



Tip!

A reference search is mainly used for continuously running systems, or if the traversing range or machine cycle of the drive cannot be represented in the display area of the encoder, e.g. if incremental encoders are used at the motor, or singleturn absolute value encoders or resolvers are used at the gearbox.

A reference is mainly set in systems/machines that bear the risk of collisions, or every time homing cannot be executed (e.g. in the case of a cross cutter having material in the machine).

Definition of the homing mode

The homing modes of the "Homing" basic function are supported 1:1.

- ▶ The homing modes are selected via the 0x55AF (Lenze code C02640) manufacturer-specific object.
- ▶ Alternatively, all CiA402 homing methods are supported. The homing modes are specified via the object [0x6098](#) (homing method).
- ▶ A detailed process description of the CiA402 homing methods can be found in the chapter "[Overview of CiA402 homing modes](#)". ([82](#))

3.9.5 Home position & target position

If the reference position is set during reference search, this selected position in the machine measuring system corresponds to the value set in the object [0x607C](#) (home offset).

Afterwards, the drive proceeds according to the mode parameterised in the object [0x60FB/7](#) (homing stop mode). See the following chapter "[Drive behaviour after setting the home position](#)".

3.9.6 Drive behaviour after setting the home position

Use the object [0x60FB/7](#) (homing stop mode) to select the behaviour of the drive after setting the home position. The object [0x60FB/7](#) is directly mapped to the Lenze code C02641.

Selection "0: Move absolute on Target position"

After setting the home position ([0x607C](#)), the drive traverses to the absolute target position set in C02643.

This selection is the Lenze setting and corresponds to the behaviour known from the previous versions.

Selection "1: Move relative by Target position"

After setting the home position ([0x607C](#)), the drive traverses relative by the target position set in C02643.

Selection "2: Stop immediately"

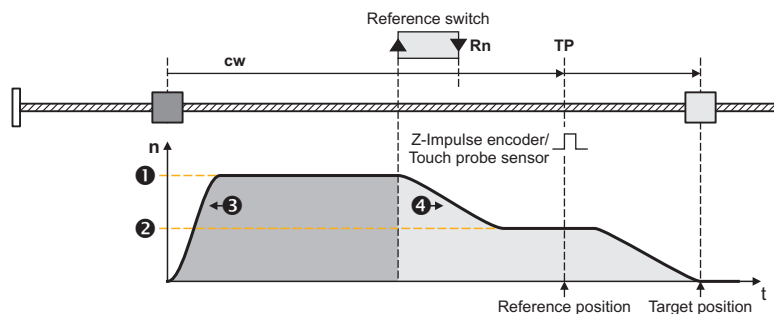
After setting the home position ([0x607C](#)), the drive stops immediately.

3.9.7 Profile data set change-over

For the reference search two profile data sets with different speeds and accelerations can be parameterised to reduce the homing time and increase the accuracy:

- ▶ With the profile data set 1 first the limit switch/reference switch (depending on the mode selected) is quickly approached.
- ▶ After reversing on the limit switch/tripping of the reference switch the profile data set 2 causes the touch probe sensor to be approached slower but more precisely and the subsequent positioning to the target position (C02643).

Profile data set 1		Profile data set 2	
① 0x6099/1	Speed 1	② 0x6099/2	Speed 2
③ 0x609A/1	Acceleration 1 (and deceleration 1)	④ 0x609A/2	Acceleration 2 (and deceleration 2)



[3-9] Example: profile data set changeover in the homing mode 0



Note!

The change-over to the profile data set 2 is only carried out if the speed 2 ([0x6099/2](#)) is set to > "0"!

In the Lenze setting ([0x6099/2](#) = "0") no change-over to the profile data set 2 takes place and the reference search and positioning to the target position is only executed with the profile parameters of the profile data set 1.

The following process descriptions of the homing modes give information about the time the change over to profile data set 2 takes place in the corresponding homing mode.

3.9.8 Overview of CiA402 homing modes

Short overview

CiA402 homing method	Evaluated signals/sensors			
	Encoder zero pulse/ touch probe sensor	Negative travel range limit switch	Positive travel range limit switch	Reference switch
-2	Positive direction of rotation at torque limit.			
-1	Negative direction of rotation at torque limit.			
01	☒	☒		
02	☒		☒	
03	☒			☒
04	☒			☒
05	☒			☒
06	☒			☒
07	☒		☒	☒
08	☒		☒	☒
09	☒		☒	☒
10	☒		☒	☒
11	☒	☒		☒
12	☒	☒		☒
13	☒	☒		☒
14	☒	☒		☒
15	Reserved: Homing is not carried out.			
16	Reserved: Homing is not carried out.			
17		☒		
18			☒	
19				☒
20				☒
21				☒
22				☒
23			☒	☒
24			☒	☒
25			☒	☒
26			☒	☒
27		☒		☒
28		☒		☒
29		☒		☒
30		☒		☒
31	Reserved: Homing is not carried out.			
32	Reserved: Homing is not carried out.			
33	☒			
34	☒			
35	Direct reference setting.			

**Note!****Profile data set change-over**

For the reference search two profile data sets with different speeds and accelerations can be parameterised to reduce the homing time and increase the accuracy.

► [Profile data set change-over](#) (81)

The following process descriptions give information about when exactly the change-over to profile data set 2 takes place in the corresponding homing mode.

If the speed 2 ([0x6099/2](#)) is set to = "0" (Lenze setting), no change-over to profile data set 2 takes place and the reference search and positioning to the target position is only executed with the profile parameters of profile data set 1.

**Note!****Drive behaviour after setting the reference**

Via the object [0x60FB/7](#) (homing stop mode) you can select how the drive behaves after setting the home position.

► [Drive behaviour after setting the home position](#) (80)

In the Lenze setting ([0x60FB/7](#) = "0") the drive behaves absolute to the target position set in C02643 like before.

Evaluation of switches/sensors

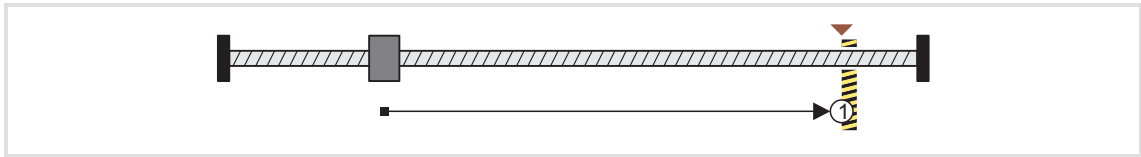
Depending on the mode selected, the following switches/sensors are evaluated during the reference search:

- Reference switch at the digital input DI2
- Positive travel range limit switch at the digital input DI3
- Negative travel range limit switch at the digital input DI4

Touch probe

For the homing modes with touch probe, the tripping event is an edge change at digital input DI1 (Lenze setting).

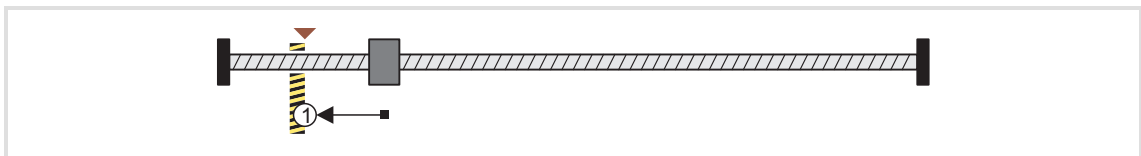
CiA402 Homing method -2



Process:

1. Movement in positive direction with reduced torque and profile data set 1.
2. "Homing to end stop": When the drive hits an end stop so that the torque limit set in C02649 is exceeded for the blocking time defined in C02650 the ([0x607C](#)) reference is set.
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

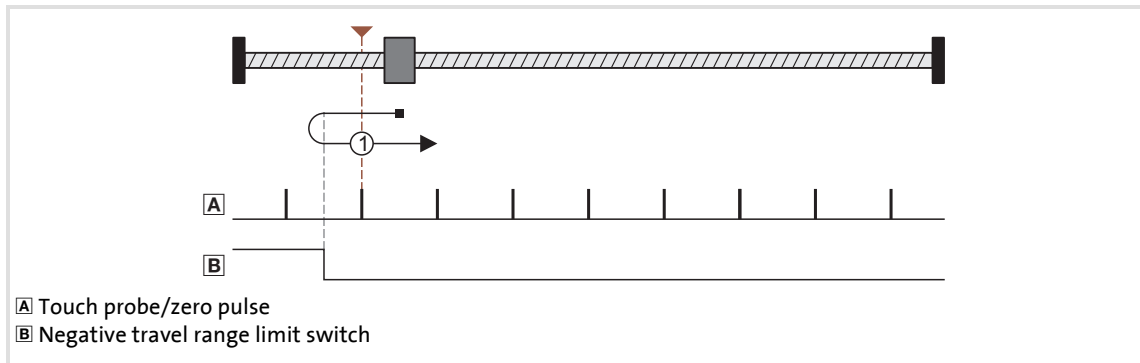
CiA402 Homing method -1



Process:

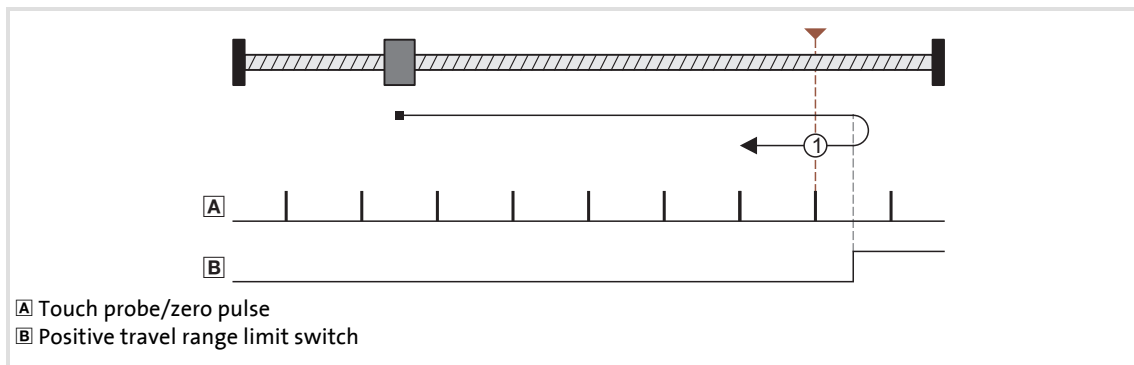
1. Movement in negative direction with reduced torque and profile data set 1.
2. "Homing to end stop": When the drive hits an end stop so that the torque limit set in C02649 is exceeded for the blocking time defined in C02650 the ([0x607C](#)) reference is set.
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 01

**Process:**

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch and change to profile data set 2.
3. Negative edge of the travel range limit switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

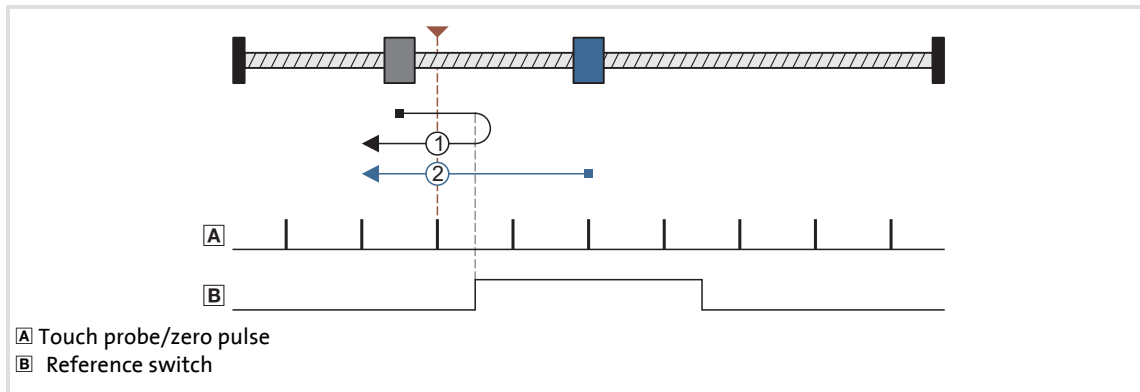
CiA402 Homing method 02



Process:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch and change to profile data set 2.
3. Negative edge of the travel range limit switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 03



Processes:

Case 1:

Axis has not yet activated reference switch:

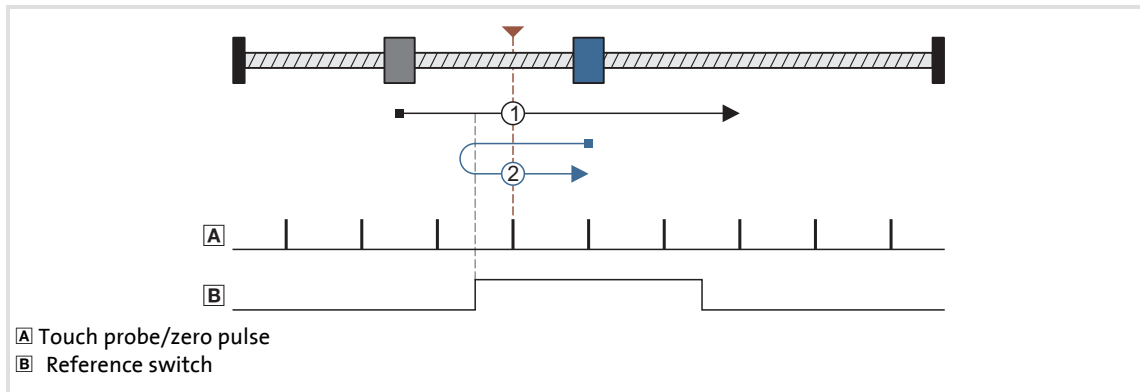
1. Movement in positive direction with profile data set 1.
2. Reversing with positive edge of the reference switch and change to profile data set 2.
3. Negative edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Negative edge of the reference switch activates touch probe detection.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 04



Processes:

Case 1:

Axis has not yet activated reference switch:

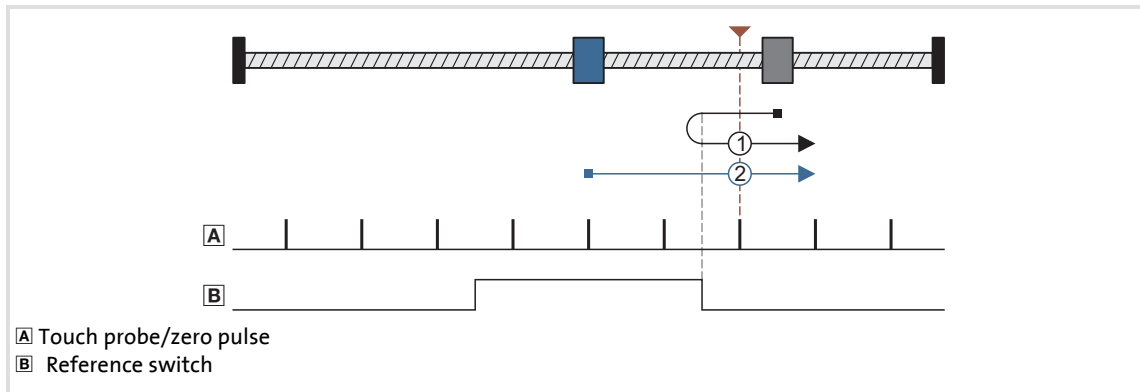
1. Movement in positive direction with profile data set 1.
2. Positive edge of the reference switch activates touch probe detection and change to profile data set 2.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. Positive edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 05



Processes:

Case 1:

Axis has not yet activated reference switch:

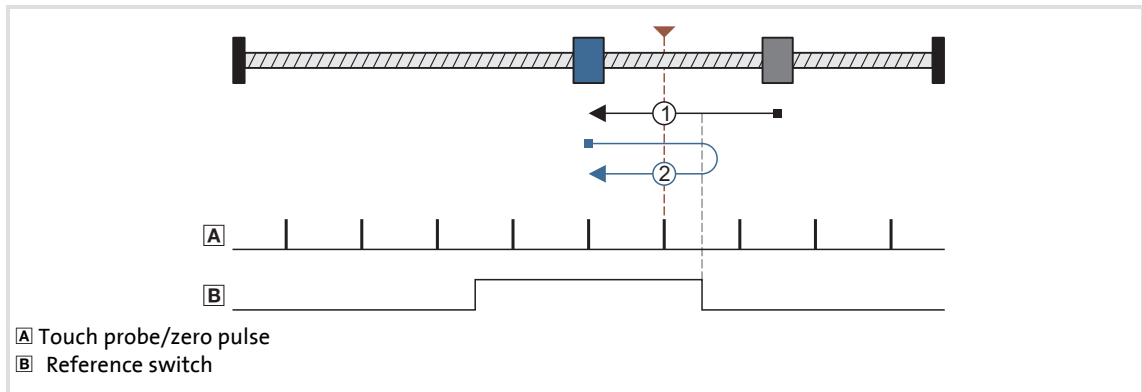
1. Movement in negative direction with profile data set 1.
2. Reversing with positive edge of the reference switch and change to profile data set 2.
3. Negative edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Negative edge of the reference switch activates touch probe detection.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 06



Processes:

Case 1:

Axis has not yet activated reference switch:

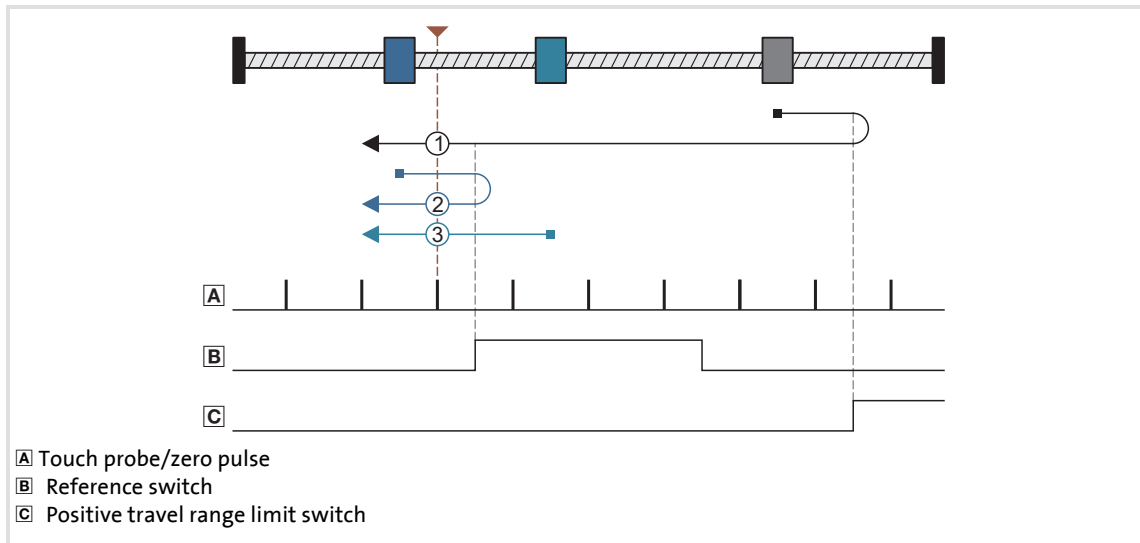
1. Movement in negative direction with profile data set 1.
2. Positive edge of the reference switch activates touch probe detection and change to profile data set 2.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. Positive edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 07



Processes:

Case 1:

Axis does not activate reference switch on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch.
3. Positive edge of the reference switch activates profile data set 2.
4. Negative edge of the reference switch activates touch probe detection.
5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

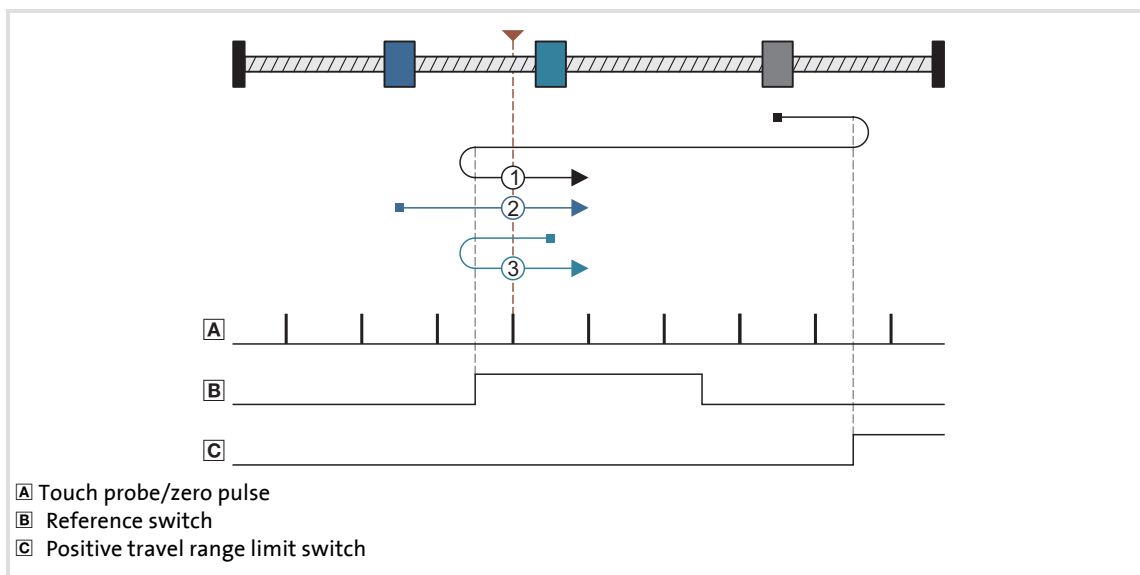
Axis activates reference switch first on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Reversing with positive edge of the reference switch and change to profile data set 2.
3. Negative edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 3: Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Negative edge of the reference switch activates touch probe detection.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/Z](#) = "0").

CiA402 Homing method 08



Processes:

Case 1: Axis does not activate reference switch on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch.
3. Positive edge of the reference switch activates profile data set 2.
4. Reversing with negative edge of reference switch.
5. Positive edge of the reference switch activates touch probe detection.
6. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
7. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/Z](#) = "0").

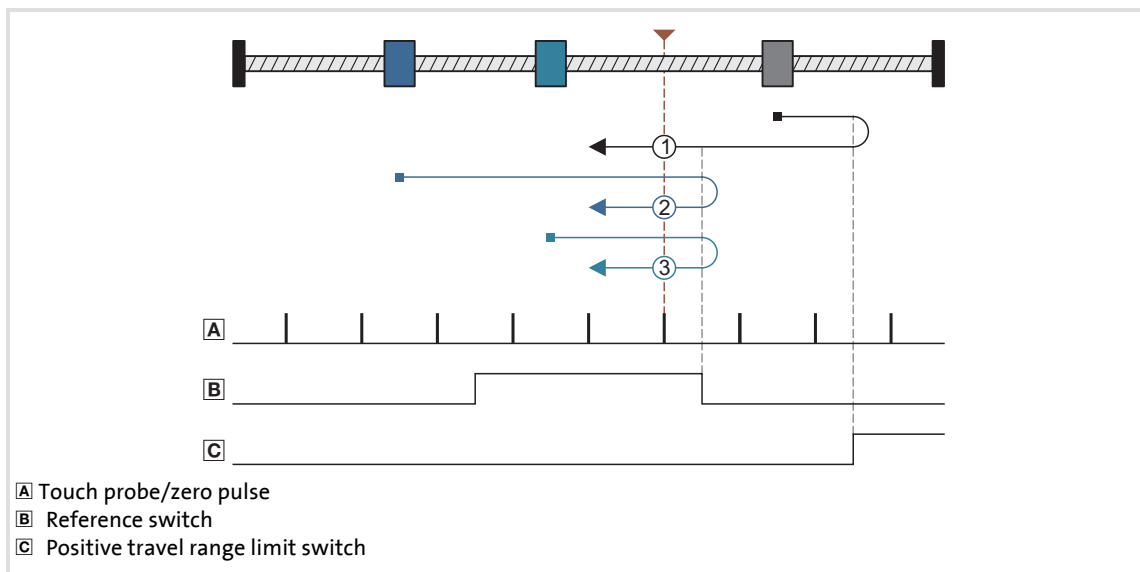
Case 2: Axis activates reference switch first on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Positive edge of the reference switch activates touch probe detection and change to profile data set 2.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 3: Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. Positive edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

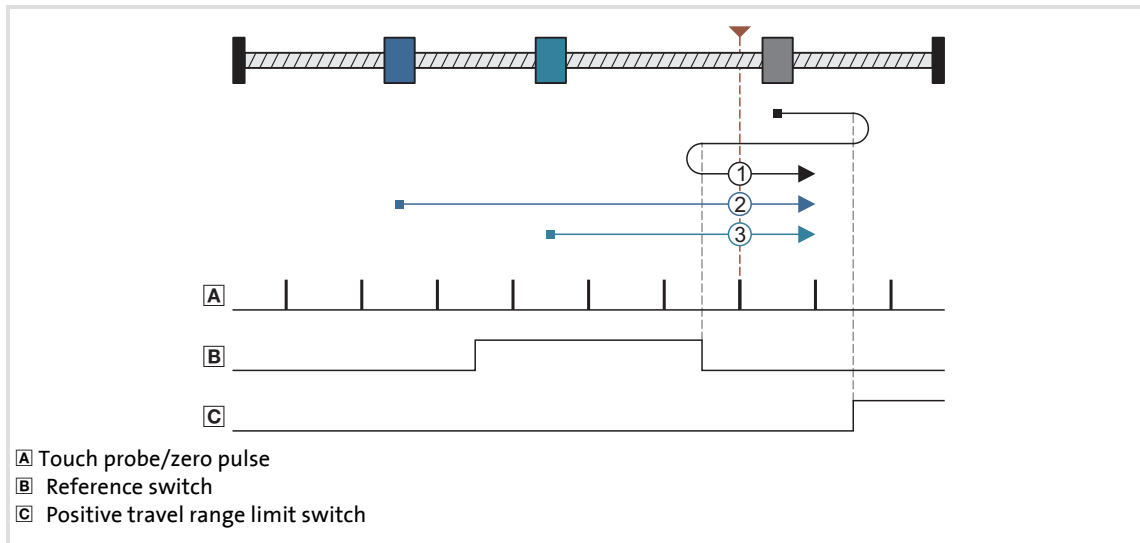
CiA402 Homing method 09



Processes:

- Case 1: Axis does not activate reference switch on the way to the limit switch:
1. Movement in positive direction with profile data set 1.
 2. Reversing to positive travel range limit switch.
 3. Positive edge of the reference switch activates touch probe detection and change to profile data set 2.
 4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
 5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/Z](#) = "0").
- Case 2: Axis activates reference switch first on the way to the limit switch:
1. Movement in positive direction with profile data set 1.
 2. Positive edge of the reference switch activates profile data set 2.
 3. Reversing with negative edge of reference switch.
 4. Positive edge of the reference switch activates touch probe detection.
 5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
 6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/Z](#) = "0").
- Case 3: Axis already stands on reference switch:
1. Movement in positive direction with profile data set 2.
 2. Reversing with negative edge of reference switch.
 3. Positive edge of the reference switch activates touch probe detection.
 4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
 5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/Z](#) = "0").

