BECKHOFF New Automation Technology

Documentation | EN

EP7211-003x

Servomotor modules with OCT

2022-10-25 | Version: 1.8

Table of contents

1 Foreword

1.1 Notes on the documentation

Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement.

No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Trademarks

Beckhoff®, TwinCAT®, TwinCAT/BSD®, TC/BSD®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered trademarks of and licensed by Beckhoff Automation GmbH. Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702 with corresponding applications or registrations in various other countries.

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Copyright

1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of instructions

In this documentation the following instructions are used.
These instructions must be read carefully and followed without fail!

⚠ DANGER

Serious risk of injury!

Failure to follow this safety instruction directly endangers the life and health of persons.

⚠ WARNING

Risk of injury!

Failure to follow this safety instruction endangers the life and health of persons.

⚠ CAUTION

Personal injuries!

Failure to follow this safety instruction can lead to injuries to persons.

NOTE

Damage to environment/equipment or data loss

Failure to follow this instruction can lead to environmental damage, equipment damage or data loss.

Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Documentation issue status

Version	Comment
1.8	• Chapter "Commissioning" updated • Structure update
1.7	• EP7211-0035 added
1.6	• UL approval added • Cabling updated • Dimensions updated • CoE parameters updated
1.5	• Images updated: imprint on the housing • CoE parameters updated
1.4	• Front page updated
1.3	• Ordering information for motor connection cables added • Pin assignment of the connectors for touch probes updated • CoE object 6010 updated
1.2	• Link to STO application example added • Corrections
1.1	• Variant -9034 removed
1.0	• First release
0.4	• Preliminary version
0.3	• Updates
0.2	• Technical data updated
0.1	• First draft

Firmware and hardware versions

This documentation refers to the firmware and hardware version that was applicable at the time the documentation was written.

The module features are continuously improved and developed further. Modules having earlier production statuses cannot have the same properties as modules with the latest status. However, existing properties are retained and are not changed, so that older modules can always be replaced with new ones.

The firmware and hardware version (delivery state) can be found in the batch number (D-number) printed on the side of the EtherCAT Box.

Syntax of the batch number (D-number)

D: WW YY FF HH	Example with D no. 29 10 02 01:
WW - week of production (calendar week) YY - year of production FF - firmware version HH - hardware version	29 - week of production 29 10 - year of production 2010 02 - firmware version 02 01 - hardware version 01

Further information on this topic: Version identification of EtherCAT devices [▶ 138].

2 EtherCAT Box - Introduction

The EtherCAT system has been extended with EtherCAT Box modules with protection class IP67. Through the integrated EtherCAT interface the modules can be connected directly to an EtherCAT network without an additional Coupler Box. The high-performance of EtherCAT is thus maintained into each module.

The extremely low dimensions of only 126 x 30 x 26.5 mm (h x w x d) are identical to those of the Fieldbus Box extension modules. They are thus particularly suitable for use where space is at a premium. The small mass of the EtherCAT modules facilitates applications with mobile I/O interface (e.g. on a robot arm). The EtherCAT connection is established via screened M8 connectors.

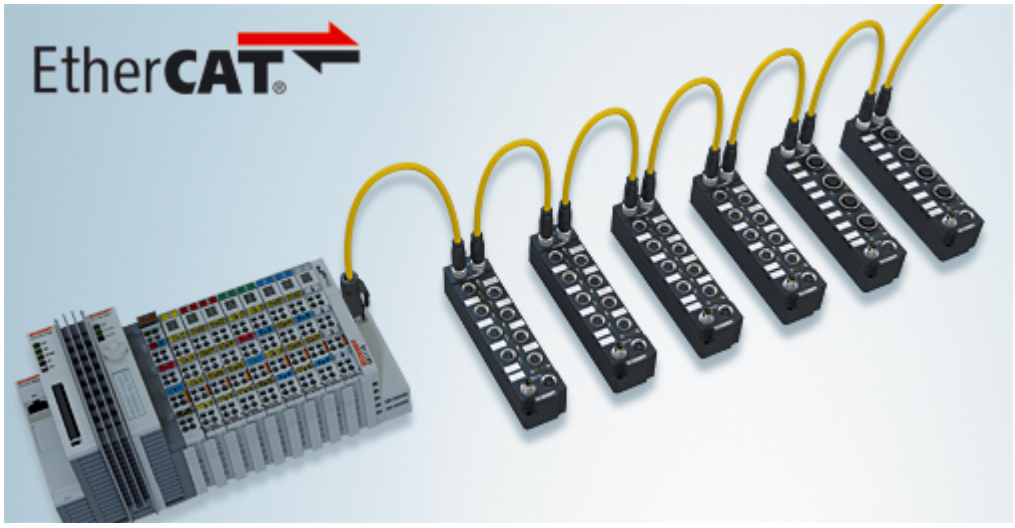


Fig. 1: EtherCAT Box Modules within an EtherCAT network

The robust design of the EtherCAT Box modules enables them to be used directly at the machine. Control cabinets and terminal boxes are now no longer required. The modules are fully sealed and therefore ideally prepared for wet, dirty or dusty conditions.

Pre-assembled cables significantly simplify EtherCAT and signal wiring. Very few wiring errors are made, so that commissioning is optimized. In addition to pre-assembled EtherCAT, power and sensor cables, field-configurable connectors and cables are available for maximum flexibility. Depending on the application, the sensors and actuators are connected through M8 or M12 connectors.

The EtherCAT modules cover the typical range of requirements for I/O signals with protection class IP67:

- digital inputs with different filters (3.0 ms or 10 µs)
- digital outputs with 0.5 or 2 A output current
- analog inputs and outputs with 16 bit resolution
- Thermocouple and RTD inputs
- Stepper motor modules

XFC (eXtreme Fast Control Technology) modules, including inputs with time stamp, are also available.

Fig. 2: EtherCAT Box with M8 connections for sensors/actuators

Fig. 3: EtherCAT Box with M12 connections for sensors/actuators

Basic EtherCAT documentation

You will find a detailed description of the EtherCAT system in the Basic System Documentation for EtherCAT, which is available for download from our website (www.beckhoff.com) under Downloads.

3 Product overview

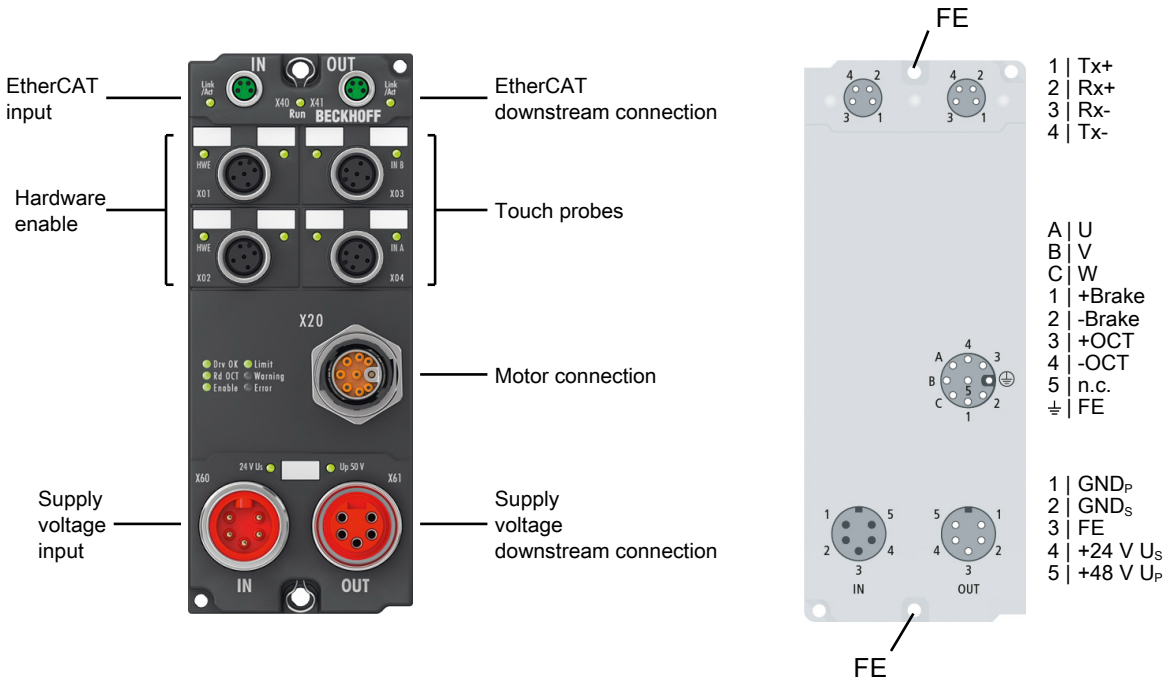
3.1 Module overview

The EP7211-0034 and EP7211-0035 modules differ only in the preset drive profile:

Module	Preset drive profile
EP7211-0034	MDP 742
EP7211-0035	CiA DS402

If necessary, you can change the drive profile. Thus EP7211-0034 can optionally be operated with CiA DS402 and EP7211-0035 with MDP 742. See chapter Drive profiles [▶ 65].