CiA402 Homing method 10



Processes:

Case 1:

Axis does not activate reference switch on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch.
3. Reversing with positive edge of the reference switch and change to profile data set 2.
4. Negative edge of the reference switch activates touch probe detection.
5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

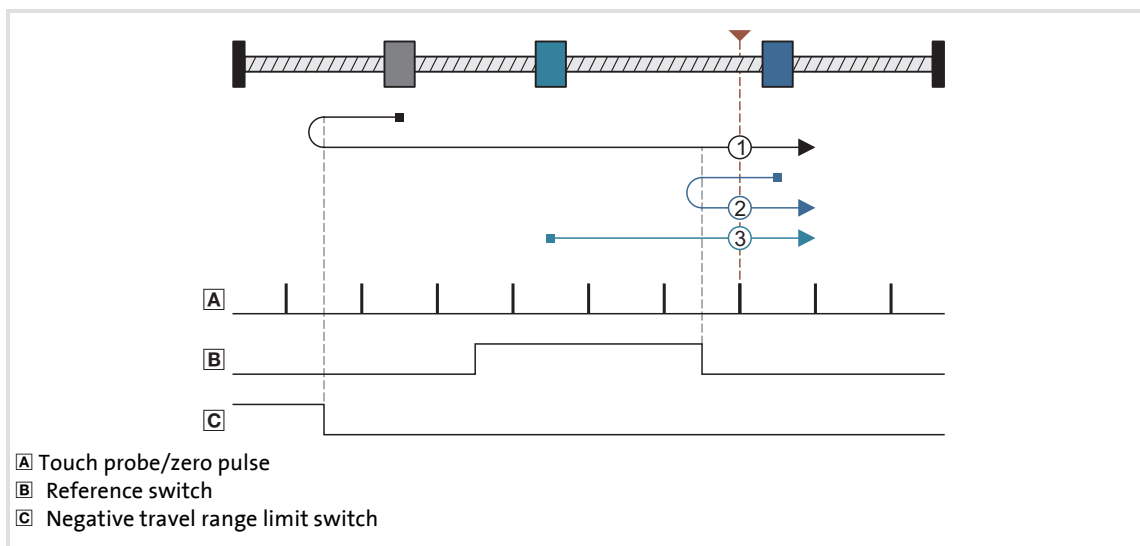
Axis activates reference switch first on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Negative edge of the reference switch activates touch probe detection.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 3: Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Negative edge of the reference switch activates touch probe detection.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 11



Processes:

Case 1: Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. Positive edge of the reference switch activates profile data set 2.
4. Negative edge of the reference switch activates touch probe detection.
5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

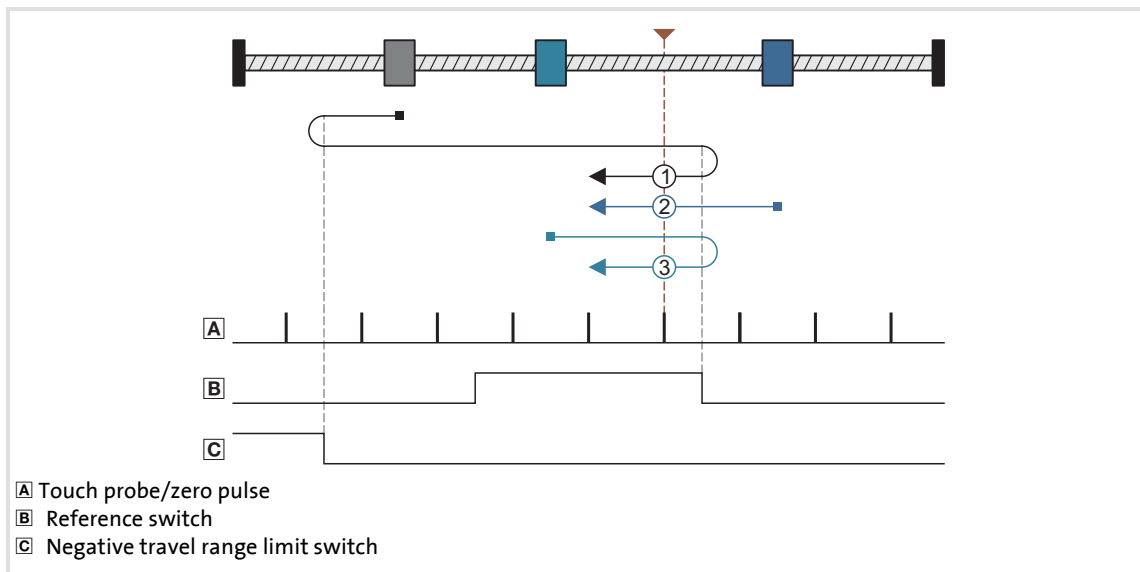
Case 2: Axis activates reference switch first on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing with positive edge of the reference switch and change to profile data set 2.
3. Negative edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 3: Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Negative edge of the reference switch activates touch probe detection.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 12



Processes:

Case 1: Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. Positive edge of the reference switch activates profile data set 2.
4. Reversing with negative edge of reference switch.
5. Positive edge of the reference switch activates touch probe detection.
6. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
7. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

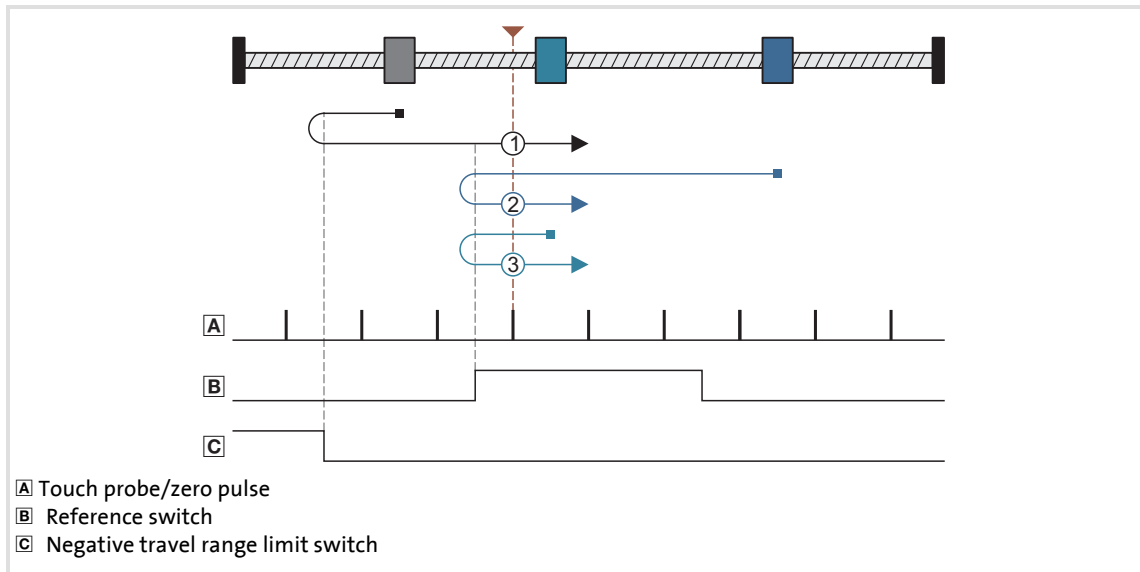
Case 2: Axis activates reference switch first on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Positive edge of the reference switch activates touch probe detection and change to profile data set 2.
3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 3: Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. Positive edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 13



Processes:

Case 1:

Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. Positive edge of the reference switch activates touch probe detection and change to profile data set 2.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

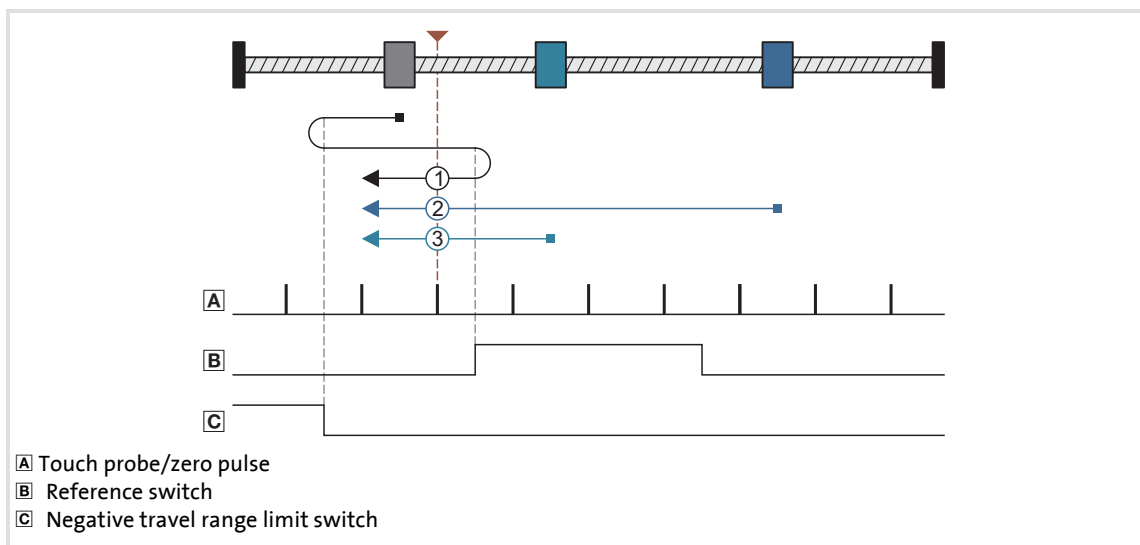
Axis activates reference switch first on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Positive edge of the reference switch activates profile data set 2.
3. Reversing with negative edge of reference switch.
4. Positive edge of the reference switch activates touch probe detection.
5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 3: Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. Positive edge of the reference switch activates touch probe detection.
4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[I](#) = "0").

CiA402 Homing method 14



Processes:

Case 1: Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. Reversing with positive edge of the reference switch and change to profile data set 2.
4. Negative edge of the reference switch activates touch probe detection.
5. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[I](#) = "0").

- Case 2: Axis activates reference switch first on the way to the limit switch:
1. Movement in negative direction with profile data set 1.
 2. Positive edge of the reference switch activates profile data set 2.
 3. Negative edge of the reference switch activates touch probe detection.
 4. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
 5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").
- Case 3: Axis already stands on reference switch:
1. Movement in negative direction with profile data set 2.
 2. Negative edge of the reference switch activates touch probe detection.
 3. The following positive edge of the encoder zero pulse/touch probe sensor sets the reference ([0x607C](#)).
 4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

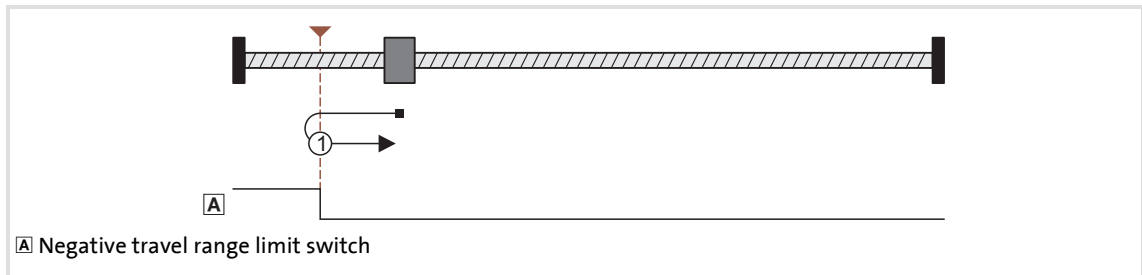
CiA402 Homing method 15

Reserved: Homing is not carried out.

CiA402 Homing method 16

Reserved: Homing is not carried out.

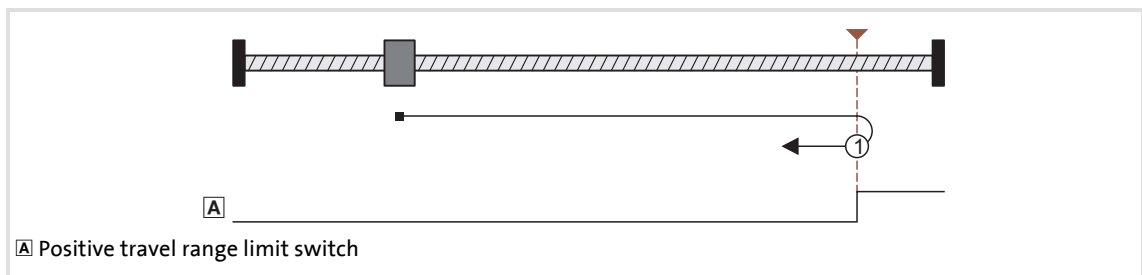
CiA402 Homing method 17



Process:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch and change to profile data set 2.
3. The following negative edge of travel range limit switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

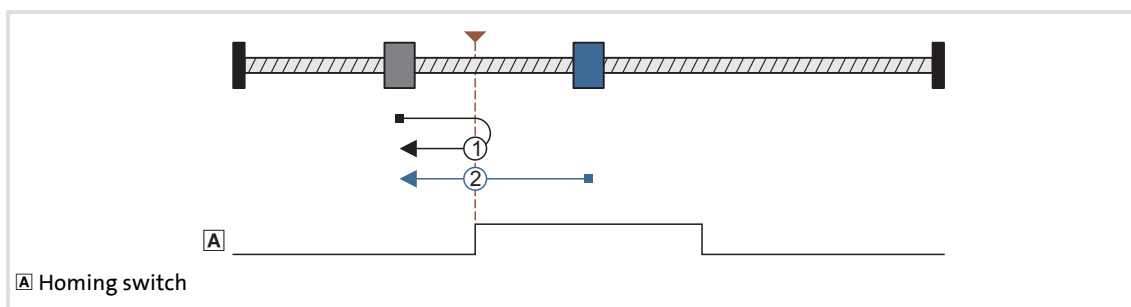
CiA402 Homing method 18



Process:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch and change to profile data set 2.
3. The following negative edge of travel range limit switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 19

**Processes:**

Case 1:

Axis has not yet activated reference switch:

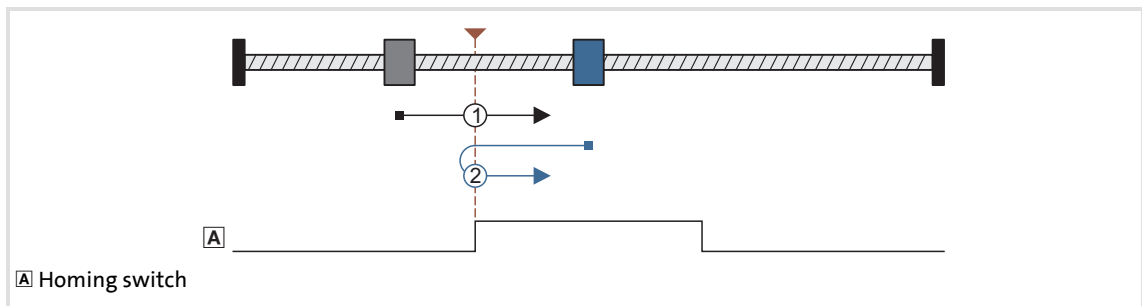
1. Movement in positive direction with profile data set 1.
2. Reversing with positive edge of the reference switch and change to profile data set 2.
3. The following negative edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2:

Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. The following negative edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 20



Processes:

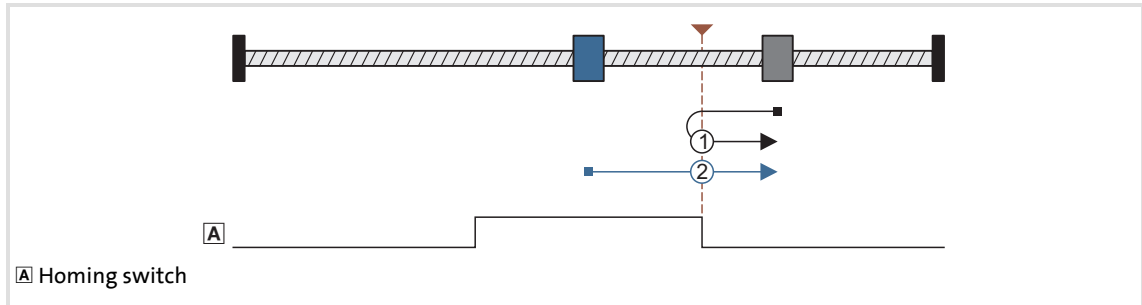
Case 1: Axis has not yet activated reference switch:

1. Movement in positive direction with profile data set 1.
2. The following positive edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 2: Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. The following positive edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 21



Processes:

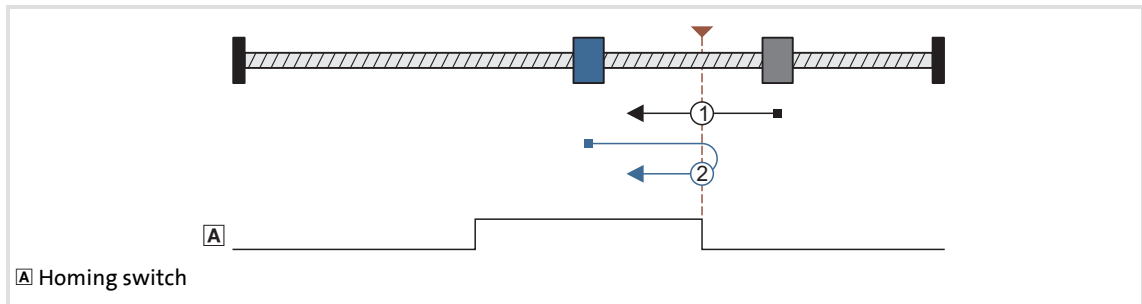
Case 1: Axis has not yet activated reference switch:

1. Movement in negative direction with profile data set 1.
2. Reversing with positive edge of the reference switch and change to profile data set 2.
3. The following negative edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

Case 2: Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. The following negative edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/7](#) = "0").

CiA402 Homing method 22



Processes:

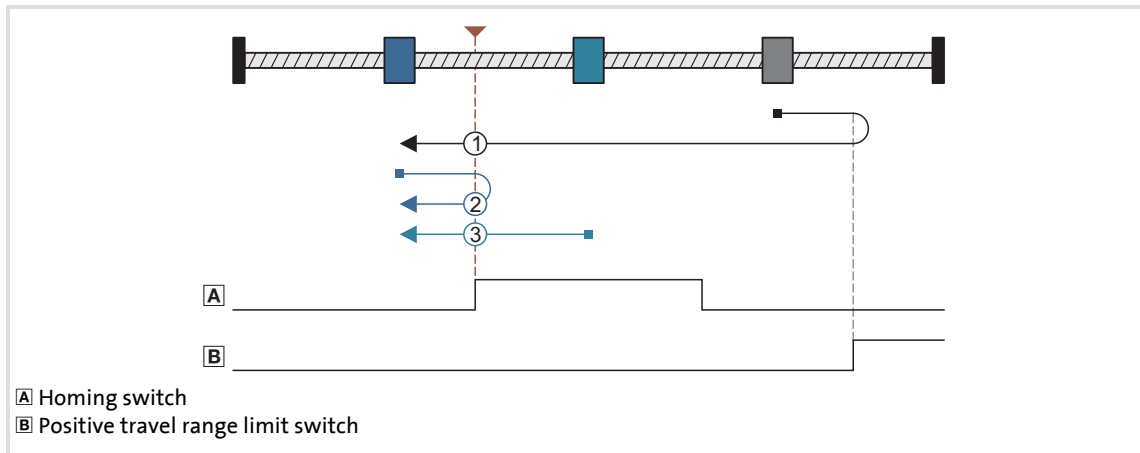
Case 1: Axis has not yet activated reference switch:

1. Movement in negative direction with profile data set 1.
2. The following positive edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 2: Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. The following positive edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

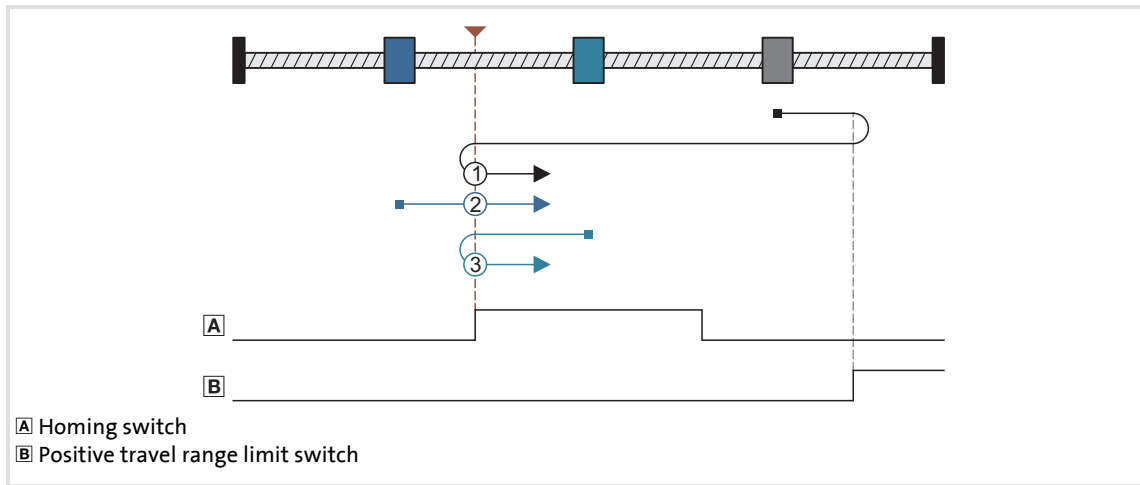
CiA402 Homing method 23



Processes:

- Case 1: Axis does not activate reference switch on the way to the limit switch:
1. Movement in positive direction with profile data set 1.
 2. Reversing to positive travel range limit switch.
 3. Positive edge of the reference switch activates profile data set 2.
 4. The following negative edge of reference switch sets reference ([0x607C](#)).
 5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").
- Case 2: Axis activates reference switch first on the way to the limit switch:
1. Movement in positive direction with profile data set 1.
 2. Reversing with positive edge of the reference switch and change to profile data set 2.
 3. The following negative edge of reference switch sets reference ([0x607C](#)).
 4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").
- Case 3: Axis already stands on reference switch:
1. Movement in negative direction with profile data set 2.
 2. The following negative edge of reference switch sets reference ([0x607C](#)).
 3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 24



Processes:

Case 1:

Axis does not activate reference switch on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch.
3. Positive edge of the reference switch activates profile data set 2.
4. Reversing with negative edge of reference switch.
5. The following positive edge of reference switch sets reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/1](#) = "0").

Case 2:

Axis activates reference switch first on the way to the limit switch:

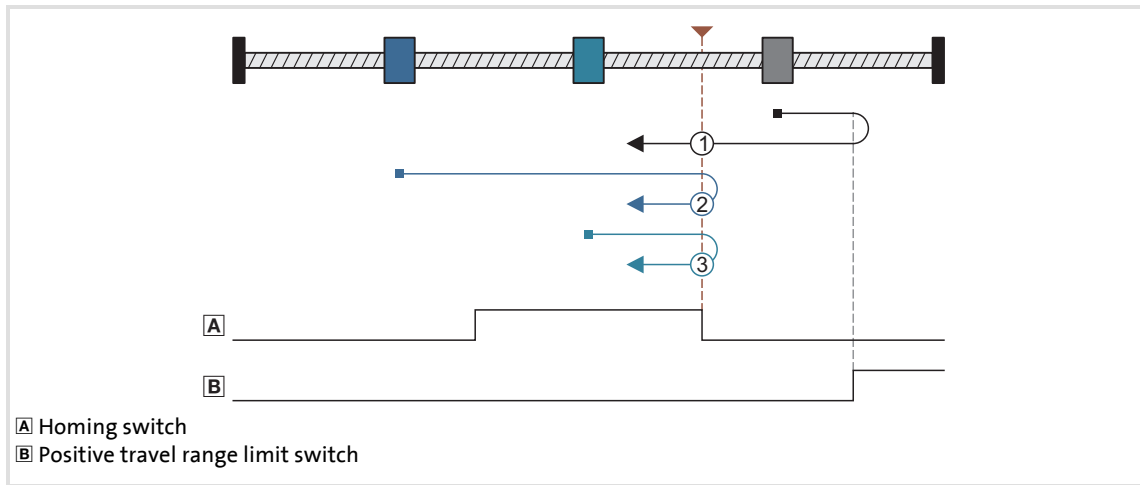
1. Movement in positive direction with profile data set 1.
2. The following positive edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/1](#) = "0").

Case 3:

Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. The following positive edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/1](#) = "0").

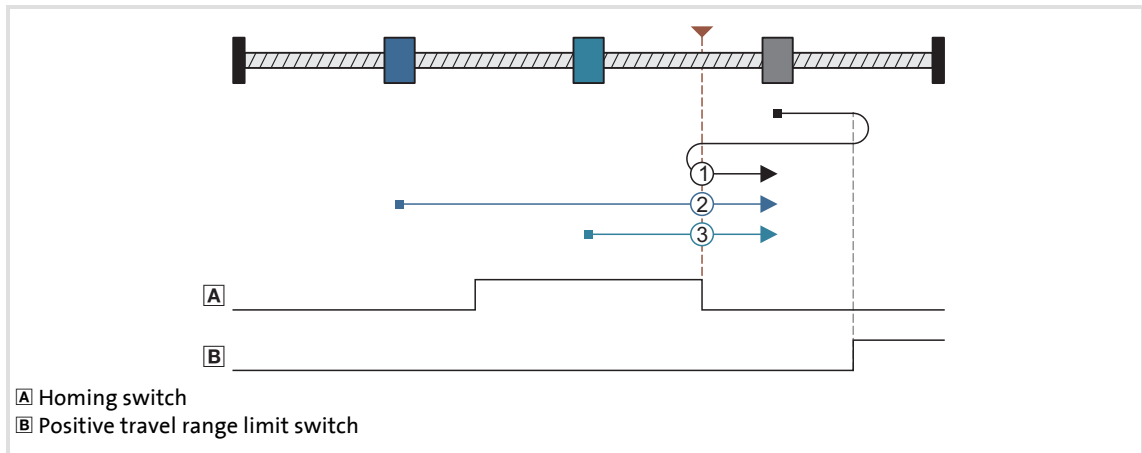
CiA02 homing method 25



Processes:

- Case 1: Axis does not activate reference switch on the way to the limit switch:
1. Movement in positive direction with profile data set 1.
 2. Reversing to positive travel range limit switch.
 3. The following positive edge of reference switch sets reference ([0x607C](#)).
 4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").
- Case 2: Axis activates reference switch first on the way to the limit switch:
1. Movement in positive direction with profile data set 1.
 2. The following positive edge of reference switch sets reference ([0x607C](#)).
 3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").
- Case 3: Axis already stands on reference switch:
1. Movement in positive direction with profile data set 2.
 2. Reversing with negative edge of reference switch.
 3. The following positive edge of reference switch sets reference ([0x607C](#)).
 4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 26



Processes:

Case 1: Axis does not activate reference switch on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Reversing to positive travel range limit switch.
3. Reversing with positive edge of the reference switch and change to profile data set 2.
4. The following negative edge of reference switch sets reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

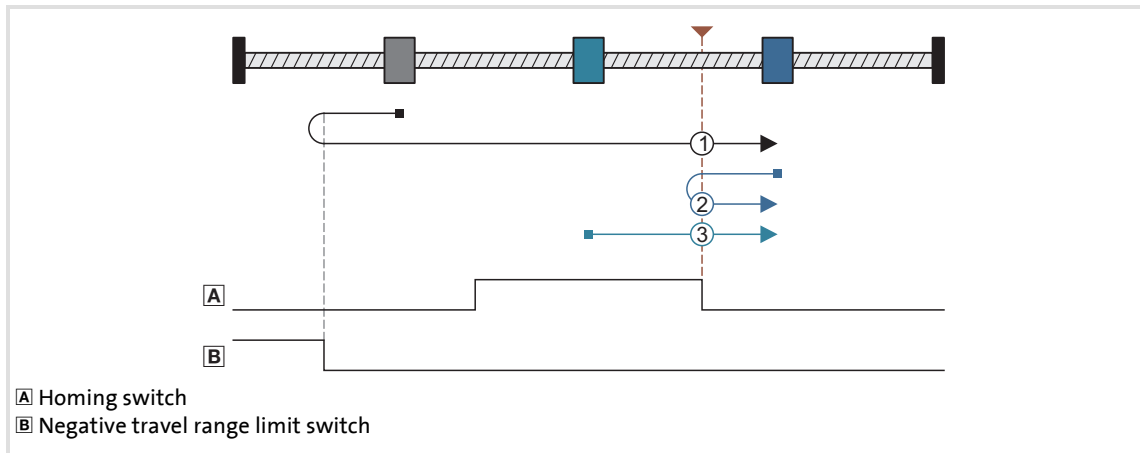
Case 2: Axis activates reference switch first on the way to the limit switch:

1. Movement in positive direction with profile data set 1.
2. Positive edge of the reference switch activates profile data set 2.
3. The following negative edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 3: Axis already stands on reference switch:

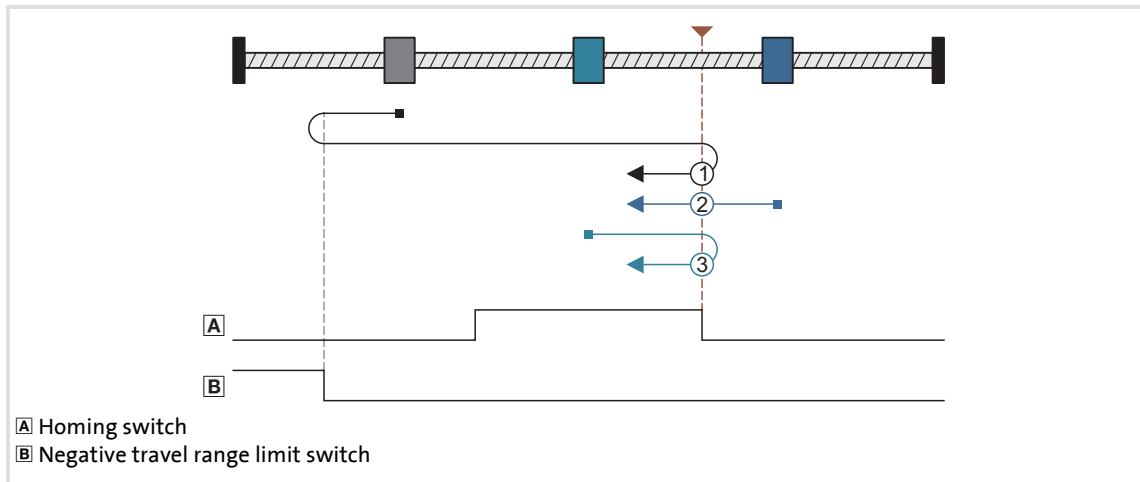
1. Movement in positive direction with profile data set 2.
2. The following negative edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 27

**Processes:**

- Case 1: Axis does not activate reference switch on the way to the limit switch:
1. Movement in negative direction with profile data set 1.
 2. Reversing to negative travel range limit switch.
 3. Positive edge of the reference switch activates profile data set 2.
 4. The following negative edge of reference switch sets reference ([0x607C](#)).
 5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").
- Case 2: Axis activates reference switch first on the way to the limit switch:
1. Movement in negative direction with profile data set 1.
 2. Reversing with positive edge of the reference switch and change to profile data set 2.
 3. The following negative edge of reference switch sets reference ([0x607C](#)).
 4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").
- Case 3: Axis already stands on reference switch:
1. Movement in positive direction with profile data set 2.
 2. The following negative edge of reference switch sets reference ([0x607C](#)).
 3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 28



Processes:

Case 1:

Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. Positive edge of the reference switch activates profile data set 2.
4. Reversing with negative edge of reference switch.
5. The following positive edge of reference switch sets reference ([0x607C](#)).
6. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 2:

Axis activates reference switch first on the way to the limit switch:

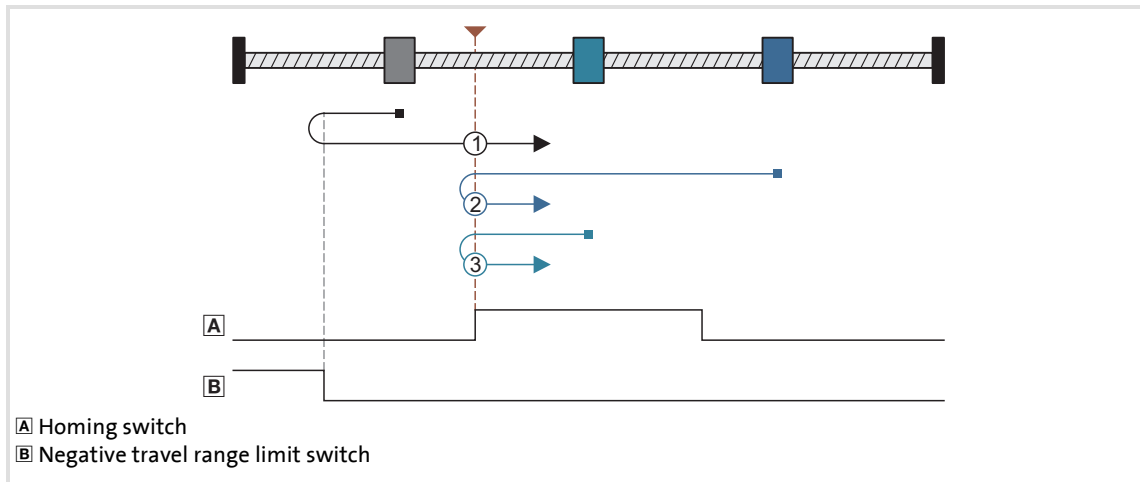
1. Movement in negative direction with profile data set 1.
2. The following positive edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 3:

Axis already stands on reference switch:

1. Movement in positive direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. The following positive edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 29



Processes:

Case 1:

Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. The following positive edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 2:

Axis activates reference switch first on the way to the limit switch:

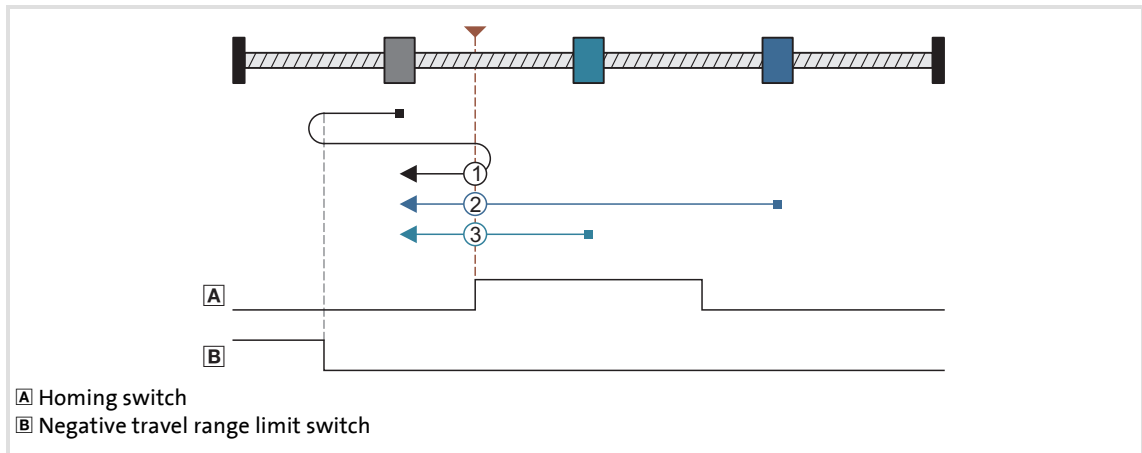
1. Movement in negative direction with profile data set 1.
2. Positive edge of the reference switch activates profile data set 2.
3. Reversing with negative edge of reference switch.
4. The following positive edge of reference switch sets reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 3:

Axis already stands on reference switch:

1. Movement in negative direction with profile data set 2.
2. Reversing with negative edge of reference switch.
3. The following positive edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 30



Processes:

Case 1: Axis does not activate reference switch on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Reversing to negative travel range limit switch.
3. Reversing with positive edge of the reference switch and change to profile data set 2.
4. The following negative edge of reference switch sets reference ([0x607C](#)).
5. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 2: Axis activates reference switch first on the way to the limit switch:

1. Movement in negative direction with profile data set 1.
2. Positive edge of the reference switch activates profile data set 2.
3. The following negative edge of reference switch sets reference ([0x607C](#)).
4. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

Case 3: Axis already stands on reference switch:

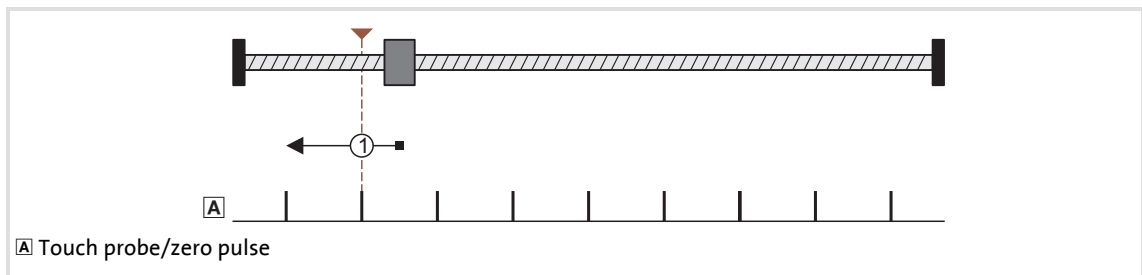
1. Movement in negative direction with profile data set 2.
2. The following negative edge of reference switch sets reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 Homing method 31

Reserved: Homing is not carried out.

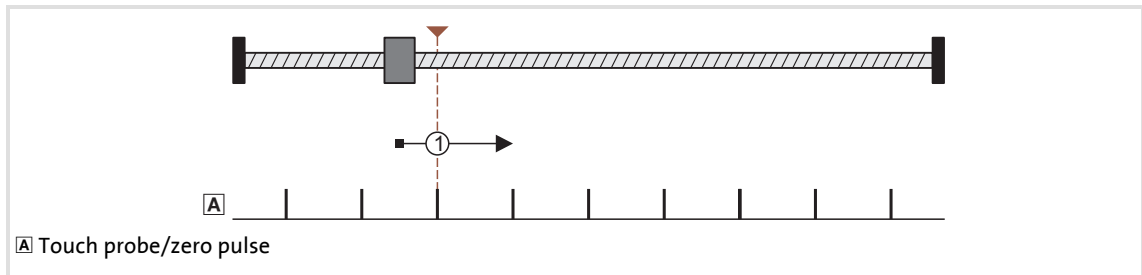
CiA402 Homing method 32

Reserved: Homing is not carried out.

CiA402 Homing method 33**Process:**

1. Movement in negative direction with profile data set 1 and activation of the touch probe detection.
2. The following positive edge of the touch probe sensor sets the reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/Z](#) = "0").

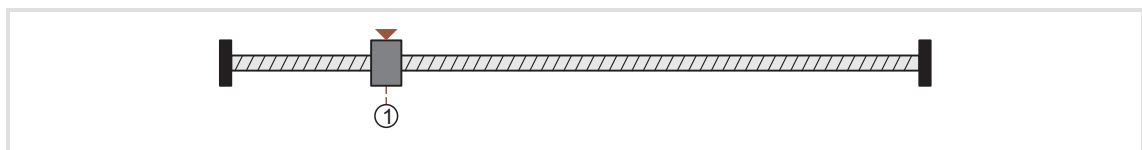
CiA402 Homing method 34



Process:

1. Movement in positive direction with profile data set 1 and activation of the touch probe detection.
2. The following positive edge of the touch probe sensor sets the reference ([0x607C](#)).
3. Absolute positioning to target position (C02643) with profile data set 2 (if [0x60FB/](#)
[Z](#) = "0").

CiA402 homing method 35



Direct reference setting.

- The measuring system is set according to the home position parameterised in the [0x607C](#) object (home offset).

3.9.9 Control commands & status information

The CiA402 control word ([0x6040](#)) serves to execute the following control commands in the "homing mode" operation mode:

Control word	Status	Function
Bit 4	0	Homing is not active
	0 ↗ 1	Start reference search
	1 ↘ 0	Cancel reference search
Bit 11	0 ↗ 1	Set reference
Bit 12	0 ↗ 1	Delete reference

The CiA402 status word ([0x6041](#)) serves to output the following status information for referencing in the "homing mode" operation mode:

Status word	Status	Meaning
Bit 12	0	Homing is not active or reference search not yet completed
	1	Reference search completed (observe bit 13)
Bit 13	0	Reference search has been executed successfully
	1	An error has occurred during the reference search
Bit 14	0	Home position is not available
	1	Home position is available

3.9.10 Basic function "Homing"

In "Homing mode" the "Homing" basic function is used.

Lenze parameters (short overview)

Parameter		Lenze setting	
		Value	Unit
C02528	Traversing range	Modulo	
C02640	Homing mode	Set home pos. directly	
C02641	Action after detect Home position	Move absolute on Target position	
C02642	Home position	0.0000	Unit
C02643	Homing: Target position	0.0000	Unit
C02644	Homing: Speed 1	360.0000	Unit/s
C02645	Homing: Acceleration 1	720.0000	Unit/s ²
C02646	Homing: Speed 2	0.0000	Unit/s
C02647	Homing: Acceleration 2	360.0000	Unit/s ²
C02649	Homing: Torque limit	10.00	%
C02650	Homing: Blocking time	1.000	s
C02652	Ref. pos. after mains switching	Delete	
C02653	Max. rot. ang. aft. mns. swtch.	180	°

3.10 Position control function

The objects described in this chapter serve to

- ▶ control the position control (including following error and in-position recognition),
- ▶ control an optional holding brake and
- ▶ request the status of the safety functions and safe inputs/outputs of the optional SM3xx safety module.

3.10.1 Input and output data

Input data

Index	Name	Data type	Object type
0x60FC	Position demand value*	INTEGER_32	VAR
0x6062	Position demand value	INTEGER_32	VAR
0x6065	Following error window	UNSIGNED_32	VAR
0x6066	Following error time out	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x6068	Position window time	UNSIGNED_32	VAR
0x60FB	Position control parameter set	UNSIGNED_32	RECORD

Output data

Index	Name	Data type	Object type
0x6041	Status word	UNSIGNED_16	VAR
0x6063	Position actual value*	INTEGER_32	VAR
0x6064	Position actual value	INTEGER_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR
0x60FA	Control effort	INTEGER_32	VAR

Grayed out = read access only

3.10.2 Object description

Except for the [0x60FA](#) object (control effort), all objects correspond to the CiA402 specification.

Objects described in other chapters:

Index	Name	Data type	Object type
► Device control			
0x6041	Status word	UNSIGNED_16	VAR
Grayed out = read access only			

Objects described in this chapter:

Index	Name	Data type	Object type
0x6062	Position demand value unit	INTEGER_32	VAR
0x6063	Position demand value unit	INTEGER_32	VAR
0x6064	Position actual value unit	INTEGER_32	VAR
0x6065	Following error window	UNSIGNED_32	VAR
0x6066	Following error time out	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x6068	Position window time	UNSIGNED_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR
0x60FA	Control effort	INTEGER_32	VAR
0x60FB	Position control parameter set	UNSIGNED_32	RECORD
0x60FC	Position demand value*	INTEGER_32	VAR
Grayed out = read access only			

0x6062 - Position demand value unit

Index Name:		Data type: INTEGER_32 Code: C03590	
0x6062 Position demand value unit			
Interpolated position setpoint for position control in the user-defined [unit]			
Display area (min. value unit max. value)			
-2147483648	pos unit	2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6063 - Position actual value*

Index | Name:

0x6063 | Position actual value*

Data type: INTEGER_32

Code: [C03591](#)

Current position in [increments]

Display area (min. value unit max. value)		
-2147483648	inc	2147483647

☒ Read access

☐ Write access

☐ CINH

☐ PLC-STOP

☐ PDO_MAP_RX

☒ PDO_MAP_TX

0x6064 - Position actual value unit

Index Name:		Data type: INTEGER_32
0x6064 Position actual value unit		Code: C03592
Current position in the user-defined [unit]		
Display area (min. value unit max. value)		
-2147483648	pos unit	2147483647
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX		

0x6065 - Following error window

Index Name:		Data type: UNSIGNED_32
0x6065 Following error window		Code: C03593
Window for following error detection		
Setting range (min. value unit max. value)		Lenze setting
0	pos unit	4294967295
		0 pos unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x6066 - Following error time out

Index Name:		Data type: UNSIGNED_32
0x6066 Following error time out		Code: C03594
Time monitoring for following error detection		
0 = following error is evaluated without time delay.		
▶ Following error detection		
Setting range (min. value unit max. value)		Lenze setting
0	ms	0
		0 ms
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x6067 - Position window

Index Name:		Data type: UNSIGNED_32
0x6067 Position window		Code: C03595
Window around the target position for the status message "target position reached"		
▶ In-position recognition		
Setting range (min. value unit max. value)		Lenze setting
0	pos unit	4294967295
		1000 pos unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x6068 - Position window time

Index Name:		Data type: UNSIGNED_32
0x6068 Position window time		Code: C03596
Time monitoring for the status message "target position reached"		
0 = position in the target window is evaluated without time delay.		
▶ In-position recognition		
Setting range (min. value unit max. value)		Lenze setting
0	ms	0
		0 ms
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

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Parameter setting & configuration

Position control function

0x60F4 - Following error actual value

Index Name:	0x60F4 Following error actual value		Data type: INTEGER_32 Code: C03597
Current following error			
Following error detection			
Display area (min. value unit max. value)			
-2147483648	pos unit	2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX			

0x60FA - Control effort

Index Name:	0x60FA Control effort		Data type: INTEGER_32 Code: C03598
Position setpoint for position control			
Display area (min. value unit max. value)			
-2147483648	inc	2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x60FB - Position control parameter set

Index Name:	0x60FB Position control parameter set		Data type: UNSIGNED_32 Code: C03599
Manufacturer-specific parameter set for position control			
Subindex	Name		
▶ 0x60FB/1	Load home position		
▶ 0x60FB/2	Brake control		
▶ 0x60FB/3	Brake torque add		
▶ 0x60FB/4	Following error reaction		
▶ 0x60FB/5	Safe I/O state		
▶ 0x60FB/6	Safety module state		
▶ 0x60FB/7	Homing stop mode		

Index Name:	0x60FB/1 Load home position		Data type: INTEGER_32 Code: C03585
Position for reference point			
Setting range (min. value unit max. value)			Lenze setting
-2147483647	pos unit	2147483647	0 pos unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index | Name: **0x60FB/2 | Brake control** Data type: UNSIGNED_8
Code: [C03602](#)

Brake control

Value is bit-coded:		Information
Bit 0	Release brake	Release brake
Bit 1	Starting torque2	Use starting torque 2 (C02587)
Bit 2	Disable stop	Do not close brake at standstill
Bit 3	Brake applied	Status detection via switching contact at the brake
Bit 4	Brake test	Carry out brake test
Bit 5	Brake grind in	Grind in brake
Bit 6	Reserved	-
Bit 7	Reserved	-

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

Index | Name: **0x60FB/3 | Brake torque add** Data type: INTEGER_32
Code: [C03603](#)

Additive value to the brake holding torque

Setting range (min. value unit max. value)	Lenze setting
-2147483647	2147483647 0

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

Index | Name: **0x60FB/4 | Following error reaction** Data type: UNSIGNED_16
Code: [C03604](#)

Error response at following error detection

► [Following error detection](#)

Selection list (Lenze setting printed in bold)	
0	No response
1	Fault
2	Trouble
3	Quick stop by trouble
4	Warning locked
5	Warning
6	Information

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

Index | Name: **0x60FB/5 | Safe IO state** Data type: UNSIGNED_8
Code: [C03605](#)

Status of the safe inputs and outputs of the SM3xx safety module

- Which bits are supported depends on the safety module used.

Value is bit-coded:	Information
Bit 0 SD-In1	Sensor input 1 in ON state
Bit 1 SD-In2	Sensor input 2 in ON state
Bit 2 SD-In3	Sensor input 3 in ON state
Bit 3 SD-In4	Sensor input 4 in ON state
Bit 4 AIS	Restart acknowledgement carried out via terminal
Bit 5 AIE	Error acknowledgement carried out via terminal
Bit 6 SD-Out1	Safe output 1 (feedback output) in the ON state.
Bit 7 Reserved	-

☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX

Index | Name: **0x60FB/6 | Safety module state** Data type: UNSIGNED_16
Code: [C03606](#)

Status of the safety functions of the SM3xx safety module

- Which bits are supported depends on the safety module used.

Value is bit-coded:	Information
Bit 0 STO	"Safe torque off (STO)" function is active
Bit 1 Reserved	-
Bit 2 Reserved	-
Bit 3 EC-STO	Error stop category 0: "Safe torque off (STO)" function is active
Bit 4 EC-SS1	Error stop category 1: "Safe stop 1 (SS1)" function is active
Bit 5 EC-SS2	Error stop category 2: "Safe stop 2 (SS2)" function is active
Bit 6 Reserved	-
Bit 7 Reserved	-
Bit 8 SLS1	Safely limited speed 1 is activated and complied with
Bit 9 SLS2	Safely limited speed 2 is activated and complied with
Bit 10 SLS3	Safely limited speed 3 is activated and complied with
Bit 11 SLS4	Safely limited speed 4 is activated and complied with
Bit 12 SDIpos	Safe positive direction of rotation (SDIpos) is activated and complied with
Bit 13 SDIneg	Safe negative direction of rotation (SDIneg) is activated and complied with
Bit 14 Error active	SM3xx safety module has the error status (trouble or warning)
Bit 15 Reserved	-

☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX

Index | Name: **0x60FB/7 | Homing stop mode** Data type: UNSIGNED_32
Code: C02641

Drive behaviour after setting the home position

- Direct mapping of the Lenze code C02641 (behaviour after detection of home position)

► [Drive behaviour after setting the home position](#)

Selection list (Lenze setting printed in bold)		Information
0	Move absolute on Target position	After setting the home position (C02642), the drive moves to the absolute target position set in C02643. • This selection is the Lenze setting and corresponds to the behaviour known from the previous versions.
1	Move relative by Target position	After setting the home position (C02642), the drive moves relatively by the target position set in C02643.
2	Stop	After setting the home position (C02642), the drive stops immediately.

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

0x60FC - Position demand value*

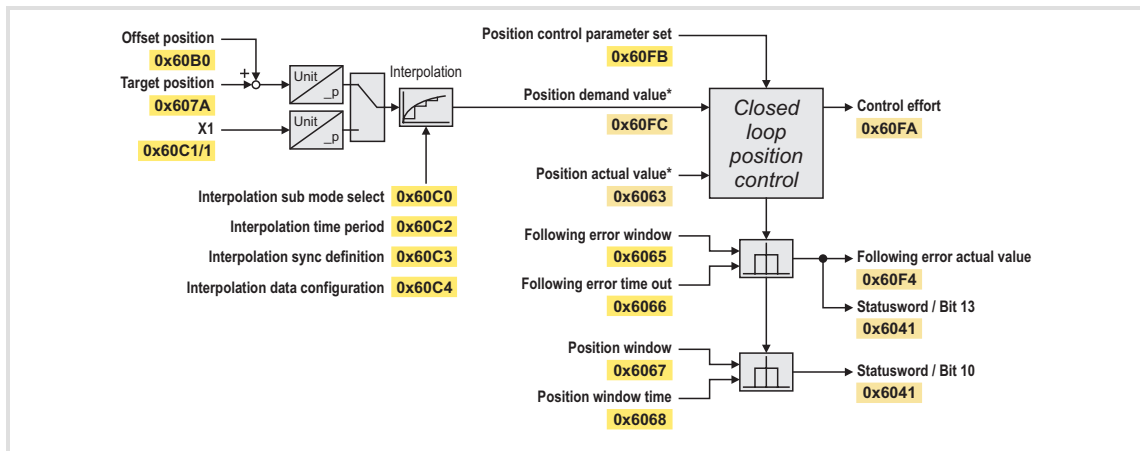
Index | Name: **0x60FC | Position demand value*** Data type: INTEGER_32
Code: [C03600](#)

Interpolated position setpoint for position control in [increments]

Display area (min. value unit max. value)		
-2147483648	inc	2147483647

☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

3.10.3 Signal flow



[3-10] Access to the position control via CiA402 device profile

3.10.4 Following error detection

The [0x6065](#) object (following error window) defines a symmetrical tolerance window around the position setpoint for the purpose of following error detection.

- ▶ If the tolerance window is set = "0", the following error detection is deactivated.
- ▶ If the tolerance window is set > "0", the following error detection is activated, i.e. a following error will be detected if the position value is outside this tolerance window.
- ▶ For activated following error detection: If the following error is detected for a longer time than the time in [ms] defined in object [0x6066](#) (following error time out),
 - bit 13 ("following error") is set in object [0x6041](#) (statusword).
 - the error response set in object [0x60FB/4](#) (following error reaction) is triggered.
 - the "Following error" error message (with error number 0x3B40001) is entered into the logbook.



Tip!

The [0x60F4](#) object (following error actual value) shows the current deviation of the actual position value from the position setpoint.

3.10.5 In-position recognition

The [0x6067](#) object (position window) defines a symmetrical tolerance window around the target position for the purpose of in-position recognition.

- ▶ If the actual position value is inside this tolerance window, the target position is deemed to be reached and bit 10 ("target position reached") is set in the [0x6041](#) object (status word).

3.10.6 Brake control

The function of a holding brake, if available, can be controlled via the [0x60FB/2](#) object (brake control).



Danger!

Please note that the motor holding brake is an important element of the safety concept of the entire machine. Proceed with special care when commissioning this part of the machine!



Stop!

In general, motor holding brakes on Lenze motors are not designed for braking during operation. The increased wear resulting from braking during operation may lead to an early destruction of the motor holding brake!



Please observe the notes in the hardware manual for mounting and electrical installation of the motor holding brake!

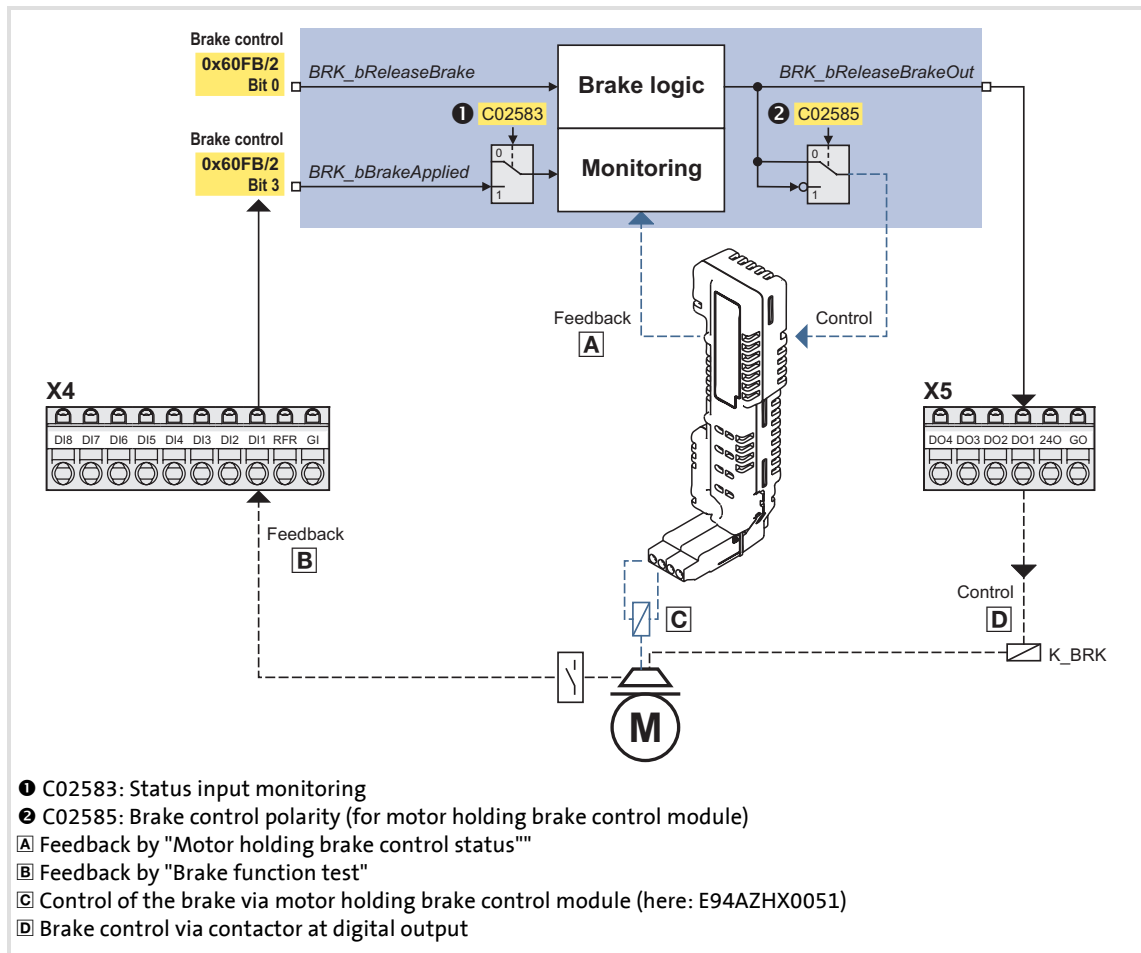
The following applies from software version V2.x of the technology application:

- If the "[Operation enabled](#)" device status is abandoned via the "[Disable operation](#)" or "[Shutdown](#)" command, the system waits until the motor holding brake is applied before inhibiting the controller.
-

3.10.6.1 Signal configuration

An external brake is supported by a fixed connection of the *BRK_bReleaseBrakeOut* output signal of the "Brake control" basic function to the DO1 digital output and the *BRK_bBrakeApplied* input signal to the DI1 digital input.

- The signal configuration of the control and status signals for the brake logic and monitoring function is executed via the parameters shown in the following signal flow:



[3-11] Signal configuration of the control and status signals



Note!

If an electrically holding (self-releasing) brake is to be controlled instead of an electrically releasing (self-holding) brake, the corresponding control and status signals must be inverted!



Please observe the notes in the hardware manual for mounting and electrical installation of the motor holding brake!

Status monitoring by "Motor holding brake control module status"

(See signal path [A](#) in fig. [\[3-11\]](#))

- ▶ Indirect status detection of the brake function.
- ▶ Monitoring of the motor holding brake control module and the electrical brake circuit.

Status monitoring by "Brake function test"

(See signal path [B](#) in fig. [\[3-11\]](#))

- ▶ Direct function test of the complete brake circuit by microswitches at the brake.
- ▶ Wear control of the brake rotor.

3.10.6.2 Torque feedforward control

In automatic operation (mode 2/12) the brake control offers the possibility of precontrolling the required torque of the drive when the brake is released.



Note!

The torque is precontrolled for one second. During this time, the actual torque must have reached 90 % of the set torque, otherwise a fault is tripped!

Via C02588 it is selected whether a parameterised starting torque or the torque memorised during the last closing operation shall be used for the feedforward control.

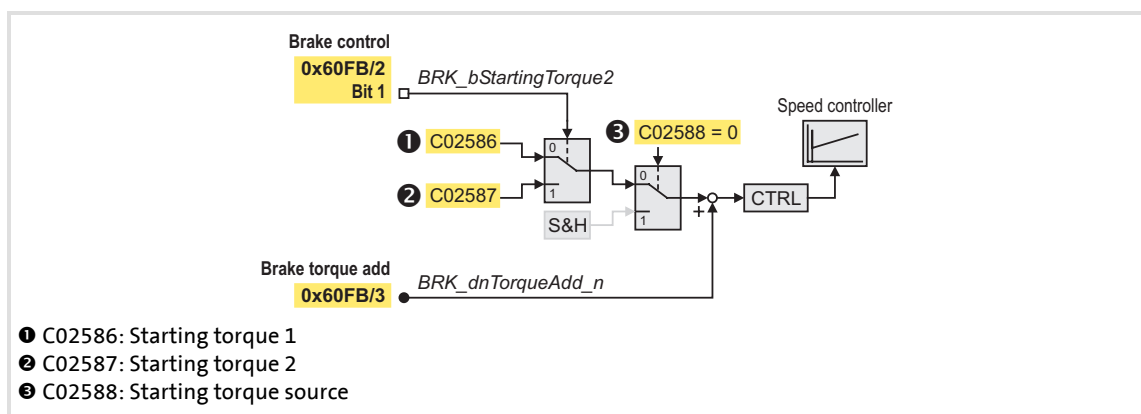
- ▶ When setting C02588 = 0, bit 1 of the [0x60FB/2](#) object (brake control) can be used to switch between two starting torques:
 - Bit 1 = 0: starting torque 1 (C02586) is used.
 - Bit 1 = 1: starting torque 2 (C02587) is used.
- ▶ When C02588 = 1, the starting torque is the setpoint which has been automatically memorised during the last closing process (falling below the speed threshold set in C02581).



Note!

The higher the threshold for brake activation set in C02581, the higher is the dynamic part in the memorised torque (e.g. the speed-dependent friction torque).

In the special case that the load changes when the brake is closed, a correction value, which is added to the memorised torque, can be defined for the torque feedforward control via the [0x60FB/3](#) object (brake torque add).



[3-12] Torque feedforward control

3.11 Interpolated position mode

The "Interpolated position mode" is required for a coordinated traversing of axes depending on each other or for traversing of single axes with time interpolation of the setpoints.



Stop!

If a limit switch is approached using this operating mode and an error is caused followed by the "Quick stop by trouble" response, a setpoint/actual value adjustment of the position must always be executed before acknowledging the error as otherwise an uncontrolled motor movement may occur after acknowledging the error!

Selection of operating mode

The "Interpolated position mode" is selected using the value "7" via the [0x6060](#) object (mode of operation).

3.11.1 Input and output data

Input data

Index	Name	Data type	Object type
0x6040	Control word	UNSIGNED_16	VAR
0x60C0	Interpolation sub mode select	INTEGER_16	VAR
0x60C1	Interpolation data record	INTEGER_32	ARRAY
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
0x60C4	Interpolation data configuration	UNSIGNED_32	RECORD
0x607C	Home offset	UNSIGNED_32	VAR
0x6065	Following error window	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR

Output data

Index	Name	Data type	Object type
0x6041	Status word	UNSIGNED_16	VAR
0x60FC	Position demand value*	INTEGER_32	VAR
0x6063	Position actual value*	INTEGER_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR

Grayed out = read access only

3.11.2 Object description

All objects correspond to the CiA402 specification, but some of them have only a restricted value range.

Objects described in other chapters:

Index	Name	Data type	Object type
▶ Device control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
▶ Position control function			
0x6065	Following error window	UNSIGNED_32	VAR
0x6066	Following error time out	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x6068	Position window time	UNSIGNED_32	VAR
0x6062	Position demand value	INTEGER_32	VAR
0x6063	Position actual value*	INTEGER_32	VAR
0x6064	Position actual value	INTEGER_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR
0x60FC	Position demand value*	INTEGER_32	VAR
▶ Homing mode			
0x607C	Home offset	UNSIGNED_32	VAR
▶ Cyclic synchronous torque mode (IEC 61800-7)			
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
▶ Cyclic synchronous velocity mode (IEC 61800-7)			
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR

Grayed out = read access only

Objects described in this chapter:

Index	Name	Data type	Object type
0x60C0	Interpolation sub mode select	INTEGER_16	VAR
0x60C1	Interpolation data record	INTEGER_32	ARRAY
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
0x60C3	Interpolation sync definition	UNSIGNED_8	RECORD
0x60C4	Interpolation data configuration	UNSIGNED_32	RECORD

Grayed out = read access only

0x60C0 - Interpolation sub mode select

Index | Name:

0x60C0 | Interpolation sub mode select

Data type: INTEGER_16

Code: [C03630](#)

Interpolation algorithm

- If "Linear interpolation" or "Quadratic interpolation" has been selected and no feedforward control values for speed and torque/acceleration are transmitted, it is wise to generate the feedforward values by differentiation of the position signal (C02681, C00276).
- If "Optimized mode 1" has been selected, the feedforward control values in the application are differentiated from the set position in the grid of the bus cycle time and then linearly interpolated to the control cycle. (No additional differentiation functions required.)

Selection list (Lenze setting printed in bold)

-11	Optimised mode 1
-1	Quadratic interpolation
0	Linear interpolation

☒ Read access
 ☒ Write access
 ☒ CINH
 ☐ PLC-STOP
 ☐ PDO_MAP_RX
 ☐ PDO_MAP_TX

0x60C1 - Interpolation data record

Index Name:		Data type: INTEGER_32	
0x60C1 Interpolation data record		Code: C03631	
Interpolation data buffer			
Subindex	Name		
▸ 0x60C1/1	X1		
Index Name:		Data type: INTEGER_32	
0x60C1/1 X1		Code: C03632	
Setpoint for position interpolation			
Setting range (min. value unit max. value)		Lenze setting	
-2147483648	pos unit	2147483647	0 pos unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX			

0x60C2 - Interpolation time period

Index | Name:

Data type: UNSIGNED_32

Code: [C03636](#)

0x60C2 | Interpolation time period

Interpolation cycle time

- For the communication via system bus (CANopen), the sync cycle time must also be parameterised in code C01121.

Subindex	Name
▸ 0x60C2/1	ip time units
▸ 0x60C2/2	ip time index

$$\text{Interpolation cycle time [s]} = \text{ip time units} \cdot 10^{\text{ip time index}} [\text{s}]$$

[3-13] Definition of the interpolation cycle time

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Parameter setting & configuration

Interpolated position mode

Index Name: 0x60C2/1 ip time units			Data type: UNSIGNED_8 Code: C03637
Basic multiplier for interpolation cycle time			
Setting range (min. value unit max. value)			Lenze setting
0	s	255	1 s
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index Name: 0x60C2/2 ip time index			Data type: INTEGER_8 Code: C03638
Exponent for interpolation cycle time			
Setting range (min. value unit max. value)			Lenze setting
-6	10 exp ip time units	0	-3 10 exp ip time units
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x60C3 - Interpolation sync definition

Index Name: 0x60C3 Interpolation sync definition		Data type: UNSIGNED_8 Code: C03639
Definition interpolation synchronisation		
Subindex	Name	
▶ 0x60C3/1	Synchronize on group	
▶ 0x60C3/2	ip sync every n event	

Index Name: 0x60C3/1 Synchronize on group			Data type: UNSIGNED_8 Code: C03640
Group synchronisation 0 = General SYNC telegram is used.			
Setting range (min. value unit max. value)			Lenze setting
0		0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index Name: 0x60C3/2 ip sync every n event			Data type: UNSIGNED_8 Code: C03641
Synchronisation at a certain number of SYNC telegram 1 = Synchronisation at each SYNC telegram			
Setting range (min. value unit max. value)			Lenze setting
1		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x60C4 - Interpolation data configuration

Index | Name: **0x60C4 | Interpolation data configuration** Data type: UNSIGNED_32
Code: [C03642](#)

Configuration of the interpolation data

Subindex	Name
▸ 0x60C4/1	Max. buffer size
▸ 0x60C4/2	Actual buffer size
▸ 0x60C4/3	Buffer organization
▸ 0x60C4/4	Buffer position
▸ 0x60C4/5	Size of data record
▸ 0x60C4/6	Buffer clear

Index | Name: **0x60C4/1 | Max. buffer size** Data type: UNSIGNED_32
Code: [C03643](#)

Maximum depth of the interpolation buffer

Display area (min. value unit max. value)	
1	1
☒ Read access	☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX

Index | Name: **0x60C4/2 | Actual buffer size** Data type: UNSIGNED_32
Code: [C03644](#)

Required depth of the interpolation buffer

Setting range (min. value unit max. value)	Lenze setting
1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index | Name: **0x60C4/3 | Buffer organization** Data type: UNSIGNED_8
Code: [C03645](#)

Organisation of the interpolation buffer

Setting range (min. value unit max. value)	Lenze setting
0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

Index | Name: **0x60C4/4 | Buffer position** Data type: UNSIGNED_16
Code: [C03646](#)

Current index position in the interpolation buffer

Setting range (min. value unit max. value)	Lenze setting
0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX	

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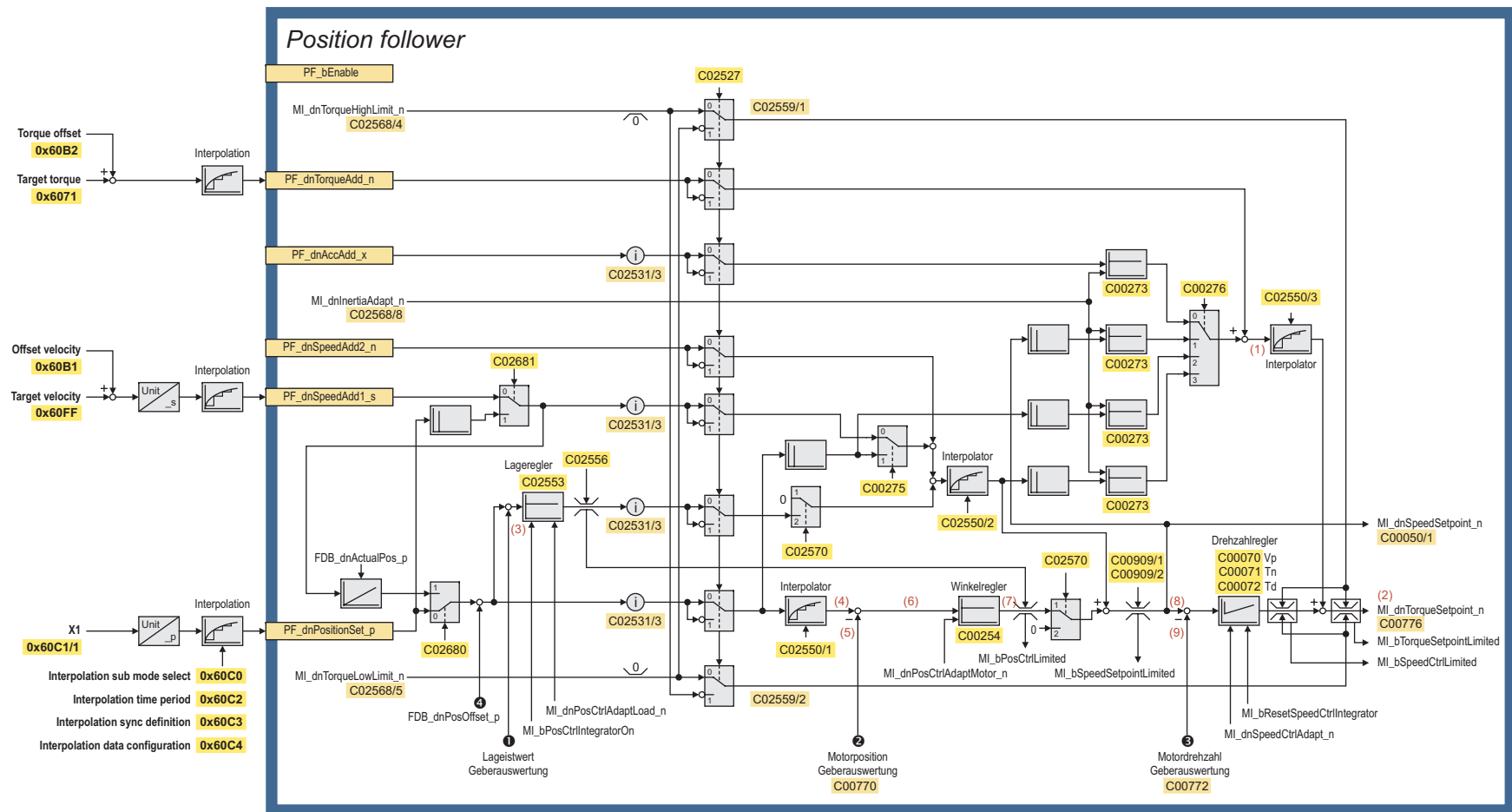
Parameter setting & configuration

Interpolated position mode

Index Name: 0x60C4/5 Size of data record			Data type: UNSIGNED_8 Code: C03647
Length of the interpolation data in byte			
Setting range (min. value unit max. value)			Lenze setting
4		4	4
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

Index Name: 0x60C4/6 Buffer clear			Data type: UNSIGNED_8 Code: C03648
Clear interpolation buffer 1 = Enable interpolation buffer.			
Setting range (min. value unit max. value)			Lenze setting
0		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

3.11.3 Signal flow



① ... ④ Signals of the signal flow encoder evaluation
FDB_... = input/output signals of the encoder evaluation
MI_... = Input/output signals of the motor interface

[3-1] Access to the "position follower" basic function via the CiA402 device profile

Internal variables of the motor control (oscilloscope signals)

- The red numbers in brackets specified in the signal flow represent internal variables of the motor control which can be recorded with the oscilloscope for diagnostic and documentation purposes.

No.	Variable of the motor control	Meaning
(1)	Torque.dnTotalTorqueAdd	Additive torque feedforward control value
(2)	Torque.dnTorqueSetpoint	Torque setpoint
(3)	Position.dnActualLoadPos	Actual position
(4)	Position.dnPositionSetpoint	Position setpoint
(5)	Position.dnActualMotorPos	Current motor position
(6)	Position.dnContouringError	Following error
(7)	Speed.dnOutputPosCtrl	Output signal - phase controller
(8)	Speed.dnSpeedSetpoint	Speed setpoint
(9)	Speed.dnActualMotorSpeed	Current motor speed

3.11.4 Setpoint selection

The position setpoint for the position follower is selected via the subindex 1 (X1) of the [0x60C1](#) object (Interpolation data record).

- Furthermore, the following objects are available for speed and torque feedforward control:

Index	Name	Data type	Object type
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR

- The setpoints can be supplied to the common limit functions for speed, acceleration, and braking.

3.11.5 Setpoint interpolation

If the communication cycle time differs from the control cycle time of the controller (1 ms), the setpoint for the position follower will be interpolated. For this purpose, the drive accepts one interpolation data setpoint per cycle and calculates for each interpolation cycle the value displayed in the [0x6062](#) object (position demand value) by interpolating the position over a specific period.

- The interpolation algorithm to be used is defined by the [0x60C0](#) object (interpolation sub mode select) and is preset to linear interpolation.
- For synchronous operation, the interpolation cycle time is defined by the [0x60C2](#) object (interpolation time period):

$$\text{Interpolation cycle time [s]} = \text{ip time units} \cdot 10^{\text{ip time index}} [\text{s}]$$

[0x60C2/1](#): ip time units

[0x60C2/2](#): ip time index

[3-2] Definition of the interpolation cycle time



Tip!

For an interpolation cycle time of e.g. 2 ms, the value "2" must be set in [0x60C2/1](#) (ip time units) and the value "3" must be set in [0x60C2/2](#) (ip time index).

- For a time coordination of the connected controllers, the [0x60C3](#) synchronisation object (interpolation sync definition) is normally used.

3.11.6 Control commands & status information

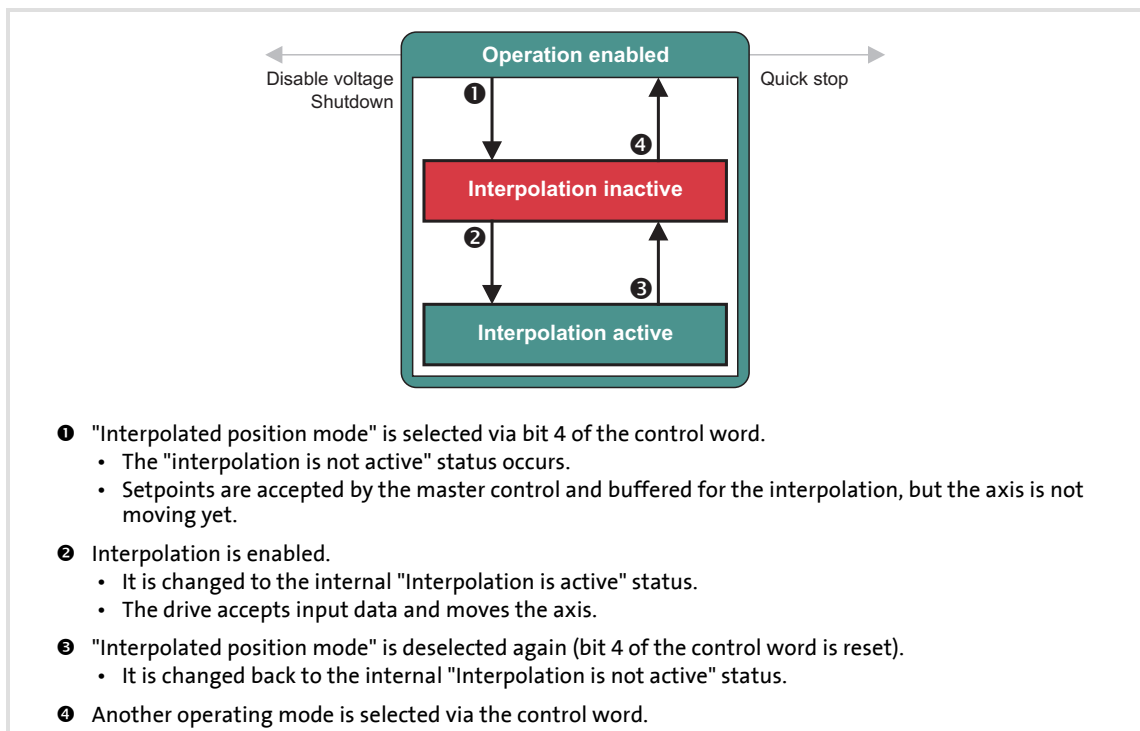
The CiA402 ([0x6040](#)) control word serves to execute control commands in the "interpolated position mode":

Control word	Status	Function
Bit 4	0	"Interpolated position mode" is not active
	0 ↗ 1	Select "Interpolated position mode"
	1 ↘ 0	Deselect "Interpolated position mode"
Bit 5	0	<i>Reserved</i> (bit must be set to "0")
Bit 6	0	<i>Reserved</i> (bit must be set to "0")
Bit 8	0 ↗ 1	Stop

The CiA402 ([0x6041](#)) status word serves to output the following status information in the "interpolated position mode":

Status word	Status	Meaning
Bit 12	0	"Interpolated position mode" is not active
	1	"Interpolated position mode" is active
Bit 13	0	<i>Reserved</i> (bit is always set to "0")

Internal states/state changes



[3-3] Internal state changes

3.11.7 Basic function "Position follower"

The "Position follower" basic function based on the "Interpolated position mode" serves as setpoint interface for position-controlled drives.

- The specified position setpoint can either refer to the encoder on the motor side or to the (position) encoder used additionally to detect the machine position. The selection of the encoder configuration serves to adapt the internal control structure accordingly.
- If the direction of rotation of the motor must be inverted due to the mounting position of the motor or the gearbox ratio available, the use of the control signals can be accordingly changed over by means of parameterisation.
- The speed can also be precontrolled with the position setpoint by a corresponding selection in C02681. Then, the speed is calculated by differentiation of the position setpoint.

Lenze parameters (short overview)

Parameter		Lenze setting	
		Value	Unit
C00050/1	Speed setpoint 1	-	rpm
C00070	Speed controller gain	0.00700	Nm/rpm
C00071	Speed controller reset time	10.0	ms
C00072	Speed controller rate time	0.00	ms
C00254	Phase controller gain	20.00	1/s
C00273/1	Motor moment of inertia	Motor-dependent	kg cm ²
C00273/2	Load moment of inertia	0.00	kg cm ²
C00275	Signal source - speed setpoint	SpeedAdd signal	
C00276	Signal source - torque setpoint	TorqueAdd/AccAdd signal	
C00909/1	Upper speed limit value	175.0	%
C00909/2	Lower speed limit value	-175.0	%
C02527	Motor mounting direction	Motor rotating CW	
C02531/3	Effective gearbox factor (dec.)	-	
C02550/1	Position setpoint interpolat.	Off	
C02550/3	Torque setpoint interpolat.	Off	
C02553	Position controller gain	20.00	1/s
C02554	Position controller reset time	60.000	s
C02555	D component position controller	0.000	
C02556	Pos. contr. limitation	214748,3647	Unit/s
C02559/1	Upper int. torque limit	-	%
C02559/2	Lower int. torque limit	-	%
C02570	Position control structure	Phase control	
C02680	Position setpoint source	Position setpoint input	
C02681	Added speed source	Add. speed input	

3.12 Cyclic synchronous position mode (IEC 61800-7)

This operating mode provides a quick position follower with speed/torque/feed force feedforward control. The motion profile to be processed is defined by the master control.

Subfunctions of the operating mode

- ▶ Calculation of the position setpoint
- ▶ Calculation of the speed feedforward control value
- ▶ Calculation of the speed feedforward control value
- ▶ Interpolation between communication cycle and control cycle
- ▶ Position control
- ▶ Speed control
- ▶ Torque control
- ▶ Update of the actual values for position, speed, and torque

Selection of operating mode

The operating mode "Cyclic synchronous position mode" is selected using the value "9" via the [8x6060](#) object (mode of operation).

3.12.1 Input and output data

Input data

Index	Name	Data type	Object type
0x6040	Control word	UNSIGNED_16	VAR
0x60C0	Interpolation sub mode select	INTEGER_16	VAR
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
0x60C4	Interpolation data configuration	UNSIGNED_32	RECORD
0x607C	Home offset	UNSIGNED_32	VAR
0x6065	Following error window	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
0x60B0	Offset position	INTEGER_32	VAR
0x607A	Target position	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR

Output data

Index	Name	Data type	Object type
0x6041	Status word	UNSIGNED_16	VAR
0x60FC	Position demand value*	INTEGER_32	VAR
0x6063	Position actual value*	INTEGER_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR

Grayed out = read access only

3.12.2 Object description

All objects correspond to the CiA402 specification, but some of them have only a restricted value range.

Objects described in other chapters:

Index	Name	Data type	Object type
► Device control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
► Position control function			
0x6065	Following error window	UNSIGNED_32	VAR
0x6066	Following error time out	UNSIGNED_32	VAR
0x6067	Position window	UNSIGNED_32	VAR
0x6068	Position window time	UNSIGNED_32	VAR
0x6062	Position demand value	INTEGER_32	VAR
0x6063	Position actual value*	INTEGER_32	VAR
0x6064	Position actual value	INTEGER_32	VAR
0x60F4	Following error actual value	INTEGER_32	VAR
0x60FC	Position demand value*	INTEGER_32	VAR
► Homing mode			
0x607C	Home offset	UNSIGNED_32	VAR
► Interpolated position mode			
0x60C0	Interpolation sub mode select	INTEGER_16	VAR
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
0x60C3	Interpolation sync definition	UNSIGNED_8	RECORD
0x60C4	Interpolation data configuration	UNSIGNED_32	RECORD
► Cyclic synchronous torque mode (IEC 61800-7)			
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
► Cyclic synchronous velocity mode (IEC 61800-7)			
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR

Grayed out = read access only

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Parameter setting & configuration

Cyclic synchronous position mode (IEC 61800-7)

Objects described in this chapter:

Index	Name	Data type	Object type
0x607A	Target position	INTEGER_32	VAR
0x60B0	Offset position	INTEGER_32	VAR

Grayed out = read access only

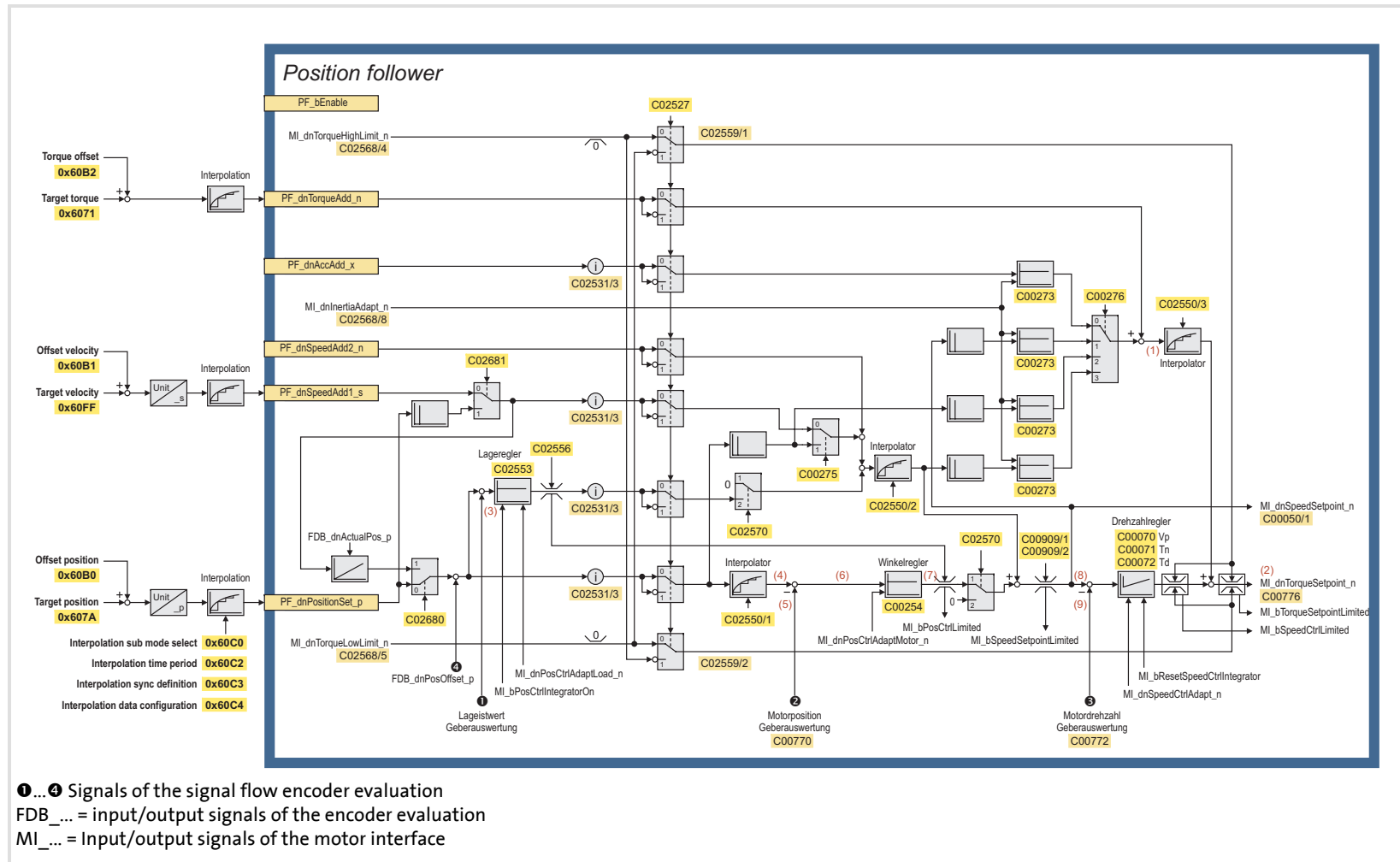
0x607A - Target position

Index Name: 0x607A Target position			Data type: INTEGER_32 Code: C03690
Position setpoint			
Setting range (min. value unit max. value)			Lenze setting
-2147483648	unit	2147483647	0 unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX			

0x60B0 - Offset position

Index Name: 0x60B0 Offset position			Data type: INTEGER_32 Code: C03691
Additive value to the position setpoint			
Setting range (min. value unit max. value)			Lenze setting
-2147483648	unit	2147483647	0 unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX			

3.12.3 Signal flow



[3-1] Access to the "position follower" basic function via the CiA402 device profile

Internal variables of the motor control (oscilloscope signals)

- The red numbers in brackets specified in the signal flow represent internal variables of the motor control which can be recorded with the oscilloscope for diagnostic and documentation purposes.

No.	Variable of the motor control	Meaning
(1)	Torque.dnTotalTorqueAdd	Additive torque feedforward control value
(2)	Torque.dnTorqueSetpoint	Torque setpoint
(3)	Position.dnActualLoadPos	Actual position
(4)	Position.dnPositionSetpoint	Position setpoint
(5)	Position.dnActualMotorPos	Current motor position
(6)	Position.dnContouringError	Following error
(7)	Speed.dnOutputPosCtrl	Output signal - phase controller
(8)	Speed.dnSpeedSetpoint	Speed setpoint
(9)	Speed.dnActualMotorSpeed	Current motor speed

3.12.4 Setpoint selection

The position setpoint is selected via the [0x6071](#) object (target position). Use the [0x60B2](#) object (offset position) to additionally define an offset which is added to the position setpoint.

The speed feedforward control value is selected via the [0x60FF](#) object (target velocity). Use the [0x60B1](#) object (offset velocity) to additionally define an offset which is added to the speed setpoint.

The torque feedforward control value is selected via the [0x6071](#) object (target torque). Use the [0x60B2](#) object (torque offset) to additionally define an offset which is added to the torque feedforward control value.

3.12.5 Setpoint interpolation

Similar to the "[Interpolated position mode](#)", the resulting position setpoint is interpolated in this operating mode as well, if the communication cycle time differs from the control cycle time of the controller (1 ms).

- For the determination of the required interpolation steps the [0x60C2](#) object (interpolation time period) is used.

3.12.6 Control commands & status information

The CiA402 ([0x6040](#)) control word serves to execute control commands in the "cyclic synchronous position mode":

Control word	Status	Function
Bit 4	0	<i>Reserved</i> (bit must be set to "0")
Bit 5	0	<i>Reserved</i> (bit must be set to "0")
Bit 6	0	<i>Reserved</i> (bit must be set to "0")
Bit 8	0 ↗ 1	Stop

The CiA402 status word ([0x6041](#)) serves to output the following status information in the "Cyclic synchronous velocity mode":

Status word	Status	Meaning
Bit 12	0	"Cyclic synchronous position mode" is not active
	1	"Cyclic synchronous position mode" is active
Bit 13	0	<i>Reserved</i> (bit is always set to "0")

3.12.7 Basic function "Position follower"

The "Position follower" basic function based on the "Cyclic synchronous velocity mode" serves as setpoint interface for position-controlled drives.

- The specified position setpoint can either refer to the encoder on the motor side or to the (position) encoder used additionally to detect the machine position. The selection of the encoder configuration serves to adapt the internal control structure accordingly.
- If the direction of rotation of the motor must be inverted due to the mounting position of the motor or the gearbox ratio available, the use of the control signals can be accordingly changed over by means of parameterisation.
- The speed can also be precontrolled with the position setpoint by a corresponding selection in C02681. Then, the speed is calculated by differentiation of the position setpoint.

Lenze parameters (short overview)

Parameter		Lenze setting	
		Value	Unit
C00050/1	Speed setpoint 1	-	rpm
C00070	Speed controller gain	0.00700	Nm/rpm
C00071	Speed controller reset time	10.0	ms
C00072	Speed controller rate time	0.00	ms
C00254	Phase controller gain	20.00	1/s
C00273/1	Motor moment of inertia	Motor-dependent	kg cm ²
C00273/2	Load moment of inertia	0.00	kg cm ²
C00275	Signal source - speed setpoint	SpeedAdd signal	
C00276	Signal source - torque setpoint	TorqueAdd/AccAdd signal	
C00909/1	Upper speed limit value	175.0	%
C00909/2	Lower speed limit value	-175.0	%
C02527	Motor mounting direction	Motor rotating CW	
C02531/3	Effective gearbox factor (dec.)	-	
C02550/1	Position setpoint interpolat.	Off	
C02550/3	Torque setpoint interpolat.	Off	
C02553	Position controller gain	20.00	1/s
C02554	Position controller reset time	60.000	s
C02555	D component position controller	0.000	
C02556	Pos. contr. limitation	214748,3647	Unit/s
C02559/1	Upper int. torque limit	-	%
C02559/2	Lower int. torque limit	-	%
C02570	Position control structure	Phase control	
C02680	Position setpoint source	Position setpoint input	
C02681	Added speed source	Add. speed input	

3.13 Cyclic synchronous velocity mode (IEC 61800-7)

This operating mode provides a fast speed follower with torque/feed force feedforward control. The speed profile to be processed is defined by the master control.