3.2 Introduction



The EP7211-003x EtherCAT Box is a 1-channel servo drive for synchronous servomotors with OCT feedback system.
It is intended for operation with motors of the AM81xx series. These motors have an electronic identification plate. EP7211-003x can read the electronic identification plate in order to set the motor parameters in TwinCAT automatically.

Process-side interfaces of EP7211-003x:

- Motor
- Motor brake
- OCT communication:
  - Feedback
  - Electronic identification plate readout
- 2 x touch probe
- Hardware enable: digital input for activating the output stage

The motor is connected via a hybrid cable. The hybrid cable contains the wires for the motor phases, the brake and the OCT communication.

Using the EP7211-003x together with an EL2904, an STO function complying with EN 61800-5-2 can be implemented in accordance with the application example.
The user bears the responsibility for the safety evaluation in case of deviation from the application example.

3.3 Technical data

All values are typical values over the entire temperature range, unless stated otherwise.

EtherCAT	
Connection	2 x M8 socket, 4-pin, green
Electrical isolation	500 V
Distributed Clocks	yes

Supply voltages	
Connection	Input: 7/8" - plug, 5-pin Downstream connection: 7/8" - socket, 5-pin
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current	max. 16 A at 40 °C
Current consumption from U_S	120 mA
DC link voltage U_P rated voltage	48 V_{DC} (8 ... 50 V_{DC}), not reverse polarity protected
U_P sum current	max. 16 A at 40 °C
Current consumption from U_P	50 mA

Motor	EP7211-0034	EP7211-0035
Motor type	Synchronous servomotor	
Connection	1 x itec socket, 9-pin [▶ 24] Hybrid connector for: • 1 x motor • 1 x feedback (OCT encoder) • 1 x brake	
Nominal output P_n	max. 276 W	
Nominal current I_n	4.5 A_{rms}	
Output peak current I_{peak}	9.0 A_{rms} für 1 s	
Rotary field frequency	0 … 599 Hz	
PWM clock frequency	16 kHz	
Current controller frequency	32 kHz	
Speed controller frequency	16 kHz	
Drive profile [▶ 65]	Alternatively: • MDP 742 (default) • CiA DS402	Alternatively: • MDP 742 • CiA DS402 (default)

Motor brake	
Output voltage	24 V_{DC} from the control voltage U_S
Output current	max. 0.5 A, short-circuit protected

Digital input "Hardware enable"	
Signal voltage "1"	10 … 30 V_{DC}

Digital inputs "Touch probe"	
Number	2

Housing data	
Dimensions W x H x D	60 mm x 150 mm x 26,5 mm (without connectors)
Weight	approx. 500 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25…+60 °C -25…+55 °C according to cURus
Ambient temperature during storage	-40…+85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional checks [▶ 13]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
EMC category	Category C3 (auxiliary filter required) Category C2, C1 in preparation (auxiliary filter required)
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals/markings	
Approvals/markings	CE, UL Requirements [▶ 30], TÜV Süd

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.4 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EtherCAT Box EP7211-003x
- 2x protective caps for EtherCAT socket (mounted)
- 1x protective cap for 7/8" socket (mounted)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.5 Technology

Servomotor

The servomotor is an electrical motor. Together with a servo drive the servomotor forms a drive. The servomotor is operated in a closed control loop with position, torque or speed control.

EP7211-003x supports control of permanent magnet synchronous motors. These consist of 3 coils which are offset by 120° and a permanent magnet rotor.

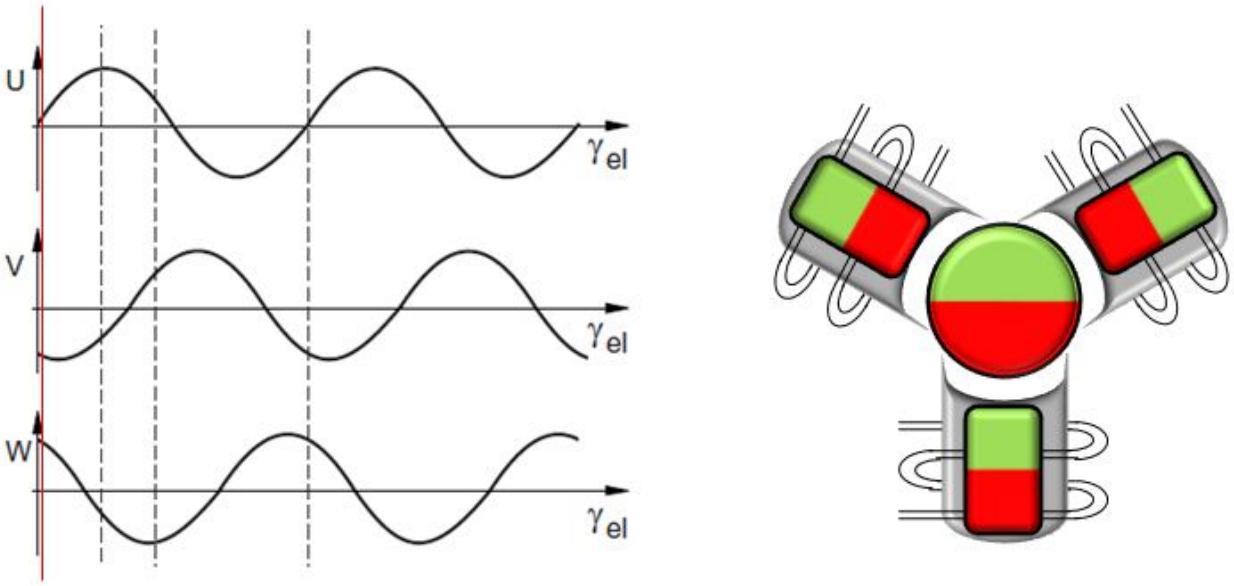


Fig. 4: Three synchronous motor coils, each offset by 120°

One Cable Technology (OCT)

In the servomotors from the AM8100-xF**2** x series the feedback signals are transmitted directly via the power supply cable, so that power and feedback system are combined in a single motor connection cable. With the use of the One Cable technology, the information is sent reliably and without interference through a digital interface. Since a cable and plug are omitted at both the motor and controller end, the component and commissioning costs are reduced.

Thermal I^2T motor model

The thermal I^2T motor model represents the thermal behavior of the motor winding taking into account the absolute thermal resistance R_{th} and the thermal capacity C_{th} of motor and the stator winding.

The model assumes that the motor reaches its maximum continuous operating temperature T_{nom} during continuous operation with rated current I_{nom}. This temperature corresponds to 100% motor load. During operation at rated current the motor model reaches a load of 63% after a time of $\tau_{th}=R_{th}\cdot C_{th}$ and slowly reaches its continuous operating temperature.

If the motor is operated with a current that is greater than the rated current, the model reaches 100% load more quickly.

If the load of the I^2T model exceeds 100%, the requested set current is limited to the rated current, in order to protect the motor winding thermally. The load reduces to a maximum of 100%. If the current falls below the rated current, the load falls below 100% and the set current limitation is cancelled.

For a motor that has been cooled to ambient temperature, the time for reaching 100% load with a set current that exceeds the rated current can be estimated with $\tau_{th}\cdot I_{nom}^2/I_{actual}^2$.

The actual load must be known for exact calculation of the time when the 100% load threshold is exceeded.