Subfunctions of the operating mode

- ▶ Calculation of the speed setpoint
- ▶ Calculation of the speed feedforward control value
- ▶ Interpolation between communication cycle and control cycle
- ▶ Speed control
- ▶ Torque control
- ▶ Limitation of the motor speed
- ▶ Update of the actual values for position, speed, and torque

Selection of operating mode

The "Cyclic synchronous velocity mode" is selected using the value "9" via the [0x6060](#) object (mode of operation).

3.13.1 Input and output data

Input data

Index	Name	Data type	Object type
0x6040	Control word	UNSIGNED_16	VAR
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR

Output data

Index	Name	Data type	Object type
0x6041	Status word	UNSIGNED_16	VAR
0x6064	Position actual value	INTEGER_32	VAR
0x606C	Velocity actual value	INTEGER_32	VAR
0x6077	Torque actual value	INTEGER_32	VAR

Grayed out = read access only

3.13.2 Object description

Objects described in other chapters:

Index	Name	Data type	Object type
▶ Device control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
▶ Position control function			
0x6064	Position actual value	INTEGER_32	VAR
▶ Interpolated position mode			
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
▶ Cyclic synchronous torque mode (IEC 61800-7)			
0x6071	Target torque	INTEGER_32	VAR
0x60B2	Torque offset	INTEGER_32	VAR
0x6077	Torque actual value	INTEGER_32	VAR
Grayed out = read access only			

Objects described in this chapter:

Index	Name	Data type	Object type
0x606C	Velocity actual value	INTEGER_32	VAR
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR
Grayed out = read access only			

0x606C - Velocity actual value

Index Name: 0x606C Velocity actual value			Data type: INTEGER_32 Code: C03653		
Current speed					
Display area (min. value unit max. value)					
-2147483648	vel unit	2147483647			
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX					

0x60B1 - Offset velocity

Index Name: 0x60B1 Offset velocity			Data type: INTEGER_32 Code: C03654		
Additive value to setpoint for speed or speed feedforward control					
Setting range (min. value unit max. value)			Lenze setting		
-2147483648	vel unit	2147483647	0 vel unit		
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX					

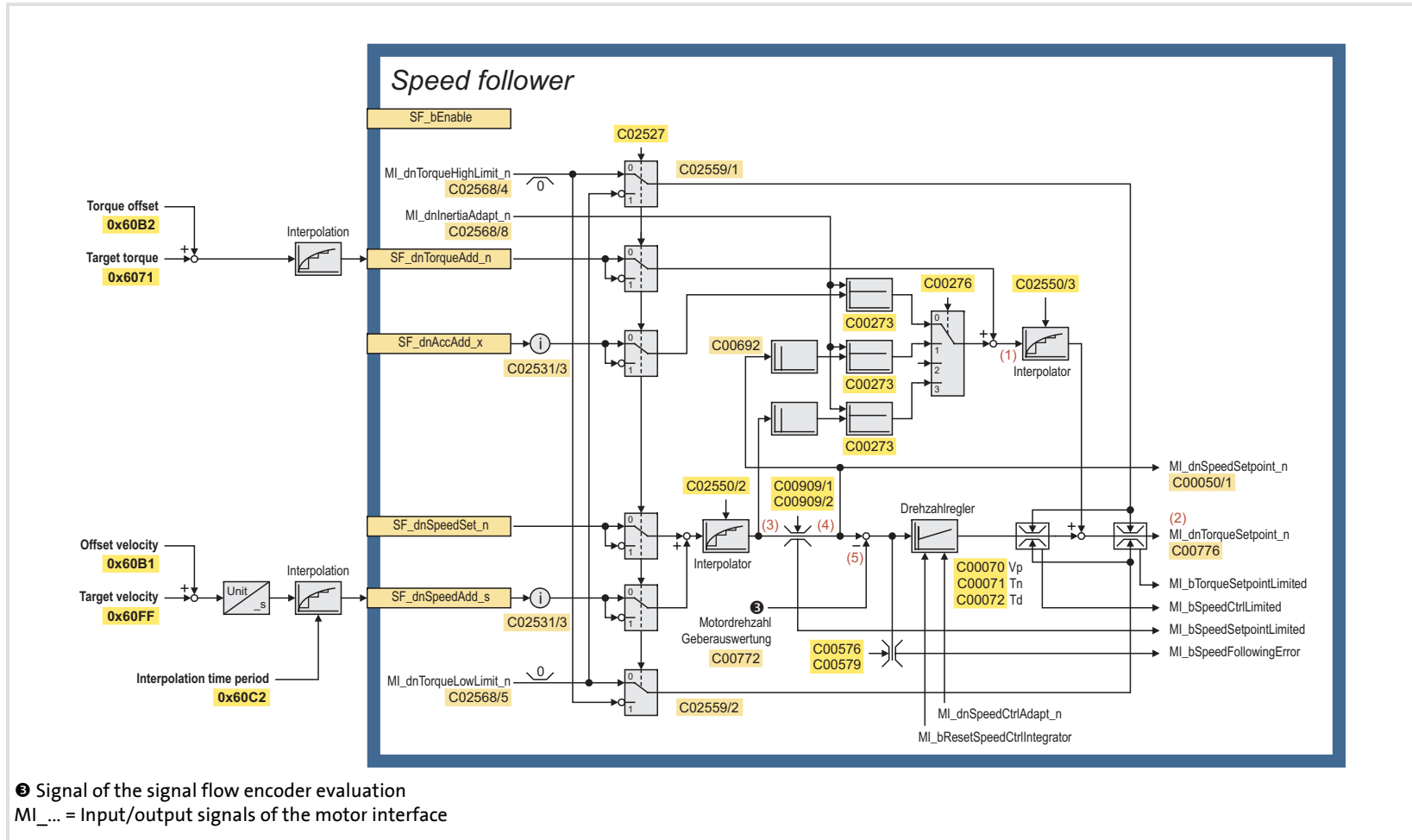
0x60FF - Target velocity

Index | Name: 0x60FF | Target velocity

Data type: INTEGER_32
Code: C03658

Setpoint for speed or speed feedforward control

Setting range (min. value unit max. value)			Lenze setting
-2147483648	vel unit	2147483647	0 vel unit
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX			



[3-1] Access to the "speed follower" basic function via the CiA402 device profile

Internal variables of the motor control (oscilloscope signals)

- The red numbers in brackets specified in the signal flow represent internal variables of the motor control which can be recorded with the oscilloscope for diagnostic and documentation purposes.

No.	Variable of the motor control	Meaning
(1)	Torque.dnTotalTorqueAdd	Additive torque feedforward control value
(2)	Torque.dnTorqueSetpoint	Torque setpoint
(3)	Speed.dnTotalSpeedAdd	Additive speed setpoint
(4)	Speed.dnSpeedSetpoint	Speed setpoint
(5)	Speed.dnActualMotorSpeed	Current motor speed

3.13.4 Setpoint selection

The speed setpoint for the speed follower is selected via the [0x60FF](#) object (target velocity). Use the [0x60B1](#) object (offset velocity) to additionally define an offset which is added to the speed setpoint.

The torque feedforward control value is selected via the [0x6071](#) object (target torque). Use the [0x60B2](#) object (torque offset) to additionally define an offset which is added to the torque feedforward control value.

3.13.5 Setpoint interpolation

Similar to the "[Interpolated position mode](#)", the resulting position setpoint is interpolated in this operating mode as well, if the communication cycle time differs from the control cycle time of the controller (1 ms).

- For the determination of the required interpolation steps the [0x60C2](#) object (interpolation time period) is used.

3.13.6 Control commands & status information

The CiA402 ([0x6040](#)) control word serves to execute control commands in the "cyclic synchronous velocity mode":

Control word	Status	Function
Bit 4	0	<i>Reserved</i> (bit must be set to "0")
Bit 5	0	<i>Reserved</i> (bit must be set to "0")
Bit 6	0	<i>Reserved</i> (bit must be set to "0")
Bit 8	0 ↗ 1	Stop

The CiA402 status word ([0x6041](#)) serves to output the following status information in the "Cyclic synchronous velocity mode":

Status word	Status	Meaning
Bit 12	0	"Cyclic synchronous velocity mode" is not active
	1	"Cyclic synchronous velocity mode" is active
Bit 13	0	<i>Reserved</i> (bit is always set to "0")

3.13.7 Basic function "Speed follower"

The "Speed follower" basic function based on the "Cyclic synchronous velocity mode" serves as setpoint interface for speed-controlled drives.

- ▶ The motor control is switched over automatically to speed control with torque limitation.
- ▶ If the direction of rotation of the motor must be inverted due to the mounting position of the motor or the gearbox ratio available, the use of the control signals can be accordingly changed over by means of parameterisation.

Lenze parameters (short overview)

Parameter		Lenze setting	
		Value	Unit
C00050/1	Speed setpoint 1	-	rpm
C00070	Speed controller gain	0.00700	Nm/rpm
C00071	Speed controller reset time	10.0	ms
C00072	Speed controller rate time	0.00	ms
C00273/1	Motor moment of inertia	Motor-dependent	kg cm ²
C00273/2	Load moment of inertia	0.00	kg cm ²
C00276	Signal source - torque setpoint	TorqueAdd/AccAdd signal	
C00576	Speed monitoring tolerance	100	%
C00579	Resp. to speed monitoring	No response	
C00692	Speed setpoint	-	%
C00909/1	Upper speed limit value	175.0	%
C00909/2	Lower speed limit value	-175.0	%
C02527	Motor mounting direction	Motor rotating CW	
C02531/3	Effective gearbox factor (dec.)	-	
C02550/2	Speed setpoint interpolat.	Off	
C02550/3	Torque setpoint interpolat.	Off	
C02559/1	Upper int. torque limit	-	%
C02559/2	Lower int. torque limit	-	%

3.14 Cyclic synchronous torque mode (IEC 61800-7)

This operating mode provides a fast torque follower with speed limitation. The torque profile to be processed is defined by the master control.

Subfunctions of the operating mode

- ▶ Calculation of the torque setpoint
- ▶ Interpolation between communication cycle and control cycle
- ▶ Torque control
- ▶ Limitation of the motor speed
- ▶ Update of the actual values for position, speed, and torque

Selection of operating mode

The "Cyclic synchronous torque mode" is selected using the value "10" via the [0x6060](#) object (mode of operation).

3.14.1 Input and output data

Input data

Index	Name	Data type	Object type
0x6040	Control word	UNSIGNED_16	VAR
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
0x60B2	Torque offset	INTEGER_32	VAR
0x6071	Target torque	INTEGER_32	VAR
0x6072	Max. torque	UNSIGNED_16	VAR
0x6076	Motor rated torque	UNSIGNED_32	VAR
0x60F6	Torque control parameters	UNSIGNED_32	RECORD

Output data

Index	Name	Data type	Object type
0x6041	Status word	UNSIGNED_16	VAR
0x6064	Position actual value	INTEGER_32	VAR
0x606C	Velocity actual value	INTEGER_32	VAR
0x6077	Torque actual value	INTEGER_32	VAR

Grayed out = read access only

3.14.2 Object description

Objects described in other chapters:

Index	Name	Data type	Object type
▶ Device control			
0x6040	Control word	UNSIGNED_16	VAR
0x6041	Status word	UNSIGNED_16	VAR
▶ Position control function			
0x6064	Position actual value	INTEGER_32	VAR
▶ Interpolated position mode			
0x60C2	Interpolation time period	UNSIGNED_32	RECORD
▶ Cyclic synchronous velocity mode (IEC 61800-7)			
0x60B1	Offset velocity	INTEGER_32	VAR
0x60FF	Target velocity	INTEGER_32	VAR
0x606C	Velocity actual value	INTEGER_32	VAR
Grayed out = read access only			

Objects described in this chapter:

Index	Name	Data type	Object type
0x6071	Target torque	INTEGER_32	VAR
0x6072	Max. torque	UNSIGNED_16	VAR
0x6073	Max. current	UNSIGNED_32	VAR
0x6074	Torque demand value	INTEGER_32	VAR
0x6075	Motor rated current	UNSIGNED_32	VAR
0x6076	Motor rated torque	UNSIGNED_32	VAR
0x6077	Torque actual value	INTEGER_32	VAR
0x6078	Current actual value	INTEGER_32	VAR
0x6079	DC link circuit voltage	UNSIGNED_32	VAR
0x6087	Torque slope	UNSIGNED_32	VAR
0x6088	Torque profile type	INTEGER_16	VAR
0x60B2	Torque offset	INTEGER_32	VAR
0x60F6	Torque control parameters	UNSIGNED_32	RECORD
0x60F7	Power stage parameters	UNSIGNED_32	RECORD
Grayed out = read access only			

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Parameter setting & configuration

Cyclic synchronous torque mode (IEC 61800-7)

0x6071 - Target torque

Index Name: 0x6071 Target torque			Data type: INTEGER_32 Code: C03670
Setpoint for torque or torque feedforward control - The object is internally limited to ± 1073741824 ($\equiv \pm 100\%$). $2^{30} \equiv 100\%$ motor reference torque (C00057/2)			
Setting range (min. value unit max. value)			Lenze setting
-2147483648	_n LENZE	2147483647	0 _n LENZE
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6072 - Max. torque

Index Name: 0x6072 Max. torque			Data type: UNSIGNED_32 Code: C03688
Maximum permissible torque (symmetrical setting) $16384 \equiv 100\%$			
Setting range (min. value unit max. value)			Lenze setting
0	_a LENZE	32767	32767 _a LENZE
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6073 - Max. current

Index Name: 0x6073 Max. current			Data type: UNSIGNED_32 Code: C00789
Maximum current (maximum overload current of the device) Direct mapping of the Lenze code C00789 (MCTRL_dwMaxDeviceCurrent).			
Display area (min. value unit max. value)			
0	1/100 A	2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6074 - Torque demand value

Index Name: 0x6074 Torque demand value			Data type: INTEGER_32 Code: C03673
Interpolated torque setpoint $2^{30} \equiv 100\%$ motor reference torque (C00057/2)			
Display area (min. value unit max. value)			
-2147483648	_n LENZE	2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6075 - Motor rated current

Index Name: 0x6075 Motor rated current			Data type: UNSIGNED_32 Code: C00088
Rated motor current			
Setting range (min. value unit max. value)			Lenze setting
1	1/100 A	150000	0 1/100 A
☒ Read access ☒ Write access ☒ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

0x6076 - Motor rated torque

Index Name:			Data type: UNSIGNED_32		
0x6076 Motor rated torque			Code: C00057/2		
Rated motor torque					
Display area (min. value unit max. value)					
0	mNm	4294967295			
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX					

0x6077 - Torque actual value

Index Name: 0x6077 Torque actual value			Data type: INTEGER_32 Code: C03677		
Current torque					
• 2 ³⁰ ≡ 100 % motor reference torque (C00057/2)					
Display area (min. value unit max. value)					
-2147483648	_n LENZE	2147483647			
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX					

0x6078 - Current actual value

Index Name: 0x6078 Current actual value			Data type: INTEGER_32 Code: C03678		
Current motor current					
• $2^{30} \equiv 100\% I_{\max_device}$ (C00789)					
Display area (min. value unit max. value)					
-2147483648	_n LENZE	2147483647			
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX					

0x6079 - DC link circuit voltage

Index Name: 0x6079 DC link circuit voltage			Data type: UNSIGNED_32 Code: C00053		
DC-bus voltage					
• Direct mapping of the Lenze code C00053 (DC-bus voltage).					
Display area (min. value unit max. value)					
0	V	2147483647			
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX					

0x6087 - Torque slope

Index | Name:

0x6087 | Torque slope

Data type: UNSIGNED_32
Code: [C03679](#)

Torque change per second

0xffffffff = no torque change per second.

Setting range (min. value unit max. value)			Lenze setting
4294967295	mNm/s	4294967295	0 mNm/s
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

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Parameter setting & configuration

Cyclic synchronous torque mode (IEC 61800-7)

0x6088 - Torque profile type

Index Name: 0x6088 Torque profile type		Data type: INTEGER_16 Code: C03680
Torque profile 0 = Linear ramp (interpolation).		
Setting range (min. value unit max. value)		Lenze setting
0		0 0
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x60B2 - Torque offset

Index Name: 0x60B2 Torque offset		Data type: INTEGER_32 Code: C03683
Additive value to setpoint for torque or torque feedforward control $2^{30} \equiv 100\%$ motor reference torque (C00057/2)		
Setting range (min. value unit max. value)		Lenze setting
-2147483648	_n LENZE	2147483647 0_n LENZE
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX		

0x60F6 - Torque control parameters

Index Name: 0x60F6 Torque control parameters		Data type: UNSIGNED_32 Code: C03682
Parameter for torque control		
Subindex	Name	
▸ 0x60F6/1	Positive speed limit	
▸ 0x60F6/2	Negative speed limit	

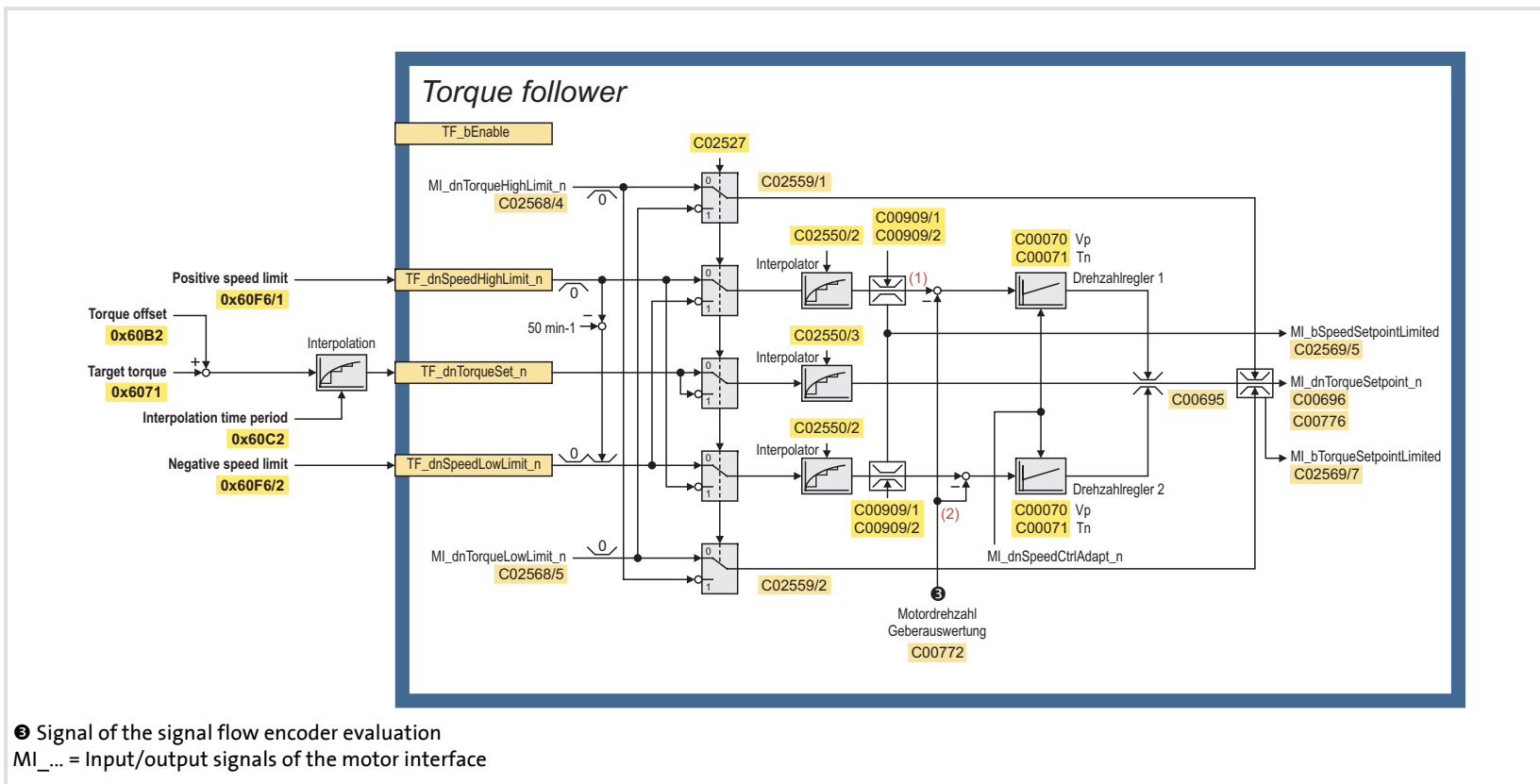
Index Name: 0x60F6/1 Positive speed limit		Data type: INTEGER_32 Code: C03684
Upper speed limit value in [%] for speed limitation - For positive direction of motion. 100 % $\equiv$ Motor reference speed (C00011). - Negative values are limited internally to the value "0".		
Setting range (min. value unit max. value)		Lenze setting
0	%	175.00 100.00 %
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

Index Name: 0x60F6/2 Negative speed limit		Data type: INTEGER_32 Code: C03685
Lower speed limit value in [%] for speed limitation - For negative direction of motion. 100 % $\equiv$ Motor reference speed (C00011). - Positive values are limited internally to the value "0".		
Setting range (min. value unit max. value)		Lenze setting
-175.00	%	0 -100.00 %
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX		

0x60F7 - Power stage parameters

Index Name:		Data type: UNSIGNED_32	
0x60F7 Power stage parameters		Code: C03681	
Power stage parameters			
Display area (min. value unit max. value)			
0			0
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☐ PDO_MAP_TX			

3.14.3 Signal flow



[3-1] Access to the "torque follower" basic function via the CiA402 device profile

Internal variables of the motor control (oscilloscope signals)

- The red numbers in brackets specified in the signal flow represent internal variables of the motor control which can be recorded with the oscilloscope for diagnostic and documentation purposes.

No.	Variable of the motor control	Meaning
(1)	Speed.dnSpeedSetpoint	Speed setpoint
(2)	Speed.dnActualMotorSpeed	Current motor speed

3.14.4 Setpoint selection

The torque setpoint for the torque follower is selected via the [0x6071](#) object (target torque). Use the [0x60B2](#) object (torque offset) to additionally define an offset which is added to the torque feedforward control value.

The [0x60F6/1](#) object (positive speed limit) serves to define the positive speed limit and the [0x60F6/2](#) object (negative speed limit) serves to define the negative speed limit for speed limitation.

3.14.5 Setpoint interpolation

Similar to the "[Interpolated position mode](#)", the resulting torque setpoint is interpolated in this operating mode as well, if the communication cycle time differs from the control cycle time of the controller (1 ms).

- For the determination of the required interpolation steps the [0x60C2](#) object (interpolation time period) is used.

3.14.6 Control commands & status information

The CiA402 ([0x6040](#)) control word serves to execute control commands in the "cyclic synchronous torque mode":

Control word	Status	Function
Bit 4	0	<i>Reserved</i> (bit must be set to "0")
Bit 5	0	<i>Reserved</i> (bit must be set to "0")
Bit 6	0	<i>Reserved</i> (bit must be set to "0")
Bit 8	0 ↗ 1	Stop

The CiA402 ([0x6041](#)) status word serves to output the following status information in the "cyclic synchronous torque mode":

Status word	Status	Meaning
Bit 12	0	"Cyclic synchronous torque mode" is not active
	1	"Cyclic synchronous torque mode" is active
Bit 13	0	<i>Reserved</i> (bit is always set to "0")

3.14.7 Basic function "Torque follower"

The "Torque follower" basic function based on the "Cyclic synchronous torque mode" serves as setpoint interface for torque-controlled drives.

- ▶ The motor control is switched over automatically to torque control with speed limitation.
- ▶ If the direction of rotation of the motor must be inverted due to the mounting position of the motor or the gearbox ratio available, the use of the control signals can be accordingly changed over by means of parameterisation.
- ▶ A stable speed limitation requires a minimum difference of the speed limit values of 50 rpm. If the defined speed limit values fall below this minimum difference, the internal lower speed limit value is lowered accordingly. The upper speed limit value remains unchanged. ▶ [Signal flow](#) (162)

Lenze parameters (short overview)

Parameter		Lenze setting	
		Value	Unit
C00070	Speed controller gain	0.00700	Nm/rpm
C00071	Speed controller reset time	10.0	ms
C00909/1	Upper speed limit value	175.0	%
C00909/2	Lower speed limit value	-175.0	%
C02527	Motor mounting direction	Motor rotating CW	
C02550/2	Speed setpoint interpolat.	Off	
C02550/3	Torque setpoint interpolat.	Off	
C02559/1	Upper int. torque limit	-	%
C02559/2	Lower int. torque limit	-	%

3.15 Touch probe

Up to 2 touch probe channels can be used in parallel.

- ▶ Possible touch probe sources:
 - TP1 : Zero pulse position encoder or digital input DI7
 - TP2 : Zero pulse position encoder or digital input DI8
- ▶ Configuration: see control word [0x60B8](#) (Touch probe function)

3.15.1 Input and output data

Input data

Index	Name	Data type	Object type
0x60B8	Touch probe function	UNSIGNED_16	VAR

Output data

Index	Name	Data type	Object type
0x60B9	Touch probe status	UNSIGNED_16	VAR
0x60BA	Touch probe pos 1 pos value	INTEGER_32	VAR
0x60BB	Touch probe pos 1 neg value	INTEGER_32	VAR
0x60BC	Touch probe pos 2 pos value	INTEGER_32	VAR
0x60BD	Touch probe pos 2 neg value	INTEGER_32	VAR

Grayed out = read access only

3.15.2 Object description

Objects described in this chapter:

Index	Name	Data type	Object type
0x60B8	Touch probe function	UNSIGNED_16	VAR
0x60B9	Touch probe status	UNSIGNED_16	VAR
0x60BA	Touch probe pos 1 pos value	INTEGER_32	VAR
0x60BB	Touch probe pos 1 neg value	INTEGER_32	VAR
0x60BC	Touch probe pos 2 pos value	INTEGER_32	VAR
0x60BD	Touch probe pos 2 neg value	INTEGER_32	VAR

0x60B8 - Touch probe function

Index | Name:

0x60B8 | Touch probe function

Data type: UNSIGNED_16

Code: C03700

Control word for the configuration of the touch probe functionality

Value is bit-coded:	Information
Bit 0 0: Deactivate touch probe 1 1: Activate touch probe 1	Configuration of the touch probe channel 1
Bit 1 0: Record first event only 1: Record all events	
Bit 2 Source for touch probe 1 0: Digital input DI7 1: Zero pulse position encoder	
Bit 3 Reserved	
Bit 4 Evaluation of positive edge 0: Deactivate 1: Activate	
Bit 5 Evaluation of negative edge 0: Deactivate 1: Activate	
Bit 6 Sequence for edge evaluation if bit 4 <u>and</u> bit 5 = 1 0: - 1: Positive edge - negative edge	
Bit 7 Sequence for edge evaluation if bit 4 <u>and</u> bit 5 = 1 0: - 1: Negative edge - positive edge	
Bit 8 0: Deactivate touch probe 2 1: Activate touch probe 2	Configuration of touch probe channel 2
Bit 9 0: Record first event only 1: Record all events	
Bit 10 Source for touch probe 2 0: Digital input DI8 1: Zero pulse position encoder	
Bit 11 Reserved	
Bit 12 Evaluation of positive edge 0: Deactivate 1: Activate	
Bit 13 Evaluation of negative edge 0: Deactivate 1: Activate	
Bit 14 Sequence for edge evaluation if bit 12 <u>and</u> bit 13 = 1 0: - 1: Positive edge - negative edge	
Bit 15 Sequence for edge evaluation if bit 12 <u>and</u> bit 13 = 1 0: - 1: Negative edge - positive edge	

☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO_MAP_RX ☐ PDO_MAP_TX

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Parameter setting & configuration

Touch probe

0x60B9 - Touch probe status

Index | Name:

0x60B9 | Touch probe status

Data type: UNSIGNED_16

Code: C03701

Status of the touch probe functionality

Value is bit-coded:	Information
Bit 0 0: Touch probe 1 deactivated 1: Touch probe 1 activated	Status of the touch probe channel 1
Bit 1 Evaluation of positive edge 0: Deactivated 1: Activated	
Bit 2 Evaluation of negative edge 0: Deactivated 1: Activated	
Bit 3 ... 5 Reserved	
Bit 6 Level for touch probe 1 if touch probe function is activated 0: LOW level 1: HIGH level	
Bit 7 Reserved	
Bit 8 0: Touch probe 2 deactivated 1: Touch probe 2 activated	Status of touch probe channel 2
Bit 9 Evaluation of positive edge 0: Deactivated 1: Activated	
Bit 10 Evaluation of negative edge 0: Deactivated 1: Activated	
Bit 11 ... 13 Reserved	
Bit 14 Level for touch probe 2 if touch probe function is activated 0: LOW level 1: HIGH level	
Bit 15 Reserved	

☒ Read access
 ☐ Write access
 ☐ CINH
 ☐ PLC-STOP
 ☐ PDO_MAP_RX
 ☒ PDO_MAP_TX

0x60BA - Touch probe pos 1 pos value

Index Name: 0x60BA Touch probe pos 1 pos value		Data type: INTEGER_32 Code: C03706
Touch probe position 1, recorded with the positive edge.		
Display area (min. value unit max. value)		
-2147483648	pos unit	2147483647
☒ Read access ☐ Write access ☐ CINH ☐ PLC-STOP ☐ PDO_MAP_RX ☒ PDO_MAP_TX		

0x60BB - Touch probe pos 1 neg value

Index | Name:

0x60BB | Touch probe pos 1 neg value

Data type: INTEGER_32
Code: [C03707](#)

Touch probe position 1, detected with negative edge.

Display area (min. value unit max. value)			
-2147483648	pos unit	2147483647	

☒ Read access

☐ Write access

☐ CINH

☐ PLC-STOP

☐ PDO_MAP_RX

☒ PDO_MAP_TX

0x60BC - Touch probe pos 2 pos value

Index | Name:

0x60BC | Touch probe pos 2 pos value

Data type: INTEGER_32

Code: [C03708](#)

Touch probe position 2, recorded with positive edge.

Display area (min. value unit max. value)		
-2147483648	pos unit	2147483647

☒ Read access
 ☐ Write access
 ☐ CINH
 ☐ PLC-STOP
 ☐ PDO_MAP_RX
 ☒ PDO_MAP_TX

0x60BD - Touch probe pos 2 neg value

Index | Name:

0x60BD | Touch probe pos 2 neg value

Data type: INTEGER_32

Code: [C03709](#)

Touch probe position 2, recorded with negative edge.

Display area (min. value | unit | max. value)

-2147483648	pos unit	2147483647
-------------	----------	------------

☒ Read access
 ☐ Write access
 ☐ CINH
 ☐ PLC-STOP
 ☐ PDO_MAP_RX
 ☒ PDO_MAP_TX

3.15.3 Internal interfaces | function block "L_CiA402TouchProbe"

The IM **L_CiA402TouchProbe** provides the interfaces for the touch probe functionality of the device profile CiA402 in the function block editor.

Inputs

Identifier	Data type	Information/possible settings
wCiA402TouchProbeCtrl	WORD	Interface of the master / master control Control word for the touch probe function (0x60B8)
dnFDB_dnActualPos_p	DINT	Interface for the "encoder evaluation" basic function - Input for current position. - Connect this input with the output <i>FDB_dnActualPos_p</i> of the system block LS_Feedback.
dnTP1_ dnTouchProbeTimeLag	DINT	Touch probe 1: Input for time stamp
bTP1_bTouchProbeReceived	BOOL	Touch probe 1: Input for status signal "Touch probe received"
bTP1_bNegativeEdge	BOOL	Touch probe 1: Input for status signal "Negative edge received"
bDigIn_bTP1	BOOL	Touch probe 1: Digital input
dnTP2_ dnTouchProbeTimeLag	DINT	Touch probe 2: Input for time stamp
bTP2_bTouchProbeReceived	BOOL	Touch probe 2: Input for the status signal "touch probe received"
bTP2_bNegativeEdge	BOOL	Touch probe 2: Input for the status signal "negative edge received"
bDigIn_bTP2	BOOL	Touch probe 2: Digital input
dnTPMotor_ dnTouchProbeTimeLag	DINT	Zero pulse for touch probe motor encoder: Input for time stamp
bTPMotor_ bTouchProbeReceived	BOOL	Zero pulse for touch probe motor encoder: Input for the status signal "touch probe received"
dnTPLoad_ dnTouchProbeTimeLag	DINT	Zero pulse for touch probe position encoder: Input for time stamp
bTPLoad_ bTouchProbeReceived	BOOL	Zero pulse for touch probe position encoder: Input for the status signal "touch probe received"
AxisData		Input for transfer of the machine parameters of the drive Connect this input to the output <i>DI_AxisData</i> of the system block LS_DriveInterface.

Outputs

Identifier	Data type	Info/meaning
wCiA402TouchProbeState	WORD	Interface to the master / master control Touch probe status (0x60B9)
dnCiA402 TouchProbe1PosVal_e4	DINT	Interface to the master / master control - Touch probe position 1, recorded with the positive edge. - Output in user units (e4 representation). - CiA402 object: 0x60BA
dnCiA402 TouchProbe1PosVal_p	DINT	Interface to the master / master control - Touch probe position 1, recorded with the positive edge. - Output in internal representation.
dnCiA402 TouchProbe1NegVal_e4	DINT	Interface to the master / master control - Touch probe position 1, detected with negative edge. - Output in user units (e4 representation). - CiA402 object: 0x60BB
dnCiA402 TouchProbe1NegVal_p	DINT	Interface to the master / master control - Touch probe position 1, detected with negative edge. - Output in internal representation.
dnCiA402 TouchProbe2PosVal_e4	DINT	Interface to the master / master control - Touch probe position 2, recorded with positive edge. - Output in user units (e4 representation). - CiA402 object: 0x60BC
dnCiA402 TouchProbe2PosVal_p	DINT	Interface to the master / master control - Touch probe position 2, recorded with positive edge. - Output in internal representation.
dnCiA402 TouchProbe2NegVal_e4	DINT	Interface to the master / master control - Touch probe position 2, recorded with negative edge. - Output in user units (e4 representation). - CiA402 object: 0x60BD
dnCiA402 TouchProbe2NegVal_p	DINT	Interface to the master / master control - Touch probe position 2, recorded with negative edge. - Output in internal representation.
bTP1_bEnablePosEdge	BOOL	Interface for enabling touch probe 1 (positive edge) Connect this output to the input <i>TPx_bEnablePosEdge</i> of the system block LS_TouchProbex (x = used digital input 1 ... 8).
bTP1_bEnableNegEdge	BOOL	Interface for enabling touch probe 1 (negative edge) Connect this output to the input <i>TPx_bEnableNegEdge</i> of the system block LS_TouchProbex (x = used digital input 1 ... 8).
bTP2_bEnablePosEdge	BOOL	Interface for enabling the touch probe 2 (positive edge) Connect this output to the input <i>TPx_bEnablePosEdge</i> of the system block LS_TouchProbex (x = used digital input 1 ... 8).
bTP2_bEnableNegEdge	BOOL	Interface for enabling the touch probe 2 (negative edge) Connect this output to the input <i>TPx_bEnableNegEdge</i> of the system block LS_TouchProbex (x = used digital input 1 ... 8).

3.16 Torque limiting

Selecting the torque limits of the drive.

3.16.1 Input and output data

Input data

Index	Name	Data type	Object type
0x60E0	Positive torque limit value	UNSIGNED_16	VAR
0x60E1	Negative torque limit value	UNSIGNED_16	VAR

3.16.2 Object description

Objects described in other chapters:

Index	Name	Data type	Object type
▶ Cyclic synchronous torque mode (IEC 61800-7)			
0x6072	Max torque	UNSIGNED_16	VAR

Objects described in this chapter:

Index	Name	Data type	Object type
0x60E0	Positive torque limit value	UNSIGNED_16	VAR
0x60E1	Negative torque limit value	UNSIGNED_16	VAR

0x60E0 - Positive torque limit value

Index | Name:

0x60E0 | Positive torque limit value

Data type: INTEGER_32

Code: [C03686](#)

Positive torque limit

• Scaling: 16384 ≡ 100%

Setting range (min. value unit max. value)			Lenze setting
0		32767	16384
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO MAP RX ☐ PDO MAP TX			

0x60E1 - Negative torque limit value

Index | Name:

0x60E1 | Negative torque limit value

Data type: INTEGER_32

Code: [C03687](#)

Negative torque limit

• Scaling: 16384 ≡ 100%

Setting range (min. value unit max. value)			Lenze setting
0		32767	16384
☒ Read access ☒ Write access ☐ CINH ☐ PLC-STOP ☒ PDO MAP RX ☐ PDO MAP TX			

3.17 Parameterisable additional functions

3.17.1 Undervoltage recognition of the DC link

[C03001](#) serves to parameterise an undervoltage recognition of the DC link. For this, the DC link voltage measured by the motor interface is compared to the voltage limit set in [C03001](#).

- ▶ If the DC link voltage falls below the voltage limit, the
 - error response (Lenze setting: "Quick stop by trouble") set in C05902/1 is triggered and the "DC-bus undervoltage" error response is entered into the logbook when the controller is enabled (module ID: 999, error ID: 8001).
 - no error response if the controller is inhibited.
- ▶ The voltage threshold can be parameterised in [C03001](#) in the range 0.00 ... 100.00% (100% $\equiv$ 1000V).
- ▶ If [C03001](#) = 0% is set (Lenze setting), the undervoltage recognition is deactivated.

Example:

The voltage threshold is set to 51.10% in [C03001](#).

If the DC link voltage falls below the value of 511V, the error response set in C05902/1 (Lenze setting: "quick stop by trouble") is carried out if the controller is enabled.

3.17.2 Connection between limiter and safety module

The connection between the "limiter" basic function and the safety module is useful for a single drive. In a safety case, the drive will autonomously be turned into a "safe state". However, problems can occur in a drive system if single axes carry out independent motion sequences which are not initiated by the control.

[C03002](#) serves to parameterise if the connection between "limiter" basic function and the safety module should be opened or closed (Lenze setting).

3.17.3 Dynamic change of the proportional gain V_p of the speed controller

The dynamic change of the speed controller gain during operation can be parameterised as a function of the desired speed by a characteristic.

- ▶ The characteristic is defined by the parameters C04100 ... C04102 of the function block [Adaption Speedcontroller](#) which is an instance of the function block **L_TbCurve**. (182)

3.17.4 Dynamic change of the proportional gain V_p of the angle/position controller

The dynamic change of the angle or position controller gain during operation can be parameterised as a function of the desired speed by a characteristic.

- ▶ The characteristic is defined by the parameters C04103 ... C04105 of the function block [Adaption Positioncontroller](#) which is an instance of the function block **L_TbCurve**. (182)

3.17.5 Telegram failure recognition and monitoring



Note!

This function is currently only supported when using the EtherCat as MotionBus.

When a telegram failure is recognised, an extrapolation of the setpoints (position, speed and torque) is carried out. Based on the position a square-law extrapolation algorithm is taken as a basis.

Telegram failure counter

The telegram failures which occurred during operation are evaluated in the application.

- ▶ The number of the single errors is stored in C03011 and the number of the multiple errors (more than 1 telegram failure in a row) is stored in C03012.
- ▶ Via C03013 you can reset the error counter.

Telegram failure monitoring

If the number of telegram failures in a row exceeds the limit value set in C03010 (Lenze setting: 1), the error response set in C05902/2 is triggered (Lenze setting: Information) and the "Maximum value for telegram failure exceeded" error response is entered into the logbook (module ID: 999, error ID: 8002). ▶ [Application error messages](#) (181)

3.18 Using the FB Editor

From »Engineer« version 2.12, the CiA402 application ([as of V2.x](#)) can be edited with the FB Editor, which means that e.g. other function blocks can be added to the interconnection.



Note!

- Please observe that deleting existing interconnections will affect basic functions of the CiA402 application!
- New port variables cannot be created.



Tip!

If additional process data need to be exchanged with the control system, 5 port variables are provided for input data and 5 port variables are provided for output data:

- Input ports:
FM1_RxD_DWORD ... FM1_RxD_DWORD
(indexes 0xA680/1...5)
- Output ports:
FM1_TxD_DWORD ... FM1_TxD_DWORD
(indexes 0xA200/1...5)

3.19 Internal interfaces | function block "L_CiA402DeviceProfile"

The **L_CiA402DeviceProfile** function block contains the main functionality of the CiA402 device profile.

Inputs

Identifier	Data type	Information/possible settings
wCiA402ControlWord	WORD	Interface of the master / master control Control word (0x6040). ▶ Device control commands
byCiA402ModeOfOperation	BYTE	Interface of the master / master control Selection of the operating mode (0x6060). ▶ Operating mode changeover
dnCiA402SetPosition_e4	DINT	Interface of the master / master control Selection of the setpoint position in user units (e4 representation) for Interpolated position mode.
dnCiA402TargetPosition_e4	DINT	Interface of the master / master control Selection of the setpoint position in user units (e4 representation) for Cyclic synchronous position mode (IEC 61800-7).
dnCiA402OffsetPosition_e4	DINT	Interface of the master / master control Selection of a position offset in user units (e4 representation).
dnCiA402TargetSpeed_e4	DINT	Interface of the master / master control Selection of a set speed in user units (e4 representation).
dnCiA402OffsetSpeed_e4	DINT	Interface of the master / master control Selection of a speed offset in user units (e4 representation).
dnCiA402TargetTorque_n	DINT	Interface of the master / master control - Selection of a torque in [%]. $2^{30} \equiv 100 \% \equiv C00057/2$
dnCiA402OffsetTorque_n	DINT	Interface of the master / master control - Selection of a torque offset in [%]. $2^{30} \equiv 100 \% \equiv C00057/2$
wCiA402PosTorqueLimit_a	WORD	Interface of the master / master control - Selection of the positive torque limit in [%]. $2^{16} \equiv 100 \% \equiv C00057/2$
wCiA402NegTorqueLimit_a	WORD	Interface of the master / master control - Selection of the negative torque limit in [%]. $2^{16} \equiv 100 \% \equiv C00057/2$
byCiA402DigitalOutput	BYTE	Interface of the master / master control Selection of the states of the digital outputs.
dnHM_dnState	DINT	Interface for the "homing" basic function - Input for the status signal of the basic function. - Connect this input to the HM_dnState output of the LS_Homing system block.
bHM_bEnabled	BOOL	Interface for the "homing" basic function - Input for the status signal "enable homing basic function". - Connect this input to the HM_bEnabled output of the LS_Homing system block.
bHM_bActive	BOOL	Interface for the "homing" basic function - Input for the status signal "homing basic function active". - Connect this input to the HM_bActive output of the LS_Homing system block.
bHM_bDone	BOOL	Interface for the "homing" basic function - Input for the status signal "homing completed". - Connect this input to the HM_bDone output of the LS_Homing system block.
bHM_bHomePosAvailable	BOOL	Interface for the "homing" basic function - Input for the status signal "home position available". - Connect this input to the HM_bHomePosAvailable output of the LS_Homing system block.

Identifier	Data type	Information/possible settings
bQSP_bActive	BOOL	Interface for the "quick stop" basic function - Input for the status signal "quick stop active". - Connect this input to the <i>QSP_bActive</i> output of the LS_Quickstop system block.
bDI_bReady	BOOL	Interface for the drive interface - Input for the status signal "controller is ready". - Connect this input to the <i>DI_bReady</i> output of the LS_DriveInterface system block.
bDI_bFailActive	BOOL	Interface for the drive interface - Input for the status signal "failure active". - Connect this input to the <i>DI_bFailActive</i> output of the LS_DriveInterface system block.
bDI_bImpActive	BOOL	Interface for the drive interface - Input for the status signal "pulse inhibit active". - Connect this input to the <i>DI_bImpActive</i> output of the LS_DriveInterface system block.
bDI_bClnhActive	BOOL	Interface for the drive interface - Input for the status signal "controller inhibit active". - Connect this input to the <i>DI_bClnhActive</i> output of the LS_DriveInterface system block.
bDI_bWarningActive	BOOL	Interface for the drive interface - Input for the status signal "warning active". - Connect this input to the <i>DI_bWarningActive</i> output of the LS_DriveInterface system block.
bDI_bMainSupplyOk	WORD	Interface for the drive interface - Input for the status signal "mains voltage applied". - Connect this input to the <i>DI_bMainSupplyOk</i> output of the LS_DriveInterface system block.
bBRK_bClnhActive	BOOL	Interface for the "brake control" basic function - Input for the status signal "controller inhibit active by brake". - Connect this input to the <i>BRK_bClnhActive</i> output of the LS_Brake system block.
bBRK_dnState	BOOL From technology application V2.x	Interface for the "brake control" basic function - Input for the status signal of the brake control - Connect this input to the <i>BRK_dnState</i> output of the LS_Brake SB.
dnFDB_dnActualPos_p	DINT	Interface for the "encoder evaluation" basic function - Input for the current position. - Connect this input with the output <i>FDB_dnActualPos_p</i> of the system block LS_Feedback.
dnFDB_dnActualSpeed_s	DINT	Interface for the "encoder evaluation" basic function - Input for the actual speed. - Connect this input to the <i>FDB_dnActualSpeed_s</i> output of the LS_Feedback system block.
dnFDB_dnPosFollowingError_p	DINT	Interface for the "encoder evaluation" basic function - Input for the actual following error. - Connect this input to the <i>FDB_dnPosFollowingError_p</i> output of the LS_Feedback system block.
dnMI_dnActualMotorTorque_n	DINT	Interface for the motor interface - Input for the actual torque. - Connect this input to the <i>MI_dnActualMotorTorque_n</i> output of the LS_MotorInterface system block.
dnMI_dnActualMotorCurrent_n	DINT	Interface for the motor interface - Input for the actual motor current. - Connect this input to the <i>MI_dnActualMotorCurrent_n</i> output of the LS_MotorInterface system block.

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Parameter setting & configuration

Internal interfaces | function block "L_CiA402DeviceProfile"

Identifier	Data type	Information/possible settings
bMI_ bMotorOrientationInverse	BOOL	Interface for the motor interface - Input for the motor mounting position. - Connect this input to the <i>MI_bMotorOrientationInverse</i> output of the LS_MotorInterface system block.
bMI_ bSpeedBelowThresholdC19	BOOL	Interface for the motor interface - Input for the zero speed recognition. - Connect this input to the <i>bSpeedBelowThresholdC19</i> output of the LS_MotorInterface system block.
bPF_bEnabled	BOOL	Interface for the "position follower" basic function - Input for the status signal "position follower basic function active". - Connect this input to the <i>PF_bEnabled</i> output of the LS_Positionfollower system block.
bSF_bEnabled	BOOL	Interface for the "speed follower" basic function - Input for the status signal "speed follower basic function active". - Connect this input to the <i>SF_bEnabled</i> output of the LS_Speedfollower system block.
bTF_bEnabled	BOOL	Interface for the "torque follower" basic function - Input for the status signal "torque follower basic function active". - Connect this input to the <i>TF_bEnabled</i> output of the LS_Torquefollower system block.
dnSMI_dnState	DINT	Interface for the safety module - Input for the status signal. - Connect this input to the <i>SMI_bEnabled</i> output of the LS_SafetyModulinterface system block.
bSYNC_ bProcessDataExpected	BOOL	Input for the status information "process data expected" Connect this input to the <i>SYNC_bProcessDataExpected</i> output of the LS_SyncInput system block.
bSYNC_ bProcessDataInvalid	BOOL	Input for the status information "process data invalid" Connect this input to the <i>SYNC_bProcessDataInvalid</i> output of the LS_SyncInput system block.
byDigitalInput	BYTE	Input for the acceptance of the status of the digital inputs
bySafeIOState	BYTE	Input for the acceptance of the I/O status of the safety module
AxisData		Input for transfer of the machine parameters of the drive Connect this input to the output <i>DI_AxisData</i> of the system block LS_DriveInterface.

Outputs

Identifier	Data type	Info/meaning
wCiA402StatusWord	WORD	Interface to the master / master control Status word (0x6041). ▶ Device statuses
byCiA402 ModeOfOperationDisplay	BYTE	Interface to the master / master control Active operating mode (0x6061). ▶ Operating mode changeover
dnCiA402ActualPosition_e4	DINT	Interface to the master / master control Actual position in user units (e4 representation).
dnCiA402ActualPosition_p	DINT	Interface to the master / master control Actual position in internal units.
dnCiA402 ActualFollowingError_e4	DINT	Interface to the master / master control Actual following error in user units (e4 representation).

Identifier	Data type	Info/meaning
dnCiA402ActualSpeed_e4	DINT	Interface to the master / master control Actual speed in user units (e4 representation).
dnCiA402ActualTorque_n	DINT	Interface to the master / master control Actual torque in [%]
dnCiA402ActualCurrent_n	DINT	Interface to the master / master control Actual motor current in [%]
byCiA402DigitalInput	BYTE	Interface to the master / master control States of the digital inputs.
bHM_bEnable	BOOL	Interface for the "homing" basic function - Control signal to enable the basic function. - Connect this output to the <i>HM_bEnable</i> input of the LS_Homing system block.
bHM_bActivateHoming	BOOL	Interface for the "homing" basic function - Control signal to start the homing process. - Connect this output to the <i>HM_bActivateHoming</i> input of the LS_Homing system block.
bHM_bLoadHomePos	BOOL	Interface for the "homing" basic function - Control signal to load the home position. - Connect this output to the <i>HM_bLoadHomePos</i> input of the LS_Homing system block.
dnHM_dnHomePos_p	DINT	Interface for the "homing" basic function - Home position to load (if <i>bHM_bLoadHomePos</i> = TRUE). - Connect this output to the <i>HM_dnHomePos_p</i> input of the LS_Homing system block.
bHM_bResetHomePos	BOOL	Interface for the "homing" basic function - Control signal to reset the homing information. - Connect this output to the <i>HM_bResetHomePos</i> input of the LS_Homing system block.
bQSP_bActivate	BOOL	Interface for the "quick stop" basic function - Control signal to require a quick stop. - Connect this output to the <i>QSP_bActivate</i> input of the LS_Quickstop system block.
bDI_bSetCInh	BOOL	Interface for the drive interface - Control signal to set/deactivate the controller inhibit. - Connect this output to the <i>DI_bSetCInh</i> input of the LS_DriveInterface system block.
bDI_bResetError	BOOL	Interface for the drive interface - Control signal to reset the error. - Connect this output to the <i>DI_bResetError</i> input of the LS_DriveInterface system block.
bDI_bSwitchOn	BOOL	Interface for the drive interface - Control signal to deactivate the switch-on inhibit. - Connect this output to the <i>DI_bSwitchOn</i> input of the LS_DriveInterface system block.
bPF_bEnable	BOOL	Interface for the "position follower" basic function - Control signal to enable the basic function. - Connect this output to the <i>PF_bEnable</i> input of the LS_PositionFollower system block.
bSF_bEnable	BOOL	Interface for the "speed follower" basic function - Control signal to enable the basic function. - Connect this output to the <i>SF_bEnable</i> input of the LS_SpeedFollower system block.
bTF_bEnable	BOOL	Interface for the "torque follower" basic function - Control signal to enable the basic function. - Connect this output to the <i>TF_bEnable</i> input of the LS_TorqueFollower system block.

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Parameter setting & configuration

Internal interfaces | function block "L_CiA402DeviceProfile"

Identifier	Data type	Info/meaning
dnSetPos_p	DINT	Interface for the selection of the position setpoint
dnSetOrAddSpeed_s	DINT	Interface for the selection of the speed setpoint or the speed feedforward control value
dnSetOrAddTorque_n	DINT	Interface for the selection of the speed setpoint or the speed feedforward control value
dnAddAcc_x	DINT	Interface for the selection of a feedforward acceleration
dnPosSpeedLimit_n	DINT	Interface for the selection of an upper speed limit
dnNegSpeedLimit_n	WORD	Interface for the selection of a lower speed limit
dnPosTorqueLimit_n	DINT	Interface for the selection of an upper torque limit
dnNegTorqueLimit_n	DINT	Interface for the selection of a lower torque limit
byDigitalOutput	BYTE	Interface for the control of the digital outputs
byBrakeControl	BYTE	Interface for the control of the brake function
dnBrakeTorqueAdd_n	DINT	Interface for the selection of a feedforward control torque for the brake control

3.20 Application error messages

In order to output application-specific error messages, a *L_DevApplErr1* FB instance of the *L_DevApplErr* function block is provided in the interconnection.

- ▶ Up to 8 different application error messages with parameterisable module ID, error ID and error response can be triggered by the application via the 8 boolean inputs.
- ▶ The first two inputs are fixed connected to trigger signals of the application, the other six inputs are free:

Error message	Error ID	Error response
1 DC-bus undervoltage	8001	Quick stop by trouble
2 Maximal value of the telegram failure exceeded	8002	Information
3 Application error (free input)	8003	Error
4 Application error (free input)	8004	Error
5 Application error (free input)	8005	Error
6 Application error (free input)	8006	Error
7 Application error (free input)	8007	Error
8 Application error (free input)	8008	Error

- ▶ Parameterisation: **all parameters** tab

Parameter	Lenze setting
C05900 Module ID	999
C05901/1...8 Error ID 1 ... 8	see table above
C05902/1...8 Error response 1 ... 8	see table above



Note!

In general, the "Warning locked" error response should not be set for the operation of the CiA402 application with a control because the control cannot distinguish this error response from the "Warning" error response. Therefore, it cannot be acknowledged.

3.21 Parameterisable function blocks

This subchapter lists all relevant parameterisable function blocks of the technology application in alphabetical order with the corresponding parameters.

3.21.1 Adaption_Positioncontroller

is an instance of	Function		
L_TbCurve	Adaption of the position controller by characteristic or curve function $y = f(x)$		

Parameter	Possible settings			Information
C04103				Characteristic mode
	0	Entire range		
	1	Symmetrical to the Y axis		Lenze setting
	2	Symmetrical to the zero point		
C04104/1...9	-200.00	%	200.00	x value of the characteristic function Subcode 1 ... 9 corresponding to the support point values X1 ... X9.
C04105/1...9	-200.00	%	200.00	y value of the characteristic function Subcode 1 ... 9 corresponding to the support point values Y1 ... Y9.

3.21.2 Adaption_Speedcontroller

is an instance of	Function		
L_TbCurve	Adaption of the speed controller by the characteristic or curve function $y = f(x)$		

Parameter	Possible settings			Information
C04100				Characteristic mode
	0	Entire range		
	1	Symmetrical to the Y axis		Lenze setting
	2	Symmetrical to the zero point		
C04101/1...9	-200.00	%	200.00	x value of the characteristic function Subcode 1 ... 9 corresponding to the support point values X1 ... X9.
C04102/1...9	-200.00	%	200.00	y value of the characteristic function Subcode 1 ... 9 corresponding to the support point values Y1 ... Y9.

3.21.3 CountMultiError

is an instance of	Function	
L_TbCount	Counter for recognised telegram failures (multiple errors)	

Parameter	Possible settings	Information
C04006		Reset function
	0 After reaching the reference value the counter is automatically reset to the starting value.	
	1 The reference value reached is stored until it is reset via <i>bLoadStartValue</i> .	Lenze setting

3.21.4 CountSingleError

is an instance of	Function	
L_TbCount	Counter for recognised telegram failures (single errors)	

Parameter	Possible settings	Information
C04005		Reset function
	0 After reaching the reference value the counter is automatically reset to the starting value.	
	1 The reference value reached is stored until it is reset via <i>bLoadStartValue</i> .	Lenze setting

3.21.5 DetectErrorLimit

is an instance of	Function	
L_TbCompare	Error triggering after exceeding the maximum value of the telegram failure Comparison of the number of recognised telegram failures with the maximum value set in C03010.	

Parameter	Possible settings	Information
C04085		Comparison operation
	0 $dnIn1 = dnIn2$	
	1 $dnIn1 > dnIn2$	Lenze setting
	2 $dnIn1 < dnIn2$	
	3 $ dnIn1 = dnIn2 $	
	4 $ dnIn1 > dnIn2 $	
	5 $ dnIn1 < dnIn2 $	

3.21.6 DetectMultiError

is an instance of	Function
L_TbCompare	Recognition of multiple errors

Parameter	Possible settings	Information
C04087		Comparison operation
	0 $dnIn1 = dnIn2$	
	1 $dnIn1 > dnIn2$	Lenze setting
	2 $dnIn1 < dnIn2$	
	3 $ dnIn1 = dnIn2 $	
	4 $ dnIn1 > dnIn2 $	
	5 $ dnIn1 < dnIn2 $	

3.21.7 DetectSingleError

is an instance of	Function
L_TbCompare	Recognition of single errors

Parameter	Possible settings	Information
C04086		Comparison operation
	0 $dnIn1 = dnIn2$	Lenze setting
	1 $dnIn1 > dnIn2$	
	2 $dnIn1 < dnIn2$	
	3 $ dnIn1 = dnIn2 $	
	4 $ dnIn1 > dnIn2 $	
	5 $ dnIn1 < dnIn2 $	

3.21.8 DetectUnderVoltage

is an instance of	Function		
L_TbCompare_n	DC-bus undervoltage recognition Comparison of the current DC-bus voltage with the UG min. threshold set in C03001.		

Parameter	Possible settings			Information
C04080				Comparison operation
	0	dnln1_n = dnln2_n		
	1	dnln1_n > dnln2_n		
	2	dnln1_n < dnln2_n		Lenze setting
	3	dnln1_n = dnln2_n		
	4	dnln1_n > dnln2_n		
	5	dnln1_n < dnln2_n		
C04081	0.00	%	100.00	Tolerance Initialisation: 0.00 %
C04082	0.00	%	100.00	Hysteresis Initialisation: 0.00 %

3.21.9 L_DevApplErr1

is an instance of	Function			
L_DevApplErr	Error triggering ▶ Application error messages (📖 181)			

Parameter	Possible settings			Information
C05900	980		999	Module ID • Initialisation: 999
C05901/1...8	0		65535	Error ID • Initialisation: 8001 ... 8008
C05902/1...8				Error response
	0	None		
	1	Error		
	2	Trouble		
	3	Quick stop by trouble		
	4	Warning locked		
	5	Warning		
	6	Information		

4 Step-by-step commissioning

The technology application "CiA402 device profile" is commissioned with the »Engineer«. The following subchapters describe the commissioning or setting of the required parameters step by step using the example of a system bus (CAN) network.