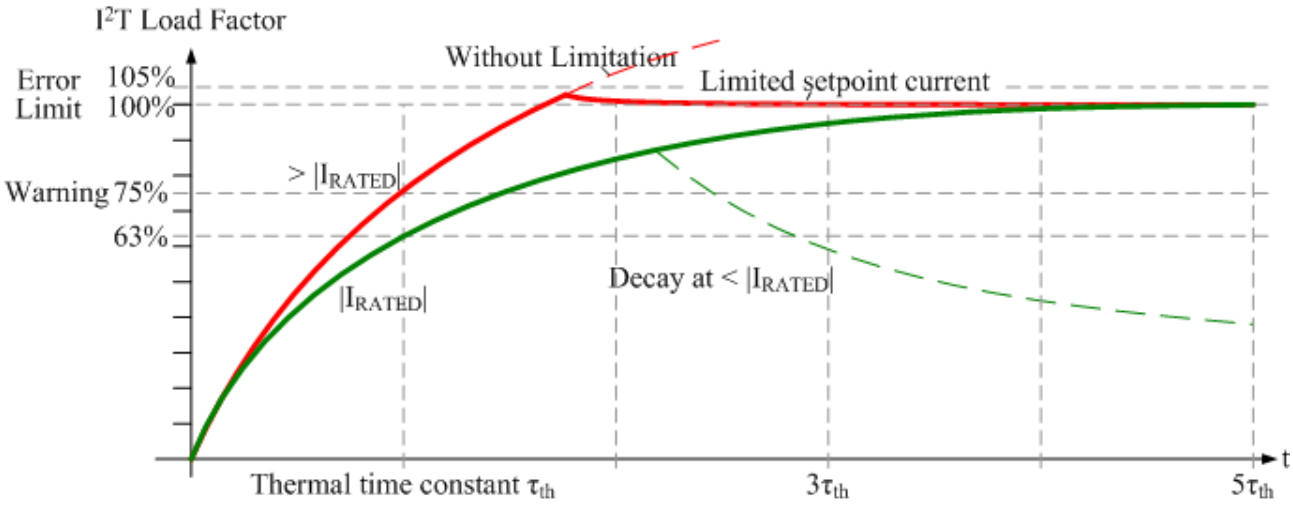
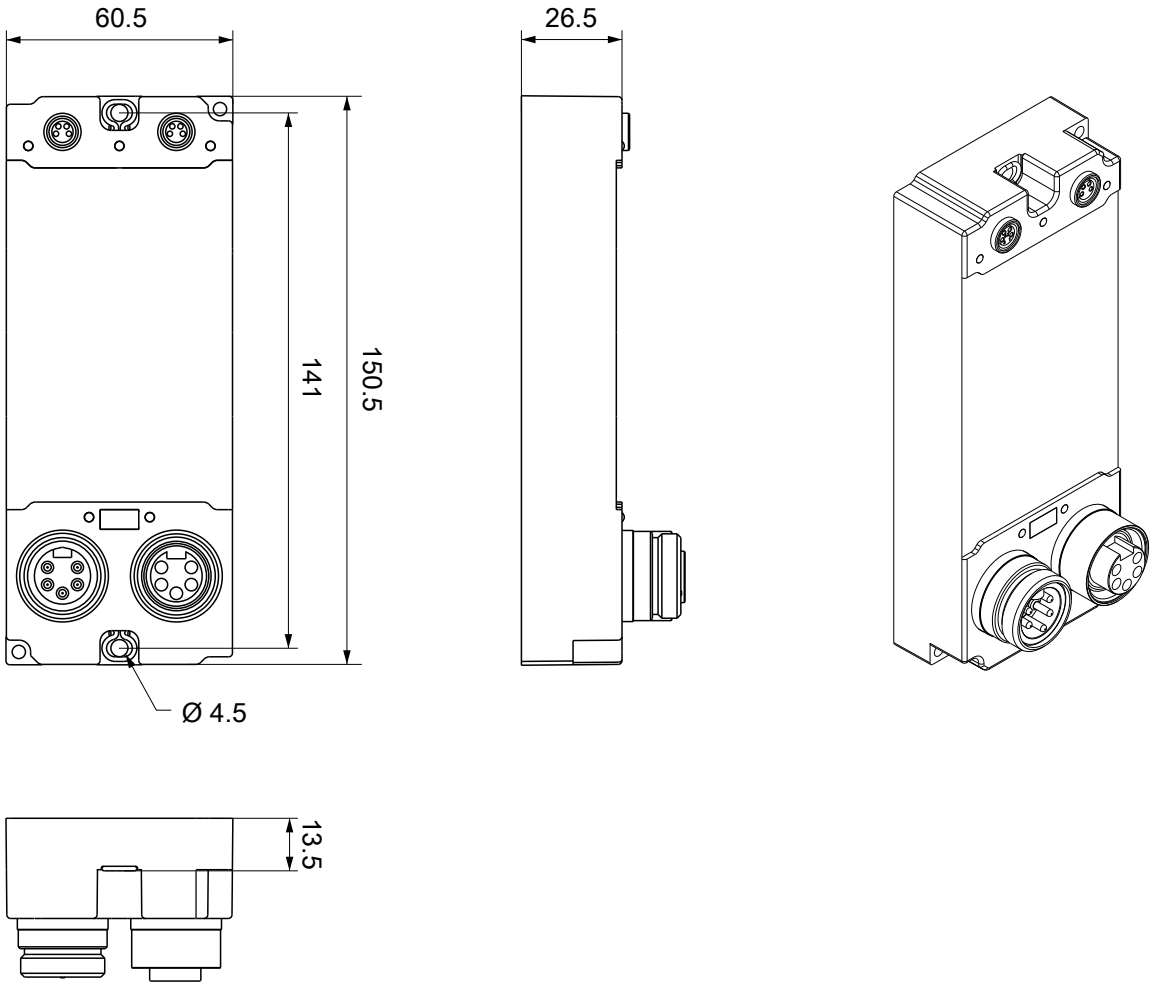


Fig. 5: Limitation to the rated motor current

4 Mounting and cabling

4.1 Mounting

4.1.1 Dimensions



All dimensions are given in millimeters.
The drawing is not true to scale.

Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two mounting holes Ø 4.5 mm for M4
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Power feed through	max. 16 A at 40°C (according to IEC 60512-3)
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 150 x 60 x 26.5 mm (without connectors)

4.1.2 Fixing

NOTE

Dirt during assembly

Dirty connectors can lead to malfunctions. Protection class IP67 can only be guaranteed if all cables and connectors are connected.

- Protect the plug connectors against dirt during the assembly.

Mount the module with two M4 screws in the centrally located mounting holes.

4.1.3 Functional earth (FE)

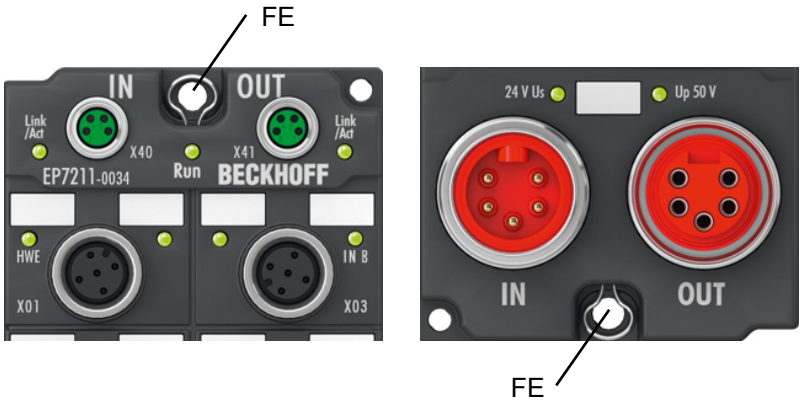
All existing connections for the functional earth must be connected to earth:

- Mounting holes
- "FE" cores in the supply cables

Functional earth via the mounting holes

The Fixing [▶ 17] also serve as connections for the functional earth (FE).

Make sure that the box is earthed with low impedance via both mounting screws.



Functional earth via the supply lines

The pins of the Supply voltages [▶ 19] marked with "FE" are directly connected to the functional earth potential of the mounting holes.

Connect the functional earth of the "FE" cores in accordance with the following instructions:

- If the remote station is a device with a 7/8" connector: connect the devices with a pre-configured cable. Possible types of preconfigured cables:
  - Beckhoff ZK2030-1112-0xxx
  - Beckhoff ZK2030-1114-0xxx
  - Beckhoff ZK2030-1314-0xxx
- Otherwise: Earth the "FE" core with low impedance as near as possible to the remote station.