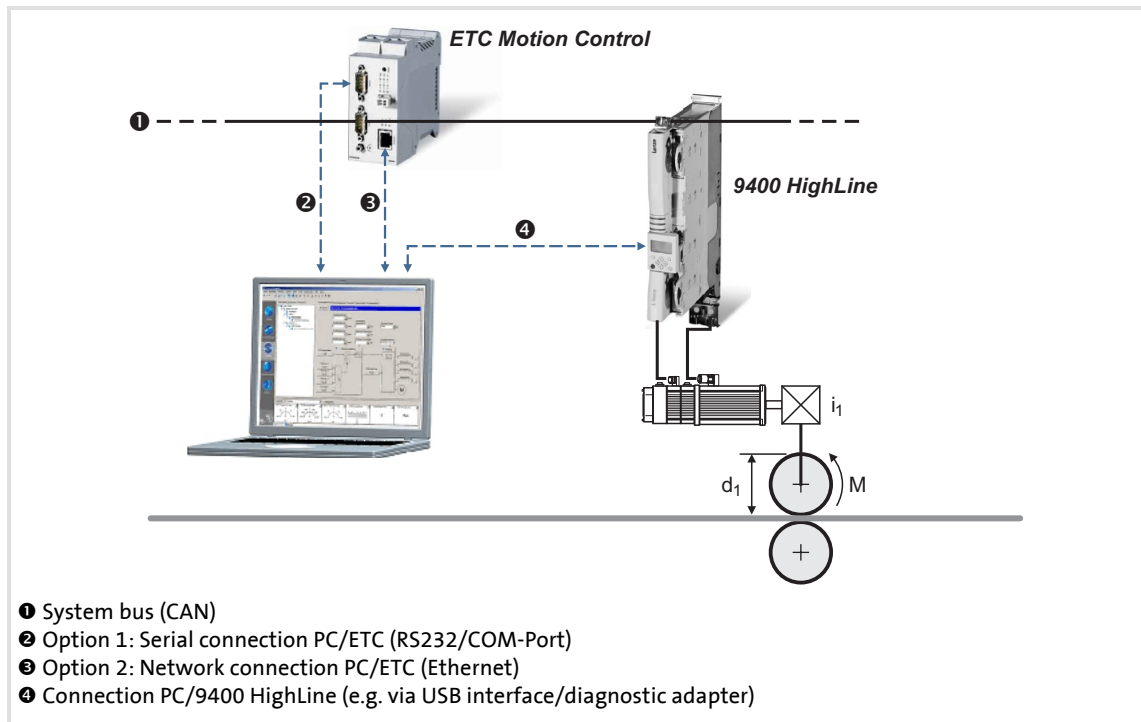


Note!

The following step-by-step instructions require that the initial commissioning of the motor and the adaptation of the controller to the electromechanics have already been executed.

For the communication via a system bus (CAN): Ensure that the CAN device address and the CAN transfer rate of the controller are set correctly via the DIP switches on the memory module.

Example: Control of the 9400 HighLine per ETC Motion Control



[4-1] Example



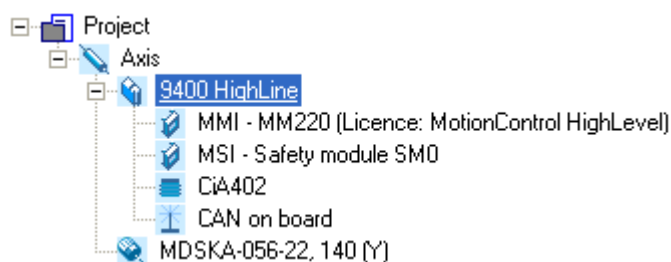
Tip!

Detailed information on how to establish the PC/ETC connection and to set up and parameterise the ETC Motion Control can be found in the "ETC Motion Control – NC operating system" System Manual.

4.1 Create new Engineer project

Commissioning is carried out with the »Engineer« by selecting the application from the catalogue, transmission to the controller, and parameter setting via corresponding dialogs.

1. Start »Engineer«.
2. Go to *Start-up wizard* and select the option "New project (empty)" and enter a name for the project in a next step.
3.  Insert axis for the 9400 HighLine controller.
 - Add the corresponding components to the axis (9400 HighLine controller, motor, safety module, memory module).
 - Select the "CiA402 device profile" application for the controller.
 - Example *project view* in the »Engineer«:



Next step

- ▶ [Set machine parameters](#) (188)

4.2 Set machine parameters



Note!

Usually, the position data is defined and interpreted in increments by the master control. In this case the feed constant and gearbox factor are already considered by the control and must be set in the controller as listed in the following table.

Parameter	Object	Name	Setting
C02524	0x6092/1	Feed constant • General normalisation: 65535 Increment $\equiv$ 1 motor revolution	
		Setting for ETC:	6.5536
C02520	0x6091/1	Gearbox factor numerator: Motor	1
C02521	0x6091/2	Gearbox factor denom.: Motor	1

4.3 Setting communication parameters for CANopen

For the system bus (CAN) communication, the communication cycle time and the control cycle time must be synchronised via the SYNC telegram. You must adapt the following parameters for this mechanism accordingly.

Example:

► ETC selection:

Parameter	Object	Name	Setting
-	0x60C2/1	CiA402 Ip time units	20
-	0x60C2/2	CiA402 Ip time index	-4

► Additionally required settings in the parameter list:

Parameter	Object	Name	Setting
C01120	0x5B9F	Sync source	1: CAN on board or 2: CAN module
C01121	0x5B9E	Sync cycle time	2000 μ s
C01122	0x5B9D	Sync phase position	400 μ s
C01124	0x5B9B	Sync-PLL increment	210 ns (> 100 ns)

4.4 Settings for "Homing mode"

For "Homing mode" the following parameters must be set:

Parameter	Object	Information
C02640	0x55AF	Homing mode
C02641	0x60FB/7	Drive behaviour after setting the home position
C02642	0x607C	Home position
C02644	0x6099/1	Speed 1
C02645	0x609A/1	Acceleration 1
C02646	0x6099/2	Speed 2
C02647	0x609A/2	Acceleration 2
C02651	C055A4	TP configuration

4.5 Settings for "Interpolated position mode"

For the "Interpolated position mode" the following parameters must be set:

Parameter	Object	Information
C03630	0x60C0	Selection of the interpolation algorithm
C03637	0x60C2/1	Adaptation of interpolation cycle time to communication cycle time
C03638	0x60C2/2	

$$\text{Interpolation cycle time [s]} = \text{ip time units} \cdot 10^{\text{ip time index}} [\text{s}]$$

[0x60C2/1](#): ip time units

[0x60C2/2](#): ip time index

[4-2] Definition of the interpolation cycle time

4.6 Speed feedforward control

The source for the speed feedforward control can be selected in C02680 (CiA402 object 0x5587).

- ▶ The following options are available:
 - The source for feedforward control is the [0x60FF](#) object (target velocity).
 - The value for the feedforward control is derived from the position data.
- ▶ If you select the interpolation algorithm [0x60C0](#) = "-11: Optimized mode 1", the feedforward control values are generated from the interpolation process.

4.7 Torque/feed force feedforward control

The source for the torque/feed force feedforward control can be selected in C00276 (CiA402 object 0x5EEB).

- ▶ The following options are available:
 - The source for feedforward control is the [0x6071](#) object (target torque).
 - The value for feedforward control is derived from the [0x60FF](#) object (target velocity).
 - The value for the feedforward control is double-derived from the position data.
- ▶ If you select the interpolation algorithm [0x60C0](#) = "-11: Optimized mode 1", the feedforward control values are generated from the interpolation process.

4.8 Controller settings

In the Lenze setting, the controllers are already set to sensible values. To optimise the control mode, the following parameters can be changed:

Parameter	Object	Information
C00254	0x5EED	Phase controller gain
C00070	0x5FB9	Speed controller gain
C00071	0x5FB8	Speed controller reset time

4.9 Final steps

1.  Go online.
2.  Download the application into the controller.



Note!

The downloaded application is basically stored in the first application memory location of the controller.

The preinstalled technology applications on the following memory locations are still available.

3. Confirm  Dialog box *Save parameter set* with **Yes, all devices**.
4. Confirm  Dialog box *Start application* with **Yes, all devices**.
5. Confirm  Dialog box *Enable controller* with **Yes, all devices**.
6. Control applications via terminals or network.

5 Parameter reference

All parameters for controller parameter setting or monitoring are stored under "codes".

- ▶ The codes are numbered and designated by a "C" in front of the code, e.g. "C00002".
- ▶ 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. C00118/3".



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 behind the name.

For general information on how to read and change parameters please see the online documentation for the »Engineer«.

5.1 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 notes:

- ▶ Parameter number (Cxxxxx)
- ▶ Parameter name (display text in the »Engineer« and keypad)
- ▶ [Data type](#)
- ▶ Decimal and hexadecimal parameter index for access via bus systems

Table contents

The table contains further general explanations & notes on the parameter and the possible settings the representation of which depends on the parameter type:

- ▶ [Parameters with read-only access](#)
- ▶ [Parameters with write access](#)

Table footer

The table footer contains the [Parameter attributes](#).

5.1.1 Data type

The following data types are available for parameters:

Data type	Meaning
INTEGER_8	8-bit value with sign
INTEGER_16	16-bit value with sign
INTEGER_32	32-bit value with sign
INTEGER_64	64-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
UNSIGNED_64	64-bit value without sign
FLOATING_POINT	32-bit floating point number
VISIBLE_STRING	String of characters from printable characters
OCTET_STRING	String of characters from any characters
BITFIELD_8	8-bit value bit-coded
BITFIELD_16	16-bit value bit-coded
BITFIELD_32	32-bit value bit-coded

5.1.2 Parameters with read-only access

Parameters for which the "write access" attribute has not been set can only be read and not 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		

Representation in the »Engineer«

The »Engineer« displays these parameters with a grey background or, when an online connection has been established, with a pale-yellow background:

	/ C...	/ S	Name	Value	Unit
	61	0	Heatsink temperature	30	°C

5.1.3 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 are either selected by means of a selection list or through direct value entry.
- Values outside the valid setting range are represented in red in the »Engineer«.

5.1.3.1 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				

Parameter setting in the »Engineer«

In the »Engineer« parameterisation is carried out by entering the desired value into the input field:

	/ C...	/ S	Name	Value	Unit
	22	0	Maximum current	0.00	A

5.1.3.2 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				

Parameter setting in the »Engineer«

In the »Engineer«, a list field is used for parameter setting:

	/ C...	/ S	Name	Value	Unit
	34	0	Config. analog input 1	0: -10 ... +10 V	

0: -10 ... +10 V
 1: -20...-4 mA, +4...+20 mA
 2: -20 ... +20 mA

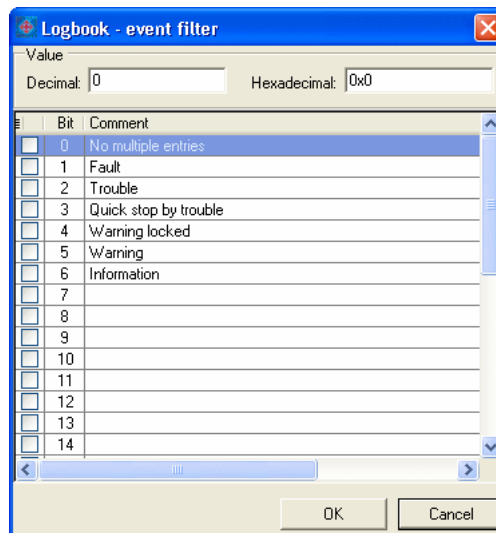
5.1.3.3 Parameters with bit-code setting

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		

Parameter setting in the »Engineer«

In the »Engineer« the parameterisation is carried out in a dialog box in which the single bits can be set or reset. Alternatively, the value can be entered as a decimal or hexadecimal value:



5.1.3.4 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	
Cxxxxx/4	

☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer

Parameter setting in the »Engineer«

In the »Engineer« parameters list every subcode is listed individually. The parameterisation is carried out as described in the chapters before.

	/ C...	/ S	Name	Value	Unit
	114	1	Dig. input. 1: Terminal polarity	0	
	114	2	Dig. input. 2: Terminal polarity	0	
	114	3	Dig. input. 3: Terminal polarity	0	
	114	4	Dig. input. 4: Terminal polarity	0	

5.1.4 Parameter attributes

Description structure

Parameter attributes are listed in the table footer:

☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer

Meaning of the attributes

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	When you carry out the command download parameter set the parameter is <u>not</u> transferred to the regenerative power supply module.

Scaling factor

The "scaling factor" is important for the parameter access via a bus system:

$$\text{Read value (via bus system)} = \text{Scaling factor} \cdot \text{Indicated value (Engineer)}$$

5.1.5 Abbreviations used in parameter & selection texts

Since the character length of the parameter and selection texts is limited, the following abbreviations are used:

Abbreviation	Meaning
CAN module	CANopen communication module (E94AYCCA)
ENP	Electronic nameplate
MXI1	<i>Module eXtension Interface 1</i> - module slot for extension 1
MXI2	<i>Module eXtension Interface 2</i> - module slot for extension 2

5.2 Parameter list

In this chapter all parameters of the technology application "CiA402 device profile" are listed in a numerically ascending order.



Note!

The parameters of the operating system (up to and including code C02999) are described in the software documentation of 9400 HighLine.

The parameters of the standard function blocks used in the application (from code C04000 on) are described in the software documentation of the 9400 function library.

C03001

Parameter | Name: **C03001 | UG min threshold** Data type: INTEGER_32
Index: 21574_d = 5446_h

If the value falls below the threshold set here, the application error message "DC bus undervoltage" is triggered with the default response "quick stop by trouble".

► [Application error messages](#)

Setting range (min. value unit max. value)			Lenze setting
0.00		100.00	0.00
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 100

C03002

Parameter | Name: **C03002 | Selection of limiter / safety interconnection** Data type: UNSIGNED_8
Index: 21573_d = 5445_h

The connection between the "limiter" basic function and the safety module is useful for a single drive. In a safety case, the drive will autonomously be turned into a "safe state". However, problems can occur in a drive system if single axes carry out independent motion sequences which are not initiated by the control.

This parameter serves to select if the connection between the "limiter" basic function and the safety module should be opened or closed (Lenze setting).

Selection list (Lenze setting printed in bold)	
0	LS_Limiter not connected
1	LS_Limiter connected
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer	
Scaling factor: 1	

C03010

Parameter | Name: **C03010 | Max. telegram failure value** Data type: UNSIGNED_32
Index: 21565_d = 543D_h

If the recognised telegram failures exceed the value set here, the application error message "telegram failure maximum value exceeded" is triggered with the default response "information".

► [Application error messages](#)

Setting range (min. value unit max. value)			Lenze setting
0		1073741824	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03011

Parameter Name:		Data type: INTEGER_32 Index: 21564 _d = 543C _h	
C03011 Counter SingleError			
Displays the number of recognised telegram failures (single errors)			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP ☐ No transfer ☐ Scaling factor: 1

C03012

Parameter Name:			Data type: INTEGER_32 Index: 21563 _d = 543B _h		
C03012 Counter MultiError					
Displays the number of recognised telegram failures (multiple errors)					
Display range (min. value unit max. value)					
-2147483647			2147483647		
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03013

Parameter Name:		Data type: UNSIGNED_8	
C03013 Reset Errorcounter		Index: 21562 _d = 543A _h	
TRUE = Reset counter for recognised telegram failures			
Selection list (Lenze setting printed in bold)			
0	FALSE		
1	TRUE		
☒ Read access		☒ Write access	☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03500

Parameter Name:				Data type: UNSIGNED_32	
C03500 CiA402 profile				Index: 21075 _d = 5253 _h	
Display range (min. value unit max. value)					
0				4294967295	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03503

Parameter | Name:

C03503 | Motor type

Data type: UNSIGNED_16
Index: 21072_d = 5250_h

▶ CiA402 object [0x6402](#)

Selection list (Lenze setting printed in bold)

0	Non-standard motor
1	Phase modulated DC motor
2	Frequency controlled DC motor
3	PM synchronous motor
4	FC synchronous motor
5	Switched reluctance motor
6	Wound rotor induction motor
7	Squirrel cage induction motor
8	Stepper motor
9	Micro-step stepper motor
10	Sinusoidal PM BL motor
11	Trapezoidal PM BL motor

☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer

Scaling factor: 1

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03504

C03504

Parameter Name:	Data type: VISIBLE_STRING Index: 21071 _d = 524F _h
C03504 Motor catalog number	
▶ CiA402 object 0x6403	
☒ Read access	☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03505

Parameter Name:	Data type: VISIBLE_STRING Index: 21070 _d = 524E _h
C03505 Motor manufacturer	
▶ CiA402 object 0x6404	
☒ Read access	☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03506

Parameter Name:	Data type: VISIBLE_STRING Index: 21069 _d = 524D _h
C03506 Http motor catalog address	
▶ CiA402 object 0x6405	
☒ Read access	☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03507

Parameter Name:	Data type: VISIBLE_STRING Index: 21068 _d = 524C _h
C03507 Motor calibration date	
▶ CiA402 object 0x6406	
☒ Read access	☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03508

Parameter Name:			Data type: UNSIGNED_32 Index: 21067 _d = 524B _h		
C03508 Motor service period					
▶ CiA402 object 0x6407					
Setting range (min. value unit max. value)				Lenze setting	
0				4294967295	
0					
☒ Read access		☒ Write access		☐ CINH	
☐ PLC STOP		☐ No transfer		Scaling factor: 1	

C03509

Parameter Name:			Data type: UNSIGNED_32 Index: 21066 _d = 524A _h		
C03509 Motor data					
▶ CiA402 object 0x6410					
Display range (min. value unit max. value)					
0			4294967295		
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03512

Parameter Name:	Data type: VISIBLE_STRING Index: 21063 _d = 5247 _h
C03512 Drive manufacturer	
▶ CiA402 object 0x6504	
☒ Read access	☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03513

Parameter Name:	Data type: VISIBLE_STRING Index: 21062 _d = 5246 _h
C03513 Http drive catalogue address	
▶ CiA402 object 0x6505	
☒ Read access	☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03514

Parameter Name:			Data type: UNSIGNED_32
C03514 Supported drive modes			Index: 21061 _d = 5245 _h
▶ CiA402 object 0x6502			
Display range (min. value unit max. value)			
0		4294967295	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP
☐ No transfer	Scaling factor: 1		

C03515

Parameter Name:		Data type: UNSIGNED_8	
C03515 Digital inputs		Index: 21060 _d = 5244 _h	
▶ CiA402 object 0x60FD			
Display range (min. value unit max. value)			
0		255	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP
☐ No transfer	Scaling factor: 1		

C03516

Parameter Name:		Data type: UNSIGNED_8	
C03516 Digital outputs		Index: 21059 _d = 5243 _h	
▶ CiA402 object 0x60FE			
Display range (min. value unit max. value)			
2			2
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP
☐ No transfer	Scaling factor: 1		

C03517

Parameter Name:			Data type: UNSIGNED_8
C03517 Physical outputs			Index: 21058 _d = 5242 _h
▶ CiA402 object 01x60FE.1			
Display range (min. value unit max. value)			
0		255	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP
☐ No transfer	Scaling factor: 1		

C03518

Parameter Name:	C03518 Bit mask		Data type: UNSIGNED_8 Index: 21057 _d = 5241 _h
	▶ CiA402 object 0x60FE.2		
Setting range (min. value unit max. value)		Lenze setting	
255		255	255
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP ☐ No transfer Scaling factor: 1

C03519

Parameter Name:	C03519 Abort connection option code		Data type: INTEGER_16 Index: 21056 _d = 5240 _h
	▶ CiA402 object 0x6007		
Setting range (min. value unit max. value)		Lenze setting	
3		3	3
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP ☐ No transfer Scaling factor: 1

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03520

C03520

Parameter Name:				Data type: UNSIGNED_32	
C03520 Error code				Index: 21055 _d = 523F _h	
▶ CiA402 object 0x603F					
Display range (min. value unit max. value)					
0				4294967295	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03521

Parameter Name:				Data type: UNSIGNED_32	
C03521 Supported drive modes				Index: 21054 _d = 523E _h	
▶ CiA402 object 0x6502					
Display range (min. value unit max. value)					
0				4294967295	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03522

Parameter Name:					Data type: VISIBLE_STRING	
C03522 Drive catalog number					Index: 21053 _d = 523D _h	
▶ CiA402 object 0x6503						
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1	

C03530

Parameter Name:			Data type: UNSIGNED_16		
C03530 Control word			Index: 21045 _d = 5235 _h		
▶ CiA402 object 0x6040					
Setting range (min. value unit max. value)				Lenze setting	
0			65535		0
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03531

Parameter Name:				Data type: UNSIGNED_16	
C03531 Status word				Index: 21044 _d = 5234 _h	
▶ CiA402 object 0x6041					
Display range (min. value unit max. value)					
0				65535	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03532

Parameter Name:			Data type: INTEGER_16		
C03532 Shutdown option code			Index: 21043 _d = 5233 _h		
▶ CiA402 object 0x605B					
Setting range (min. value unit max. value)			Lenze setting		
0			0		0
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03533

Parameter Name:				Data type: INTEGER_16	
C01533 DS402 disable operation option code				Index: 21042 _d = 5232 _h	
▶ CiA402 object 0x605C					
Setting range (min. value unit max. value)				Lenze setting	
0			0	0	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03534

Parameter Name: C03534 Quick stop option code			Data type: INTEGER_16 Index: 21041 _d = 5231 _h
▶ CiA402 object 0x605A			
Setting range (min. value unit max. value)			Lenze setting
2		2	2
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03535

Parameter Name: C03535 Halt option code			Data type: INTEGER_16 Index: 21040 _d = 5230 _h
▶ CiA402 object 0x605D			
Setting range (min. value unit max. value)			Lenze setting
2		2	2
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03536

Parameter Name: C03536 Fault reaction option code			Data type: INTEGER_16 Index: 21039 _d = 522F _h
▶ CiA402 object 0x605E			
Setting range (min. value unit max. value)			Lenze setting
2		2	2
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03537

Parameter Name:		Data type: INTEGER_8	
C03537 Mode of operation		Index: 21038 _d = 522E _h	
▶ CiA402 object 0x6060			
Selection list (Lenze setting printed in bold)			
0	no mode		
6	Homing mode		
7	Interpolated position mode		
8	Cyclic synchronous position mode		
9	Cyclic synchronous velocity mode		
10	Cyclic synchronous torque mode		
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03538

Parameter | Name: **C03538 | Mode of operation display** Data type: INTEGER_8
Index: 21037_d = 522D_h

▶ CiA402 object [0x6061](#)

Selection list (display only)	
0	no mode
6	Homing mode
7	Interpolated position mode
8	Cyclic synchronous position mode
9	Cyclic synchronous velocity mode
10	Cyclic synchronous torque mode

☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03550

Parameter Name:			Data type: INTEGER_8	
C03550 Position notation index			Index: 21025 _d = 5221 _h	
▶ CiA402 object 0x6089				
Setting range (min. value unit max. value)			Lenze setting	
0			0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03551

Parameter Name:		Data type: UNSIGNED_8	
C03551 Position dimension index		Index: 21024 _d = 5220 _h	
▶ CiA402 object 0x608A			
Setting range (min. value unit max. value)		Lenze setting	
0		0 0	
☒ Read access		☒ Write access	
☐ CINH		☐ PLC STOP	
☐ No transfer		Scaling factor: 1	

C03552

Parameter Name:		Data type: INTEGER_8	
C03552 Velocity notation index		Index: 21023 _d = 521F _h	
▶ CiA402 object 0x608B			
Setting range (min. value unit max. value)		Lenze setting	
0		0 0	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer		Scaling factor: 1	

C03553

Parameter Name:		Data type: UNSIGNED_8 Index: 21022 _d = 521E _h	
C03553 Velocity dimension index			
▶ CiA402 object 0x608C			
Setting range (min. value unit max. value)		Lenze setting	
0		0 0	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer		Scaling factor: 1	

C03554

Parameter Name:			Data type: INTEGER_8 Index: 21021 _d = 521D _h	
C03554 Acceleration notation index				
▶ CiA402 object 0x608D				
Setting range (min. value unit max. value)			Lenze setting	
0			0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03555

Parameter Name:			Data type: UNSIGNED_8		
C03555 Acceleration dimension index			Index: 21020 _d = 521C _h		
▶ CiA402 object 0x608E					
Setting range (min. value unit max. value)			Lenze setting		
0			0		0
☒ Read access			☒ Write access		
☐ CINH			☐ PLC STOP		
☐ No transfer			Scaling factor: 1		

C03556

Parameter Name:			Data type: UNSIGNED_32
C03556 Position encoder resolution			Index: 21019 _d = 521B _h
▶ CiA402 object 0x608F			
Display range (min. value unit max. value)			
0		4294967295	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP
☐ No transfer	Scaling factor: 1		

C03557

Parameter Name:			Data type: UNSIGNED_32 Index: 21018 _d = 521A _h	
C03557 Encoder increments				
▶ CiA402 object 0x608F.1				
Setting range (min. value unit max. value)			Lenze setting	
65536			65536	65536
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03558

Parameter Name:			Data type: UNSIGNED_32 Index: 21017 _d = 5219 _h		
C03558 Motor revolution					
▶ CiA402 object 0x608F.2					
Setting range (min. value unit max. value)				Lenze setting	
1				1 1	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer				Scaling factor: 1	

C03559

Parameter Name:		Data type: UNSIGNED_32 Index: 21016 _d = 5218 _h	
C03559 Velocity encoder resolution			
▶ CiA402 object 0x6090			
Display range (min. value unit max. value)			
2		2	
☒ Read access		☐ Write access	
☐ CINH		☐ PLC STOP	
☐ No transfer		Scaling factor: 1	

C03560

Parameter Name:			Data type: UNSIGNED_32 Index: 21015 _d = 5217 _h
C03560 Encoder increments per second			
▶ CiA402 object 0x6090.1			
Setting range (min. value unit max. value)			Lenze setting
65536		65536	65536
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03561

Parameter Name:		Data type: UNSIGNED_32 Index: 21014 _d = 5216 _h	
C03561 Motor revolutions per second			
▶ CiA402 object 0x6090.2			
Setting range (min. value unit max. value)		Lenze setting	
1		1	1
☒ Read access		☒ Write access	
☐ CINH		☐ PLC STOP	
☐ No transfer		Scaling factor: 1	

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03562

C03562

Parameter Name:	C03562 Gear ratio		Data type: UNSIGNED_32 Index: 21013 _d = 5215 _h
▶ CiA402 object 0x6091			
Display range (min. value unit max. value)			
2		2	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03565

Parameter Name:	C03565 Feed constant		Data type: UNSIGNED_32 Index: 21010 _d = 5212 _h
▶ CiA402 object 0x6092			
Display range (min. value unit max. value)			
2		2	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03567

Parameter Name:	C03567 Feed shaft revolutions		Data type: UNSIGNED_32 Index: 21008 _d = 5210 _h
▶ CiA402 object 0x6092.2			
Setting range (min. value unit max. value)		Lenze setting	
1		1	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03568

Parameter Name:	C03568 Position factor		Data type: UNSIGNED_32 Index: 21007 _d = 520F _h
▶ CiA402 object 0x6093			
Display range (min. value unit max. value)			
2		2	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03569

Parameter Name:	C03569 Position factor numerator		Data type: UNSIGNED_32 Index: 21006 _d = 520E _h
▶ CiA402 object 0x6093.1			
Setting range (min. value unit max. value)		Lenze setting	
1		1	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03570

Parameter Name:	C03570 Position factor divisor		Data type: UNSIGNED_32 Index: 21005 _d = 520D _h
▶ CiA402 object 0x6093.2			
Setting range (min. value unit max. value)		Lenze setting	
1		1	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03571

Parameter Name:				Data type: UNSIGNED_32	
C03571 Velocity encoder factor				Index: 21004 _d = 520C _h	
▶ CiA402 object 0x6094					
Display range (min. value unit max. value)					
2					2
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03572

Parameter Name:					Data type: UNSIGNED_32	
C03572 Velocity encoder factor numerator					Index: 21003 _d = 520B _h	
▶ CiA402 object 0x6094.1						
Setting range (min. value unit max. value)				Lenze setting		
1				1		1
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1	

C03573

Parameter Name:				Data type: UNSIGNED_32 Index: 21002 _d = 520A _h	
C03573 Velocity encoder factor divisor					
▶ CiA402 object 0x6094.2					
Setting range (min. value unit max. value)				Lenze setting	
1				1 1	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03574

Parameter Name:				Data type: UNSIGNED_32	
C03574 Velocity factor1				Index: 21001 _d = 5209 _h	
▶ CiA402 object 0x6095					
Display range (min. value unit max. value)					
2				2	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03575

Parameter Name:				Data type: UNSIGNED_32 Index: 21000 _d = 5208 _h	
C03575 Velocity factor1 numerator					
▶ CiA402 object 01x6095.1					
Setting range (min. value unit max. value)				Lenze setting	
1			1	1	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03576

Parameter Name:			Data type: UNSIGNED_32 Index: 20999 _d = 5207 _h		
C03576 Velocity factor1 divisor					
▶ CiA402 object 0x6095.2					
Setting range (min. value unit max. value)				Lenze setting	
1				1 1	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03577

C03577

Parameter Name:				Data type: UNSIGNED_32 Index: 20998 _d = 5206 _h	
C03577 Velocity factor2					
▶ CiA402 object 0x6096					
Display range (min. value unit max. value)					
2				2	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer				Scaling factor: 1	

C03578

Parameter Name:			Data type: UNSIGNED_32		
C03578 Velocity factor1 numerator			Index: 20997 _d = 5205 _h		
▶ CiA402 object 01x6096.1					
Setting range (min. value unit max. value)			Lenze setting		
1			1	1	
☒ Read access			☒ Write access		
☐ CINH			☐ PLC STOP		
☐ No transfer			Scaling factor: 1		

C03579

Parameter Name:			Data type: UNSIGNED_32		
C03579 Velocity factor2 divisor			Index: 20996 _d = 5204 _h		
▶ CiA402 object 0x6096.2					
Setting range (min. value unit max. value)			Lenze setting		
1			1	1	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03580

Parameter Name:		Data type: UNSIGNED_32 Index: 20995 _d = 5203 _h	
C03580 Acceleration factor			
▶ CiA402 object 0x6097			
Display range (min. value unit max. value)			
2			2
☒ Read access		☐ Write access	
☐ CINH		☐ PLC STOP	
☐ No transfer		Scaling factor: 1	

C03581

Parameter Name:			Data type: UNSIGNED_32 Index: 20994 _d = 5202 _h		
C03581 Acceleration factor numerator					
▶ CiA402 object 01x6097.1					
Setting range (min. value unit max. value)				Lenze setting	
1			1	1	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer				Scaling factor: 1	