4.2 Cabling

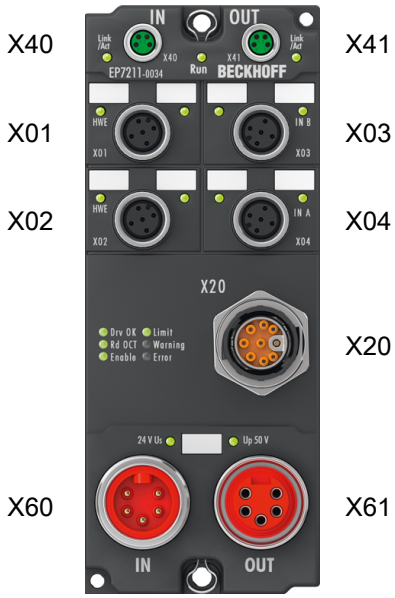


Fig. 6: Connector overview

Name	Connector type	Tightening torque	Function
X01	M12	0.6 Nm [1]	Hardware Enable HWE [▶ 26]
X02			
X03	M12	0.6 Nm [1]	Touch Probe [▶ 28]
X04			
X20	itec	-	Motor, brake and feedback system [▶ 24]
X40	M8	0.4 Nm [1]	EtherCAT [▶ 22]
X41			
X60	7/8"	1.5 Nm	Supply voltages [▶ 19]
X61			

[1] Mount connectors on these plug connectors using a torque wrench, e.g. ZB8801 from Beckhoff.

Protective caps

- Seal unused connectors with protective caps.
- Ensure the correct seating of pre-assembled protective caps.
  Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

4.2.1 Supply voltages

⚠ WARNING

Power supply from SELV/PELV power supply unit!

SELV/PELV circuits (Safety Extra Low Voltage, Protective Extra Low Voltage) according to IEC 61010-2-201 must be used to supply this device.

Notes:

- SELV/PELV circuits may give rise to further requirements from standards such as IEC 60204-1 et al, for example with regard to cable spacing and insulation.
- A SELV (Safety Extra Low Voltage) supply provides safe electrical isolation and limitation of the voltage without a connection to the protective conductor,
  a PELV (Protective Extra Low Voltage) supply also requires a safe connection to the protective conductor.

⚠ CAUTION

Observe the UL requirements

- When operating under UL conditions, observe the warnings in the chapter UL Requirements [▶ 30].

The EtherCAT Box has one input for two supply voltages:

- **Control voltage U_S**
  The following sub-functions are supplied from the control voltage U_S:
  - the fieldbus
  - the processor logic
  - typically the inputs and the sensors if the EtherCAT Box has inputs.
- **Peripheral voltage U_P**
  For EtherCAT Box modules with digital outputs the digital outputs are typically supplied from the peripheral voltage U_P. U_P can be supplied separately. If U_P is switched off, the fieldbus function, the function of the inputs and the supply of the sensors are maintained.

The exact assignment of U_S and U_P can be found in the pin assignment of the I/O connections.

Redirection of the supply voltages

The power IN and OUT connections are bridged in the module. Hence, the supply voltages U_s and U_p can be passed from EtherCAT Box to EtherCAT Box in a simple manner.

NOTE

Note the maximum current!

Ensure that the permitted current for the connectors is not exceeded when routing the supply voltages U_S and U_P:

M8 connector: max. 4 A
7/8" connector: max 16 A

NOTE

Unintentional cancellation of the electrical isolation of GND_S and GND_P possible.

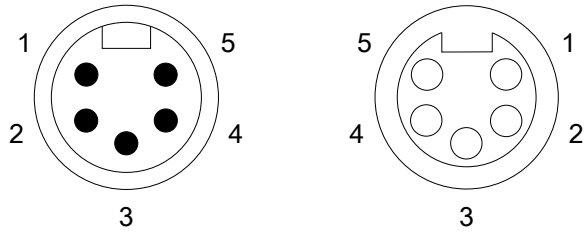
In some types of EtherCAT Box modules the ground potentials GND_S and GND_P are connected.

- If several EtherCAT Box modules are supplied with the same electrically isolated voltages, check whether there is an EtherCAT Box among them in which the ground potentials are connected.

4.2.1.1 Connectors

Two 7/8 " connectors at the low-end of the modules are used for feeding and routing the supply voltages:

- "IN" (male): left connector for feeding the supply voltages
- "OUT" (female): right connector for downstream connection of supply voltages



Plug
Feed-in

Socket
Forwarding

NOTE

Defect possible through polarity reversal

The input for the DC link voltage U_P is not protected against polarity reversal.

- Ensure that the polarity is correct.

NOTE

Fuse protection of the DC link voltage

The electrical fuse protection of the DC link voltage must be selected in such a way that the maximum current is limited to 16 A (max. 1 second)!

Pin	Name	Comment	Core colors [1)]
1	GND_P	GND to U_P	Black
2	GND_S	GND to U_S	Blue
3	FE	Functional earth	Gray
4	+24 V_{DC} U_S	Control voltage U_S	Brown
5	+48 V_{DC} U_P	DC link voltage U_P	White

[1)] The core colors apply to cables of type: Beckhoff ZK203x-xxxx.

4.2.1.2 Status LEDs

The status of the supply voltages is signaled by two LEDs. A Status LED lights up green when the respective supply voltage is present on the supply voltage input.

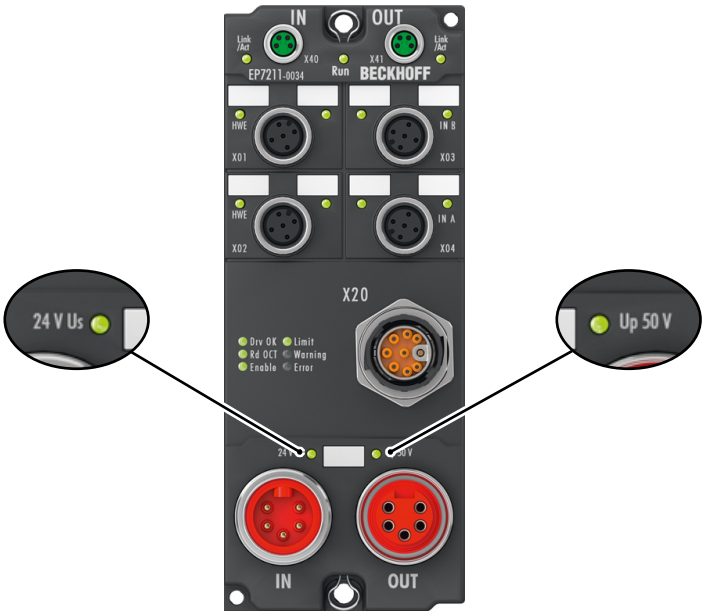
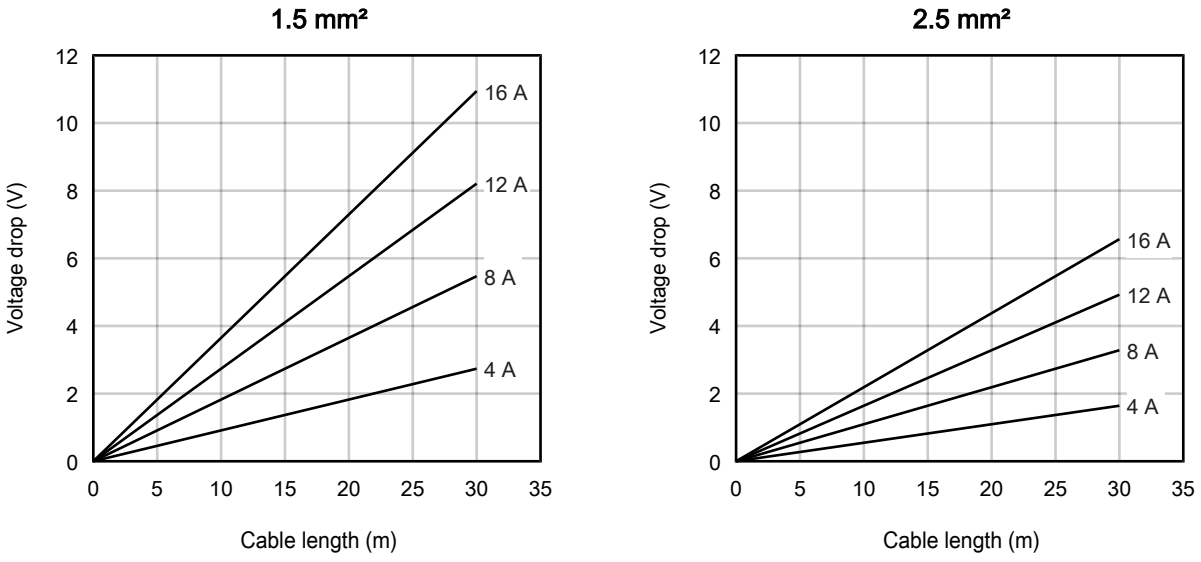


Fig. 7: Power supply Status LEDs

4.2.1.3 Conductor losses

Take into account the voltage drop on the supply line when planning a system. Avoid the voltage drop being so high that the supply voltage at the box lies below the minimum nominal voltage.
Variations in the voltage of the power supply unit must also be taken into account.

Voltage drop on the supply line



4.2.2 EtherCAT

4.2.2.1 Connectors

EtherCAT Box Modules have two green M8 sockets for the incoming and downstream EtherCAT connections.

Fig. 8: EtherCAT connectors

Connection

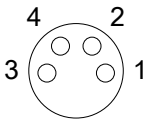


Fig. 9: M8 socket

EtherCAT	M8 connector	Core colors		
Signal	**Contact**	**ZB9010, ZB9020, ZB9030, ZB9032, ZK1090-6292, ZK1090-3xxx-xxxx**	**ZB9031 and old versions of ZB9030, ZB9032, ZK1090-3xxx-xxxx**	**TIA-568B**
Tx +	1	yellow[1)]	orange/white	white/orange
Tx -	4	orange[1)]	orange	orange
Rx +	2	white[1)]	blue/white	white/green
Rx -	3	blue[1)]	blue	green
Shield	Housing	Shield	Shield	Shield

[1)] Core colors according to EN 61918

Adaptation of core colors for cables ZB9030, ZB9032 and ZK1090-3xxxx-xxxx

For standardization, the core colors of the ZB9030, ZB9032 and ZK1090-3xxx-xxxx cables have been changed to the EN61918 core colors: yellow, orange, white, blue. So there are different color codes in circulation. The electrical properties of the cables have been retained when the core colors were changed.

4.2.2.2 Status LEDs

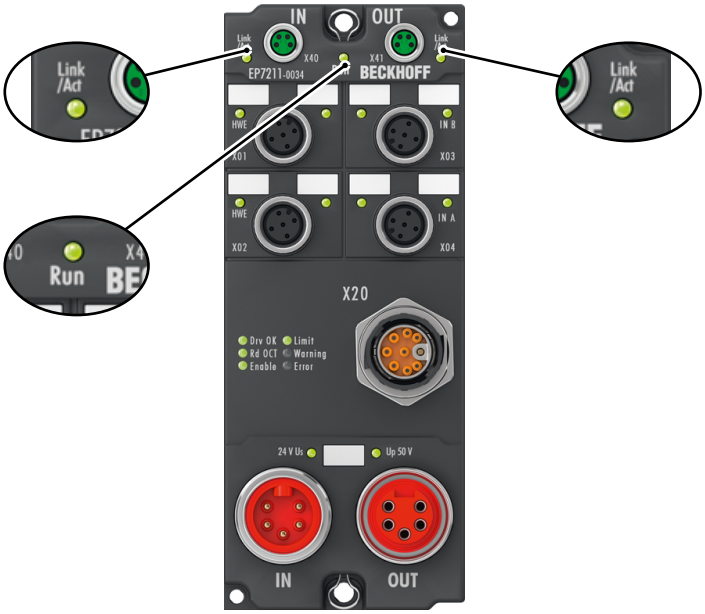


Fig. 10: EtherCAT Status LEDs

L/A (Link/Act)

A green LED labelled "L/A" is located next to each EtherCAT socket. The LED indicates the communication state of the respective socket:

LED	Meaning
off	no connection to the connected EtherCAT device
lit	LINK: connection to the connected EtherCAT device
flashes	ACT: communication with the connected EtherCAT device

Run

Each EtherCAT slave has a green LED labelled "Run". The LED signals the status of the slave in the EtherCAT network:

LED	Meaning
off	Slave is in "Init" state
flashes uniformly	Slave is in "Pre-Operational“ state
flashes sporadically	Slave is in "Safe-Operational" state
lit	Slave is in "Operational" state

Description of the EtherCAT slave states

4.2.3 Motor, brake and feedback system

4.2.3.1 Connector

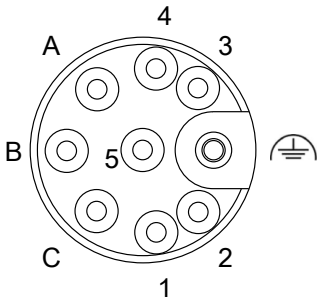


Fig. 11: itec socket

Pin	Name	Comment	Core colors[1)]
1	Brake +	Motor brake +	Red
2	Brake -	Motor brake -	Black
3	OCT +	Data and supply for the OCT feedback system	White
4	OCT -	Data and supply for the OCT feedback system	Blue
5	-	-	
A	U	Motor phase U	Black
B	W	Motor phase W	Grey
C	V	Motor phase V	Brown
⏚	FE, shield	Functional earth, cable shield	green-yellow

[1)] The core colors apply to the ZK470x-xxxx motor cables from Beckhoff.

4.2.3.2 Connecting cables

Beckhoff Automation offers suitable connecting cables with itec connectors. The following table shows some examples:

Ordering information	Material	Wire gauge	Properties
ZK4701-0401-2xxx	PVC	0.75 mm^2	For fixed installation
ZK4701-0421-2xxx	PUR	0.75 mm^2	Highly flexible, drag-chain suitable
ZK4701-0461-2xxx	PUR	0.75 mm^2	Torsion-resistant for robot applications

The complete product range can be found on our homepage www.beckhoff.com.

4.2.3.3 Status LEDs

Fig. 12: Status LEDs of the motor connection

LED displays

LED	Display	Meaning
Drv OK	green illuminated	The driver stage is ready for operation.
Rd OCT	flashing green	The electronic identification plate is being read.
Enable	green	The driver stage is enabled. The LED is linked with bits 1 and 2 of the status word[1)].
Limit	orange	Limit reached (e.g. torque or speed limit). The LED is linked with bit 11 of the status word[1)].
Warning	flashes	Error while reading the electronic identification plate.
	orange	Warning. The "Warning" threshold value is exceeded. Possible reasons: • Motor load (I^2T) is higher than 100% • The motor output stage is not activated [▶ 32] • Maximum operating temperature exceeded The LED is linked with bit 7 of the status word[1)].
Error	red	Error. The “Error” threshold value is exceeded. Possible reasons: • Overcurrent • Voltage not available • Feedback not connected • Max. temperature (100 °C) exceeded The LED is linked with bit 3 of the status word[1)].

[1)] Status word in the CoE directory:

- Device profile MDP742 [▶ 97] (default for EP7211-0034)
- Device profile DS402 [▶ 122] (default for EP7211-0035)

4.2.4 Hardware Enable HWE

4.2.4.1 Connectors

Connect the "Hardware Enable" signal to the X01 or alternatively the X02 socket. The X01 and X02 sockets have the same configuration and are bridged 1:1 inside the box.

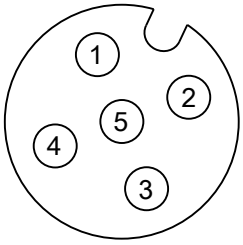


Fig. 13: M12 socket pin assignment

Pin	Signal	Core colors[1)]
1	n.c.	Brown
2	n.c.	White
3	n.c.	Blue
4	Hardware Enable HWE	Black
5	FE (Functional earth)	Grey

[1)] The core colors apply to cables of the types ZK2000-5xxx, ZK2000-6xxx and ZK2000-7xxx from Beckhoff.

4.2.4.2 Cabling

The X01 and X02 sockets have the same configuration and are bridged 1:1 inside the box. This makes it possible to forward the signal for "Hardware Enable" from one box to the next.