C03582

Parameter Name:			Data type: UNSIGNED_32 Index: 20993 _d = 5201 _h		
C03582 Acceleration factor divisor					
▶ CiA402 object 0x6097.2					
Setting range (min. value unit max. value)				Lenze setting	
1			1	1	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer				Scaling factor: 1	

C03583

Parameter Name:			Data type: UNSIGNED_8		
C03583 Polarity			Index: 20992 _d = 5200 _h		
▶ CiA402 object 0x607E					
Display range (min. value unit max. value)					
2					2
☒ Read access			☐ Write access		
☐ CINH			☐ PLC STOP		
☐ No transfer			Scaling factor: 1		

C03585

Parameter Name:			Data type: INTEGER_32
C03585 Load home position			Index: 20990 _d = 51FE _h
▶ CiA402 object 0x60FB.1			
Setting range (min. value unit max. value)			Lenze setting
-2147483647		2147483647	0
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP
☐ No transfer	Scaling factor: 1		

C03590

Parameter Name:			Data type: INTEGER_32 Index: 20985 _d = 51F9 _h	
C03590 Position demand value unit				
▶ CiA402 object 0x6062				
Display range (min. value unit max. value)				
1			255	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03591

Parameter Name:			Data type: INTEGER_32 Index: 20984 _d = 51F8 _h		
C03591 Position actual value					
▶ CiA402 object 0x6063					
Display range (min. value unit max. value)					
-2147483647			134217727		
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03592

Parameter Name:			Data type: INTEGER_32 Index: 20983 _d = 51F7 _h	
C03592 Position actual value unit				
▶ CiA402 object 0x6064				
Display range (min. value unit max. value)				
-2147483647			134217727	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03593

Parameter Name:			Data type: UNSIGNED_32 Index: 20982 _d = 51F6 _h	
C03593 Following error window				
▶ CiA402 object 0x6065				
Setting range (min. value unit max. value)			Lenze setting	
0		4294967295	1000	
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03594

C03594

Parameter Name: C03594 Following error time out			Data type: UNSIGNED_32 Index: 20981 _d = 51F5 _h	
▶ CiA402 object 0x6066				
Setting range (min. value unit max. value)			Lenze setting	
0			0	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03595

Parameter Name: C03595 Position window			Data type: UNSIGNED_32 Index: 20980 _d = 51F4 _h
▶ CiA402 object 0x6067			
Setting range (min. value unit max. value)			Lenze setting
0		4294967295	1000
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03596

Parameter Name: C03596 Position window time			Data type: UNSIGNED_32 Index: 20979 _d = 51F3 _h	
▶ CiA402 object 0x6068				
Setting range (min. value unit max. value)			Lenze setting	
0			0	0
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer
				Scaling factor: 1

C03597

Parameter Name: C03597 Following error actual value			Data type: INTEGER_32 Index: 20978 _d = 51F2 _h		
▶ CiA402 object 0x60F4					
Display range (min. value unit max. value)					
-2147483647				2147483647	
☒ Read access		☐ Write access		☐ CINH	
☐ PLC STOP		☐ No transfer		Scaling factor: 1	

C03598

Parameter Name: C03598 Control effort			Data type: INTEGER_32 Index: 20977 _d = 51F1 _h	
▶ CiA402 object 0x60FA				
Display range (min. value unit max. value)				
-2147483647			2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03599

Parameter Name: C03599 Position control parameter set			Data type: UNSIGNED_32 Index: 20976 _d = 51F0 _h	
▶ CiA402 object 0x60FB				
Display range (min. value unit max. value)				
7			7	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03600

Parameter Name:			Data type: INTEGER_32 Index: 20975 _d = 51EF _h
C03600 Position demand value			
▶ CiA402 object 0x60FC			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access	☐ Write access	☐ CINH ☐ PLC STOP ☐ No transfer	Scaling factor: 1

C03601

Parameter Name:			Data type: INTEGER_8 Index: 20974 _d = 51EE _h
C03601 Homing method			
▶ CiA402 object 0x6098			
Setting range (min. value unit max. value)			Lenze setting
-2		35	0
☒ Read access	☒ Write access	☐ CINH ☐ PLC STOP ☐ No transfer	Scaling factor: 1

C03602

Parameter Name:			Data type: UNSIGNED_8
C03602 Brake control			Index: 20973 _d = 51ED _h
▶ CiA402 object 0x60FB.2			
Setting range (min. value unit max. value)			Lenze setting
0		255	0
☒ Read access	☒ Write access	☐ CINH ☐ PLC STOP ☐ No transfer	Scaling factor: 1

C03603

Parameter Name:			Data type: INTEGER_32 Index: 20972 _d = 51EC _h
C03603 Brake torque add			
▶ CiA402 object 0x60FB.3			
Setting range (min. value unit max. value)			Lenze setting
-2147483648		2147483647	0
☒ Read access	☒ Write access	☐ CINH ☐ PLC STOP ☐ No transfer	Scaling factor: 1

C03604

Parameter | Name:

C03604 | Following error reaction

Data type: UNSIGNED_16
Index: 20971_d = 51EB_h

▶ CiA402 object [0x60FB.4](#)

Selection list (Lenze setting printed in bold)	
0	No response
1	Fault
2	Trouble
3	Quick stop by trouble
4	Warning locked
5	Warning
6	Information

☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer

Scaling factor: 1

C03605

Parameter Name:		Data type: UNSIGNED_8 Index: 20970 _d = 51EA _h	
C03605 Safe IO state			
▶ CiA402 object 0x60FB.5			
Display range (min. value unit max. value)			
0		255	
☒ Read access		☐ Write access	
☐ CINH		☐ PLC STOP	
☐ No transfer		Scaling factor: 1	

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03606

C03606

Parameter Name:			Data type: UNSIGNED_16		
C03606 Safety module state			Index: 20969 _d = 51E9 _h		
▶ CiA402 object 0x60FB.6					
Display range (min. value unit max. value)					
0				65535	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03612

Parameter Name:			Data type: UNSIGNED_32		
C03612 Homing speeds			Index: 20963 _d = 51E3 _h		
▶ CiA402 object 0x6099					
Display range (min. value unit max. value)					
2					2
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03615

Parameter Name:			Data type: UNSIGNED_32 Index: 20960 _d = 51E0 _h		
C03615 Homing acceleration					
▶ CiA402 object 0x609A					
Display range (min. value unit max. value)					
2					2
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03630

Parameter Name:			Data type: INTEGER_16 Index: 20945 _d = 51D1 _h		
C03630 Interpolation sub mode select					
▶ CiA402 object 0x60C0					
Setting range (min. value unit max. value)				Lenze setting	
-11			0	0	
☒ Read access	☒ Write access	☒ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03631

Parameter Name:				Data type: UNSIGNED_32
C03631 Interpolation data record				Index: 20944 _d = 51D0 _h
▶ CiA402 object 0x60C1				
Display range (min. value unit max. value)				
1			1	
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer Scaling factor: 1

C03632

Parameter Name:			Data type: INTEGER_32 Index: 20943 _d = 51CF _h	
C03632 Interpolated data X1				
▶ CiA402 object 0x60C1.1				
Setting range (min. value unit max. value)			Lenze setting	
-2147483647			2147483647	0
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer Scaling factor: 1

C03636

Parameter Name:			Data type: UNSIGNED_32 Index: 20939 _d = 51CB _h		
C03636 Interpolation time period					
▶ CiA402 object 0x60C2					
Display range (min. value unit max. value)					
2			2		
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03637

Parameter Name: C03637 Ip time units				Data type: UNSIGNED_8 Index: 20938 _d = 51CA _h
▶ CiA402 object 0x60C2.1				
Setting range (min. value unit max. value)			Lenze setting	
0		255	1	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer
				Scaling factor: 1

C03638

Parameter Name: C03638 Ip time index			Data type: INTEGER_8 Index: 20937 _d = 51C9 _h
▶ CiA402 object 0x60C2.2			
Setting range (min. value unit max. value)			Lenze setting
-6		0	-3
☒ Read access	☒ Write access	☐ CINH ☐ PLC STOP ☐ No transfer	Scaling factor: 1

C03639

Parameter Name:			Data type: UNSIGNED_8		
C03639 Interpolation sync definition			Index: 20936 _d = 51C8 _h		
▶ CiA402 object 0x60C3					
Display range (min. value unit max. value)					
2					2
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03640

Parameter Name:			Data type: UNSIGNED_8 Index: 20935 _d = 51C7 _h	
C03640 Synchronize on group				
▶ CiA402 object 01x60C3.1				
Setting range (min. value unit max. value)			Lenze setting	
0		0	0	
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer
				Scaling factor: 1

C03641

Parameter Name:			Data type: UNSIGNED_8		
C03641 Ip sync every N event			Index: 20934 _d = 51C6 _h		
▶ CiA402 object 0x60C3.2					
Setting range (min. value unit max. value)			Lenze setting		
1			1		1
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

9400 Technology applications | CiA402 device profile

Parameter reference

Parameter list | C03642

C03642

Parameter Name:	C03642 Interpolation data configuration		Data type: UNSIGNED_32 Index: 20933 _d = 51C5 _h
▶ CiA402 object 0x60C4			
Display range (min. value unit max. value)			
6		6	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03643

Parameter Name:	C03643 Max buffer size		Data type: UNSIGNED_32 Index: 20932 _d = 51C4 _h
▶ CiA402 object 0x60C4.1			
Display range (min. value unit max. value)			
0		4294967295	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03644

Parameter Name:	C03644 Actual buffer size		Data type: UNSIGNED_32 Index: 20931 _d = 51C3 _h
▶ CiA402 object 0x60C4.2			
Setting range (min. value unit max. value)			Lenze setting
1			1
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03645

Parameter Name:	C03645 Buffer organization		Data type: UNSIGNED_8 Index: 20930 _d = 51C2 _h
▶ CiA402 object 0x60C4.3			
Setting range (min. value unit max. value)			Lenze setting
0			0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03646

Parameter Name:	C03646 Buffer position		Data type: UNSIGNED_16 Index: 20929 _d = 51C1 _h
▶ CiA402 object 0x60C4.4			
Setting range (min. value unit max. value)			Lenze setting
0			0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03647

Parameter Name:	C03647 Size of data record		Data type: UNSIGNED_8 Index: 20928 _d = 51C0 _h
▶ CiA402 object 0x60C4.5			
Setting range (min. value unit max. value)			Lenze setting
4			4
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03648

Parameter Name: C03648 Buffer clear			Data type: UNSIGNED_8 Index: 20927 _d = 51BF _h
▶ CiA402 object 0x60C4.6			
Setting range (min. value unit max. value)			Lenze setting
0		1	1
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03653

Parameter Name: C03653 Velocity actual value			Data type: INTEGER_32 Index: 20922 _d = 51BA _h
▶ CiA402 object 0x606C			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03654

Parameter Name: C03654 Offset velocity			Data type: INTEGER_32 Index: 20921 _d = 51B9 _h
▶ CiA402 object 0x60B1			
Setting range (min. value unit max. value)			Lenze setting
-2147483648		2147483647	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03658

Parameter Name: C03658 Target velocity			Data type: INTEGER_32 Index: 20917 _d = 51B5 _h
▶ CiA402 object 0x60FF			
Setting range (min. value unit max. value)			Lenze setting
-2147483647		2147483647	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03670

Parameter Name: C03670 Target torque			Data type: INTEGER_32 Index: 20905 _d = 51A9 _h
▶ CiA402 object 0x6071			
Setting range (min. value unit max. value)			Lenze setting
-2147483647		2147483647	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03673

Parameter Name: C03673 Torque demand value			Data type: INTEGER_32 Index: 20902 _d = 51A6 _h
▶ CiA402 object 0x6074			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

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Parameter reference

Parameter list | C03677

C03677

Parameter Name:			Data type: INTEGER_32 Index: 20898 _d = 51A2 _h		
C03677 Torque actual value					
▶ CiA402 object 0x6077					
Display range (min. value unit max. value)					
-2147483647				2147483647	
☒ Read access		☐ Write access		☐ CINH	
☐ PLC STOP		☐ No transfer		Scaling factor: 1	

C03678

Parameter Name:			Data type: INTEGER_32 Index: 20897 _d = 51A1 _h	
C03678 Current actual value				
▶ CiA402 object 0x6078				
Display range (min. value unit max. value)				
-2147483647			2147483647	
☒ Read access		☐ Write access	☐ CINH	☐ PLC STOP
☐ No transfer		Scaling factor: 1		

C03679

Parameter Name:			Data type: UNSIGNED_32 Index: 20896 _d = 51A0 _h		
C03679 Torque slope					
▶ CiA402 object 0x6087					
Setting range (min. value unit max. value)				Lenze setting	
4294967295			4294967295		4294967295
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03680

Parameter Name:			Data type: INTEGER_16		
C03680 Torque profile type			Index: 20895 _d = 519F _h		
▶ CiA402 object 0x6088					
Setting range (min. value unit max. value)			Lenze setting		
0			0		0
☒ Read access	☒ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03681

Parameter Name:			Data type: UNSIGNED_32 Index: 20894 _d = 519E _h	
C03681 Power stage parameters				
▶ CiA402 object 0x60F7				
Display range (min. value unit max. value)				
0			4294967295	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1	

C03682

Parameter Name:			Data type: UNSIGNED_32 Index: 20893 _d = 519D _h		
C03682 Torque control parameters					
▶ CiA402 object 0x60F6					
Display range (min. value unit max. value)					
2			2		
☒ Read access	☐ Write access	☐ CINH	☐ PLC STOP	☐ No transfer	Scaling factor: 1

C03683

Parameter Name: C03683 Torque offset			Data type: INTEGER_32 Index: 20892 _d = 519C _h
▶ CiA402 object 0x60B2			
Setting range (min. value unit max. value)			Lenze setting
-2147483648		2147483647	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03684

Parameter Name: C03684 Positive speed limit			Data type: INTEGER_32 Index: 20891 _d = 519B _h
▶ CiA402 object 0x60F6.1			
Setting range (min. value unit max. value)			Lenze setting
0.00		175.00	100.00
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 100

C03685

Parameter Name: C03685 Negative speed limit			Data type: INTEGER_32 Index: 20890 _d = 519A _h
▶ CiA402 object 0x60F6.2			
Setting range (min. value unit max. value)			Lenze setting
-175.00		0.00	-100.00
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 100

C03686

Parameter Name: C03686 Positive torque limit			Data type: UNSIGNED_16 Index: 20889 _d = 5199 _h
▶ CiA402 object 0x60E0			
Setting range (min. value unit max. value)			Lenze setting
0		32767	16384
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03687

Parameter Name: C03687 Negative torque limit			Data type: UNSIGNED_16 Index: 20888 _d = 5198 _h
▶ CiA402 object 0x60E1			
Setting range (min. value unit max. value)			Lenze setting
0		32767	16384
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

C03688

Parameter Name: C03688 Max torque			Data type: UNSIGNED_16 Index: 20887 _d = 5197 _h
▶ CiA402 object 0x6072			
Setting range (min. value unit max. value)			Lenze setting
0		32767	32767
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer			Scaling factor: 1

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Parameter reference

Parameter list | C03690

C03690

Parameter Name:	C03690 Target position		Data type: INTEGER_32 Index: 20885 _d = 5195 _h
▶ CiA402 object 0x607A			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03691

Parameter Name:	C03691 Offset position		Data type: INTEGER_32 Index: 20884 _d = 5194 _h
▶ CiA402 object 0x60B0			
Setting range (min. value unit max. value)			Lenze setting
-2147483648		2147483647	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03700

Parameter Name:	C03700 Touch probe function		Data type: UNSIGNED_16 Index: 20875 _d = 518B _h
▶ CiA402 object 0x60B8			
▶ Touch probe			
Setting range (min. value unit max. value)			Lenze setting
0		65535	0
☒ Read access ☒ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03701

Parameter Name:	C03701 Touch probe function		Data type: UNSIGNED_16 Index: 20874 _d = 518A _h
▶ CiA402 object 0x60B9			
▶ Touch probe			
Display range (min. value unit max. value)			
0		65535	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03706

Parameter Name:	C03706 Touch probe pos1 pos value		Data type: INTEGER_32 Index: 20869 _d = 5185 _h
▶ CiA402 object: 0x60BA			
▶ Touch probe			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03707

Parameter Name:	C03707 Touch probe pos1 neg value		Data type: INTEGER_32 Index: 20868 _d = 5184 _h
▶ CiA402 object: 0x60BB			
▶ Touch probe			
Display range (min. value unit max. value)			
-2147483647		2147483647	
☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1			

C03708

Parameter | Name: **C03708 | Touch probe pos2 pos value** Data type: INTEGER_32
Index: 20867_d = 5183_h

► CiA402 object: [0x60BC](#)

► [Touch probe](#)

Display range (min. value | unit | max. value)

-2147483647 2147483647

☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

C03709

Parameter | Name: **C03709 | Touch probe pos2 neg value** Data type: INTEGER_32
Index: 20866_d = 5182_h

► CiA402 object: [0x60BD](#)

► [Touch probe](#)

Display range (min. value | unit | max. value)

-2147483647 2147483647

☒ Read access ☐ Write access ☐ CINH ☐ PLC STOP ☐ No transfer Scaling factor: 1

5.3 Attribute table

The Attribute table contains information required for communicating with the controller via parameters.

How to read the table of attributes:

Column		Meaning	Entry	
Code		Parameter designation	Cxxxxx	
Name		Short parameter 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	Only required for access via 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	BITFIELD_8	1 byte bit-coded
			BITFIELD_16	2 bytes bit-coded
			BITFIELD_32	4 bytes bit-coded
			INTEGER_8	1 byte with sign
			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
Access	Factor	Factor for data transmission via 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
	R	Read access	☒ Reading allowed	
	W	Write access	☒ Writing allowed	
		CINH	☒ Writing only possible when controller is inhibited	

Attribute table

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C03001	UG min threshold	21574	5446	E	1	INTEGER_32	100	☒	☒	
C03002	Selection of limiter / safety interconnection	21573	5445	E	1	UNSIGNED_8	1	☒	☒	
C03010	Max. telegram failure value	21565	543D	E	1	UNSIGNED_32	1	☒	☒	
C03011	Counter SingleError	21564	543C	E	1	INTEGER_32	1	☒		
C03012	Counter MultiError	21563	543B	E	1	INTEGER_32	1	☒		
C03013	Reset Errorcounter	21562	543A	E	1	UNSIGNED_8	1	☒	☒	
C03500	CiA402 profile	21075	5253	E	1	UNSIGNED_32	1	☒		
C03503	Motor type	21072	5250	E	1	UNSIGNED_16	1	☒	☒	
C03504	Motor catalogue number	21071	524F	E	1	VISIBLE_STRING	1	☒	☒	
C03505	Motor manufacturer	21070	524E	E	1	VISIBLE_STRING	1	☒	☒	
C03506	http motor catalogue address	21069	524D	E	1	VISIBLE_STRING	1	☒	☒	
C03507	Motor calibration date	21068	524C	E	1	VISIBLE_STRING	1	☒	☒	
C03508	Motor service period	21067	524B	E	1	UNSIGNED_32	1	☒	☒	
C03509	Motor data	21066	524A	E	1	UNSIGNED_32	1	☒		

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C03512	Drive manufacturer	21063	5247	E	1	VISIBLE_STRING	1	☒	☒	
C03513	http drive catalogue address	21062	5246	E	1	VISIBLE_STRING	1	☒	☒	
C03514	Supported drive modes	21061	5245	E	1	UNSIGNED_32	1	☒		
C03515	Digital inputs	21060	5244	E	1	UNSIGNED_8	1	☒		
C03516	Digital outputs	21059	5243	E	1	UNSIGNED_8	1	☒		
C03517	Physical outputs	21058	5242	E	1	UNSIGNED_8	1	☒		
C03518	Bit mask	21057	5241	E	1	UNSIGNED_8	1	☒	☒	
C03519	Abort connection option code	21056	5240	E	1	INTEGER_16	1	☒	☒	
C03520	Error code	21055	523F	E	1	UNSIGNED_32	1	☒		
C03521	Supported drive modes	21054	523E	E	1	UNSIGNED_32	1	☒		
C03522	Drive catalogue number	21053	523D	E	1	VISIBLE_STRING	1	☒	☒	
C03530	Control word	21045	5235	E	1	UNSIGNED_16	1	☒	☒	
C03531	Status word	21044	5234	E	1	UNSIGNED_16	1	☒		
C03532	Shutdown option code	21043	5233	E	1	INTEGER_16	1	☒	☒	
C03533	Disable operation option code	21042	5232	E	1	INTEGER_16	1	☒	☒	
C03534	Quick stop option code	21041	5231	E	1	INTEGER_16	1	☒	☒	
C03535	Halt option code	21040	5230	E	1	INTEGER_16	1	☒	☒	
C03536	Fault reaction option code	21039	522F	E	1	INTEGER_16	1	☒	☒	
C03537	Mode of operation	21038	522E	E	1	INTEGER_8	1	☒	☒	
C03538	Mode of operation display	21037	522D	E	1	INTEGER_8	1	☒		
C03550	Position notation index	21025	5221	E	1	INTEGER_8	1	☒	☒	
C03551	Position dimension index	21024	5220	E	1	UNSIGNED_8	1	☒	☒	
C03552	Velocity notation index	21023	521F	E	1	INTEGER_8	1	☒	☒	
C03553	Velocity dimension index	21022	521E	E	1	UNSIGNED_8	1	☒	☒	
C03554	Acceleration notation index	21021	521D	E	1	INTEGER_8	1	☒	☒	
C03555	Acceleration dimension index	21020	521C	E	1	UNSIGNED_8	1	☒	☒	
C03556	Position encoder resolution	21019	521B	E	1	UNSIGNED_32	1	☒		
C03557	Encoder increments	21018	521A	E	1	UNSIGNED_32	1	☒	☒	
C03558	Motor revolution	21017	5219	E	1	UNSIGNED_32	1	☒	☒	
C03559	Velocity encoder resolution	21016	5218	E	1	UNSIGNED_32	1	☒		
C03560	Encoder increments per second	21015	5217	E	1	UNSIGNED_32	1	☒	☒	
C03561	Motor revolutions per second	21014	5216	E	1	UNSIGNED_32	1	☒	☒	
C03562	Gear ratio	21013	5215	E	1	UNSIGNED_32	1	☒		
C03565	Feed constant	21010	5212	E	1	UNSIGNED_32	1	☒		
C03567	Feed shaft revolutions	21008	5210	E	1	UNSIGNED_32	1	☒	☒	
C03568	Position factor	21007	520F	E	1	UNSIGNED_32	1	☒		
C03569	Position factor numerator	21006	520E	E	1	UNSIGNED_32	1	☒	☒	
C03570	Position factor divisor	21005	520D	E	1	UNSIGNED_32	1	☒	☒	
C03571	Velocity encoder factor	21004	520C	E	1	UNSIGNED_32	1	☒		
C03572	Velocity encoder factor numerator	21003	520B	E	1	UNSIGNED_32	1	☒	☒	
C03573	Velocity encoder factor divisor	21002	520A	E	1	UNSIGNED_32	1	☒	☒	
C03574	Velocity factor1	21001	5209	E	1	UNSIGNED_32	1	☒		
C03575	Velocity factor1 numerator	21000	5208	E	1	UNSIGNED_32	1	☒	☒	
C03576	Velocity factor1 divisor	20999	5207	E	1	UNSIGNED_32	1	☒	☒	
C03577	Velocity factor2	20998	5206	E	1	UNSIGNED_32	1	☒		
C03578	Velocity factor2 numerator	20997	5205	E	1	UNSIGNED_32	1	☒	☒	
C03579	Velocity factor2 divisor	20996	5204	E	1	UNSIGNED_32	1	☒	☒	
C03580	Acceleration factor	20995	5203	E	1	UNSIGNED_32	1	☒		
C03581	Acceleration factor numerator	20994	5202	E	1	UNSIGNED_32	1	☒	☒	
C03582	Acceleration factor divisor	20993	5201	E	1	UNSIGNED_32	1	☒	☒	
C03583	Polarity	20992	5200	E	1	UNSIGNED_8	1	☒		

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Parameter reference

Attribute table

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C03585	Load home position	20990	51FE	E	1	INTEGER_32	1	☒	☒	
C03590	Position demand value unit	20985	51F9	E	1	INTEGER_32	1	☒		
C03591	Position actual value	20984	51F8	E	1	INTEGER_32	1	☒		
C03592	Position actual value unit	20983	51F7	E	1	INTEGER_32	1	☒		
C03593	Following error window	20982	51F6	E	1	UNSIGNED_32	1	☒	☒	
C03594	Following error time out	20981	51F5	E	1	UNSIGNED_32	1	☒	☒	
C03595	Position window	20980	51F4	E	1	UNSIGNED_32	1	☒	☒	
C03596	Position window time	20979	51F3	E	1	UNSIGNED_32	1	☒	☒	
C03597	Following error actual value	20978	51F2	E	1	INTEGER_32	1	☒		
C03598	Control effort	20977	51F1	E	1	INTEGER_32	1	☒		
C03599	Position control parameter set	20976	51F0	E	1	UNSIGNED_32	1	☒		
C03600	Position demand value	20975	51EF	E	1	INTEGER_32	1	☒		
C03601	Homing method	20974	51EE	E	1	INTEGER_8	1	☒	☒	
C03602	Brake control	20973	51ED	E	1	UNSIGNED_8	1	☒	☒	
C03603	Brake torque add	20972	51EC	E	1	INTEGER_32	1	☒	☒	
C03604	Following error reaction	20971	51EB	E	1	UNSIGNED_16	1	☒	☒	
C03605	Safe I/O state	20970	51EA	E	1	UNSIGNED_8	1	☒		
C03606	Safety module state	20969	51E9	E	1	UNSIGNED_16	1	☒		
C03612	Homing speeds	20963	51E3	E	1	UNSIGNED_32	1	☒		
C03615	Homing acceleration	20960	51E0	E	1	UNSIGNED_32	1	☒		
C03630	Interpolation sub mode select	20945	51D1	E	1	INTEGER_16	1	☒	☒	☒
C03631	Interpolation data record	20944	51D0	E	1	UNSIGNED_32	1	☒		
C03632	Interpolated data X1	20943	51CF	E	1	INTEGER_32	1	☒	☒	
C03636	Interpolation time period	20939	51CB	E	1	UNSIGNED_32	1	☒		
C03637	ip time units	20938	51CA	E	1	UNSIGNED_8	1	☒	☒	
C03638	ip time index	20937	51C9	E	1	INTEGER_8	1	☒	☒	
C03639	Interpolation sync definition	20936	51C8	E	1	UNSIGNED_8	1	☒		
C03640	Synchronize on group	20935	51C7	E	1	UNSIGNED_8	1	☒	☒	
C03641	ip sync every n event	20934	51C6	E	1	UNSIGNED_8	1	☒	☒	
C03642	Interpolation data configuration	20933	51C5	E	1	UNSIGNED_32	1	☒		
C03643	Max. buffer size	20932	51C4	E	1	UNSIGNED_32	1	☒		
C03644	Actual buffer size	20931	51C3	E	1	UNSIGNED_32	1	☒	☒	
C03645	Buffer organization	20930	51C2	E	1	UNSIGNED_8	1	☒	☒	
C03646	Buffer position	20929	51C1	E	1	UNSIGNED_16	1	☒	☒	
C03647	Size of data record	20928	51C0	E	1	UNSIGNED_8	1	☒	☒	
C03648	Buffer clear	20927	51BF	E	1	UNSIGNED_8	1	☒	☒	
C03653	Velocity actual value	20922	51BA	E	1	INTEGER_32	1	☒		
C03654	Offset velocity	20921	51B9	E	1	INTEGER_32	1	☒	☒	
C03658	Target velocity	20917	51B5	E	1	INTEGER_32	1	☒	☒	
C03670	Target torque	20905	51A9	E	1	INTEGER_32	1	☒	☒	
C03673	Torque demand value	20902	51A6	E	1	INTEGER_32	1	☒		
C03677	Torque actual value	20898	51A2	E	1	INTEGER_32	1	☒		
C03678	Current actual value	20897	51A1	E	1	INTEGER_32	1	☒		
C03679	Torque slope	20896	51A0	E	1	UNSIGNED_32	1	☒	☒	
C03680	Torque profile type	20895	519F	E	1	INTEGER_16	1	☒	☒	
C03681	Power stage parameters	20894	519E	E	1	UNSIGNED_32	1	☒		
C03682	Torque control parameters	20893	519D	E	1	UNSIGNED_32	1	☒		
C03683	Torque offset	20892	519C	E	1	INTEGER_32	1	☒	☒	
C03684	Positive speed limit	20891	519B	E	1	INTEGER_32	100	☒	☒	
C03685	Negative speed limit	20890	519A	E	1	INTEGER_32	100	☒	☒	
C03686	Positive torque limit	20889	5199	E	1	UNSIGNED_16	1	☒	☒	

Code	Name	Index		Data				Access		
		dec	hex	DS	DA	DT	Factor	R	W	CINH
C03687	Negative torque limit	20888	5198	E	1	UNSIGNED_16	1	☒	☒	
C03688	Max torque	20887	5197	E	1	UNSIGNED_16	1	☒	☒	
C03690	Torque position	20885	5195	E	1	INTEGER_32	1	☒		
C03691	Offset position	20884	5194	E	1	INTEGER_32	1	☒	☒	
C03700	Touch probe function	20875	518B	E	1	UNSIGNED_16	1	☒	☒	
C03701	Touch probe function	20874	518A	E	1	UNSIGNED_16	1	☒		
C03706	Touch probe pos1 pos value	20869	5185	E	1	INTEGER_32	1	☒		
C03707	Touch probe pos1 neg value	20868	5184	E	1	INTEGER_32	1	☒		
C03708	Touch probe pos2 pos value	20867	5183	E	1	INTEGER_32	1	☒		
C03709	Touch probe pos2 neg value	20866	5182	E	1	INTEGER_32	1	☒		

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