Sample:

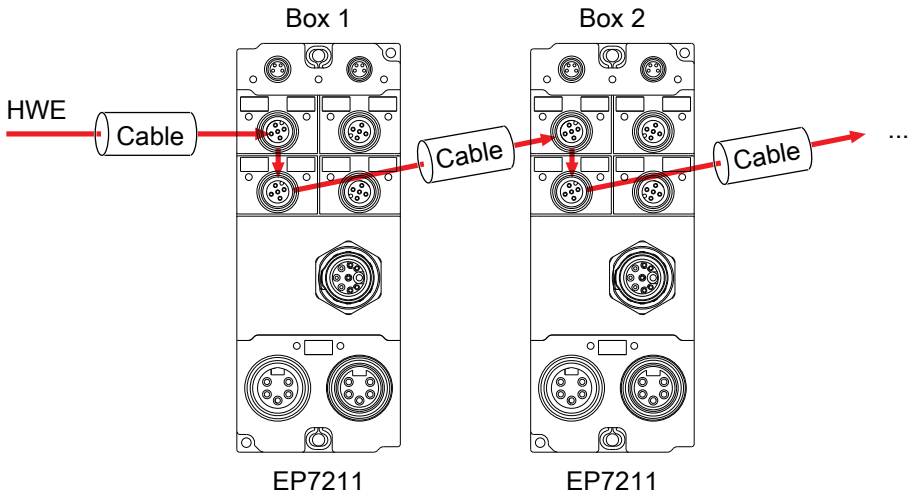


Fig. 14: Sample: forwarded HWE signal

4.2.4.3 Status LED

Fig. 15: Status LED for HWE

The green LED with the name "HWE" (Hardware Enable) lights when a high level is present on the corresponding pin of X01 or X02.
→ The motor output stage is activated.

4.2.5 Touch Probe

4.2.5.1 Connector

Connect touch probes to the sockets X03 and X04. The X03 and X04 sockets have the same configuration and are bridged 1:1 inside the box.

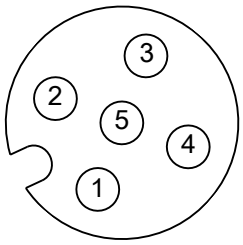


Fig. 16: M12 socket pin assignment

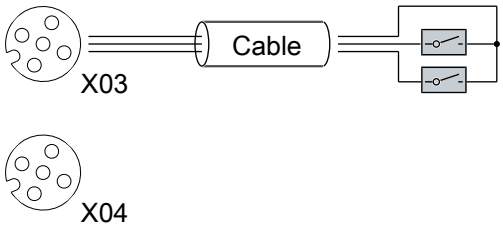
Pin	Signal	Core colors[1)]
1	U_S: +24 V_{DC}	Brown
2	IN B = TP2	White
3	GND_S	Blue
4	IN A = TP1	Black
5	FE (Functional earth)	Grey

[1)] The core colors apply to cables of the types ZK2000-5xxx, ZK2000-6xxx and ZK2000-7xxx from Beckhoff.

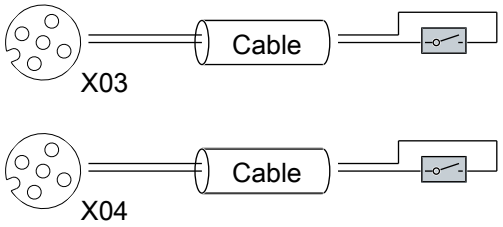
4.2.5.2 Cabling

The X03 and X04 sockets have the same configuration and are bridged 1:1 inside the box. This enables the touch probes to be wired in two ways:

- One common cable (connection to X03 *or* X04)



- One cable per touch probe (connection to X03 *and* X04)



4.2.5.3 Status LEDs

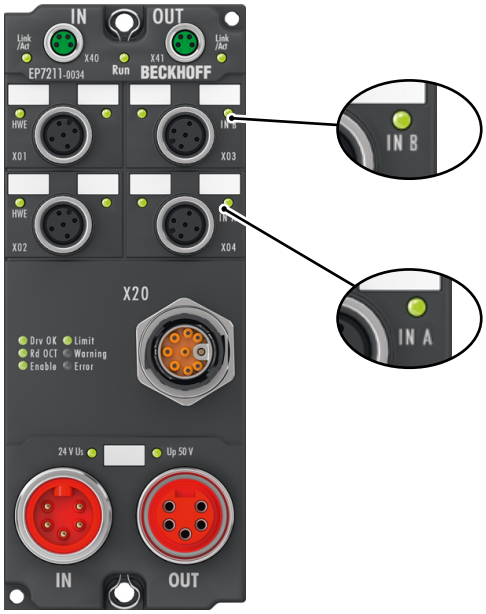


Fig. 17: Touch probe Status LEDs

The green LEDs with the names "IN A" and "IN B" light when a high level is present on the corresponding pins of X03 or X04:

- IN A = TP1
- IN B = TP2

4.3 UL Requirements

The installation of UL-certified EtherCAT Box modules must meet the following requirements.

Supply voltage

⚠ CAUTION

CAUTION!

This UL requirements are valid for all supply voltages of all marked EtherCAT Box Modules!
For the compliance of the UL requirements the EtherCAT Box Modules should only be supplied

- by a 24 V_{DC} supply voltage, supplied by an isolating source and protected by means of a fuse (in accordance with UL248), rated maximum 4 Amp, or
- by a 24 V_{DC} power source, that has to satisfy *NEC class 2*.
  A *NEC class 2* power supply shall not be connected in series or parallel with another (class 2) power source!

⚠ CAUTION

CAUTION!

To meet the UL requirements, the EtherCAT Box Modules must not be connected to unlimited power sources!

Networks

⚠ CAUTION

CAUTION!

To meet the UL requirements, EtherCAT Box Modules must not be connected to telecommunication networks!

Ambient temperature range

⚠ CAUTION

CAUTION!

To meet the UL requirements, EtherCAT Box Modules has to be operated only at an ambient temperature range of -25 °C to +55 °C!

Marking for UL

All EtherCAT Box Modules certified by UL (Underwriters Laboratories) are marked with the following label.

Fig. 18: UL label

⚠ CAUTION

Notes on motion devices

- *Galvanic isolation from the supply*
  The modules are intended for operation within circuits not connected directly to the supply mains (galvanically isolated from the supply, i.e. on transformer secondary).

4.4 Disposal

Products marked with a crossed-out wheeled bin shall not be discarded with the normal waste stream. The device is considered as waste electrical and electronic equipment. The national regulations for the disposal of waste electrical and electronic equipment must be observed.

5 Commissioning

5.1 Activate motor output stage

Activate the motor output stage by applying a high level to the digital input Hardware Enable HWE [▶ 26].

5.2 Integrating into a TwinCAT project

The procedure for integration in a TwinCAT project is described in these Quick start guide.

5.3 Start-up and parameter configuration

5.3.1 Integration into the NC configuration

(Master: TwinCAT 2.11 R3)

Installation of the latest XML device description

Please ensure that you have installed the corresponding latest XML device description in TwinCAT. This can be downloaded from the Beckhoff Website and installed according to the installation instructions.

Integration into the NC can be accomplished as follows:

- The box must already have been added manually under I/O devices or have been scanned in by the system (see section Configuration in TwinCAT).

Adding an axis automatically

- TwinCAT detects the new axes automatically once the IO modules have been successfully scanned. The user is asked whether the detected axes should be added automatically (see Fig. *Axis detected*). If this is confirmed, all axes are automatically liked to the NC.

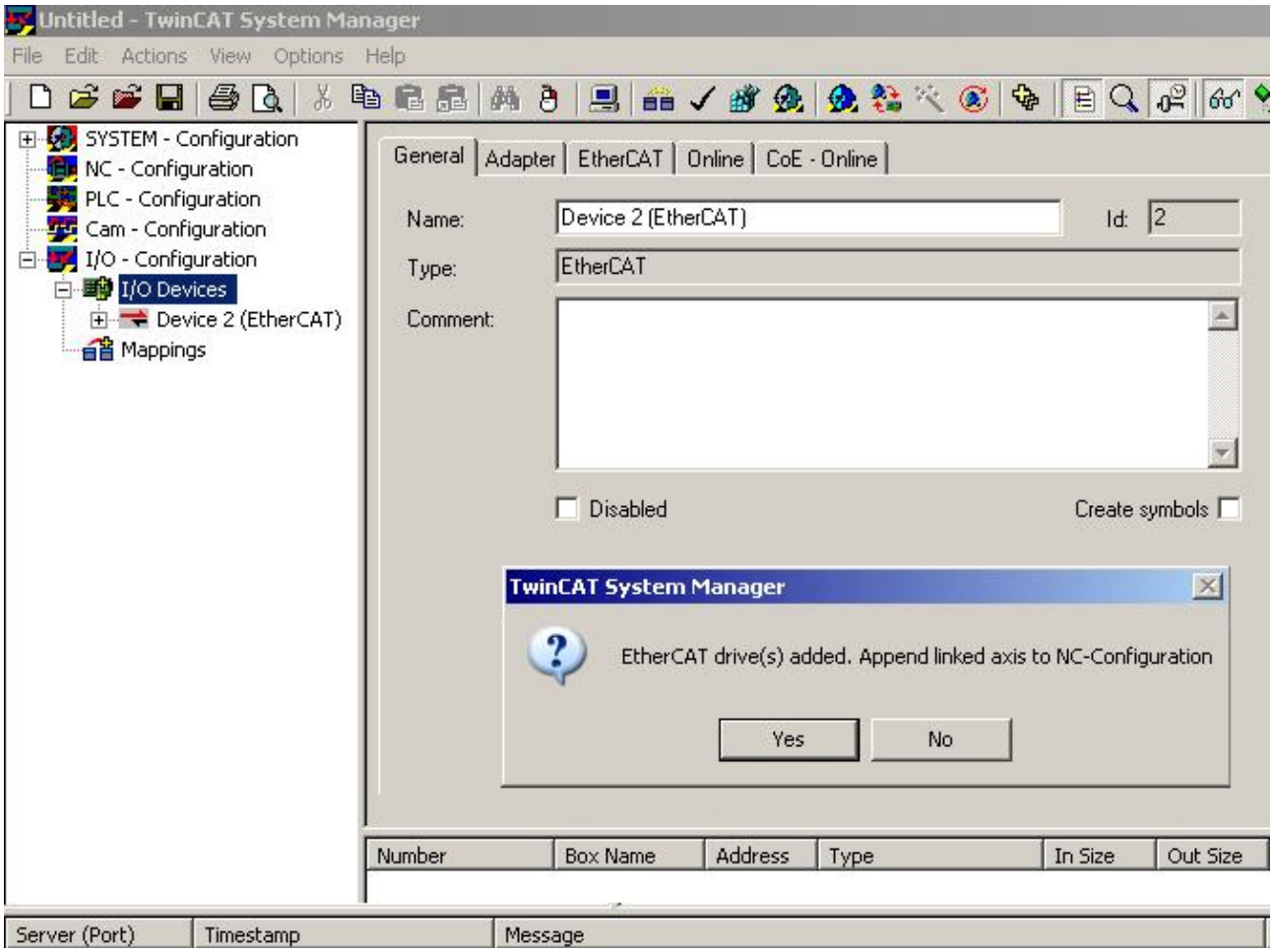


Fig. 19: Axis detected

- Several parameters have to be set before the motor can be started up. The values can be found in the chapter Settings in the CoE register [▶ 42].
  Set these parameters before continuing with the motor commissioning.

Adding an axis manually

- First add a new task. Right-click on NC configuration and select "Append Task..." (see Fig. *Adding a new task*).
- Rename the task if required and confirm with OK.

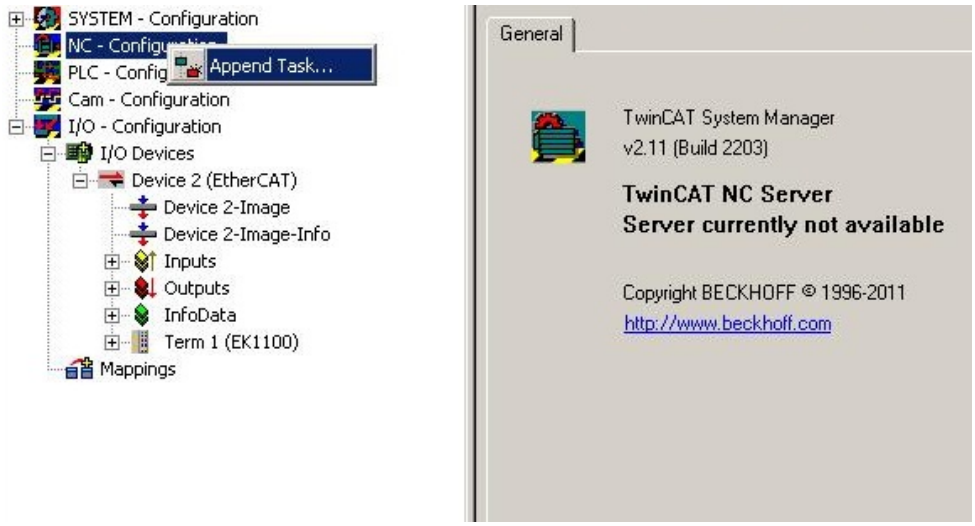


Fig. 20: Adding a new task

- Right-click on *Axes*, then add a new axis (see Fig. *Adding a new axis*).

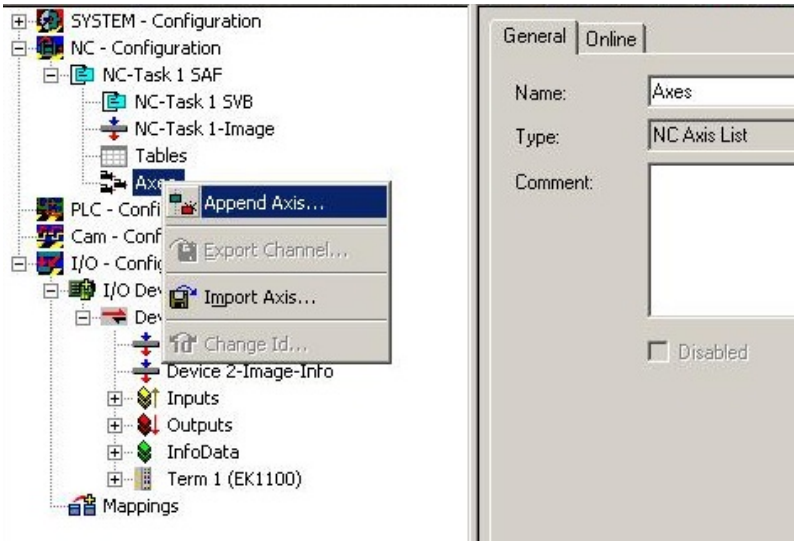


Fig. 21: Adding a new axis

- Select Continuous Axis type and confirm with OK (see Fig. *Selecting and confirming the axis type*).

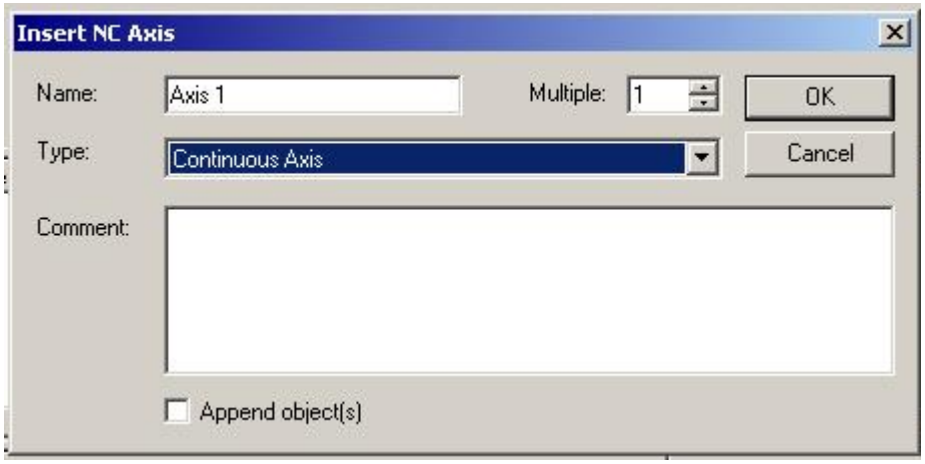


Fig. 22: Selecting and confirming the axis type

- Left-click your axis to select it. On the *Settings* tab, select "Link To..." (see Fig. *Linking the axis with the box*).

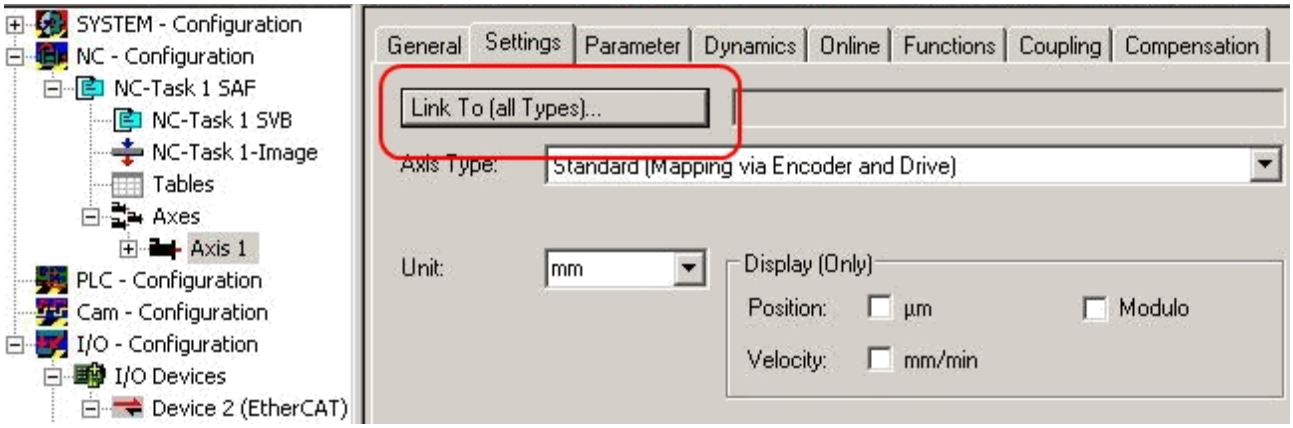


Fig. 23: Linking the axis with the box

- Select the appropriate box (CANopen DS402, EtherCAT CoE) and confirm with "OK".

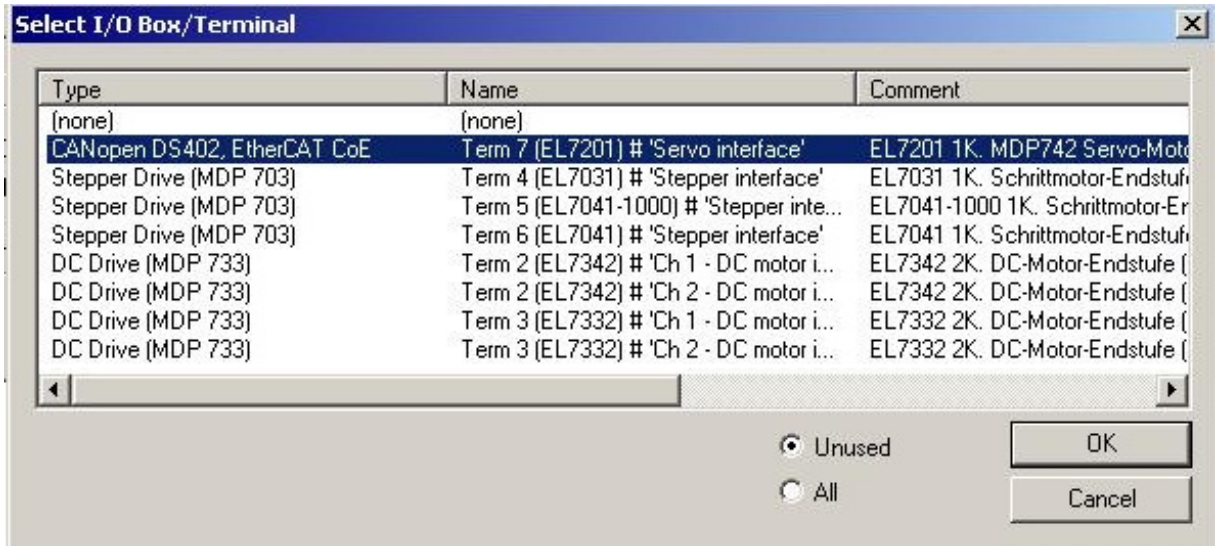


Fig. 24: Selection of the correct box

- All main links between the NC configuration and the box are set automatically (see Fig. *Automatic linking of all main variables*)

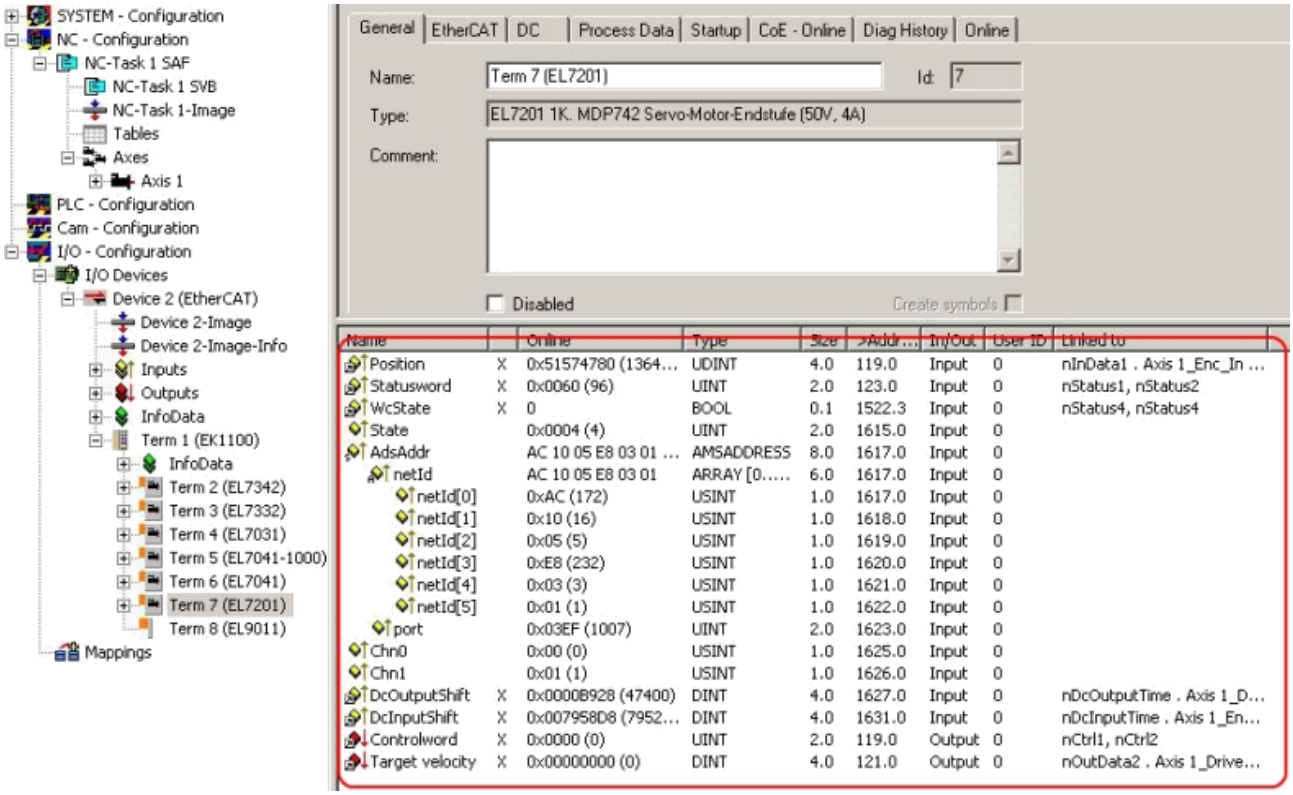


Fig. 25: Automatic linking of all main variables

- Several parameters have to be set before the motor can be started up. The values can be found in the chapters Settings in the CoE register [▶ 42] and NC settings [▶ 45].
  Set these parameters before continuing with the motor commissioning.

5.3.2 Settings with the Drive Manager

(Master TwinCAT 2.11 R3)

The data given here serve as an example for a servomotor type AM8131-0F20-0000 from Beckhoff Automation. For other motors the values may vary, depending on the application.

Table of contents

The TwinCAT Drive Manager is available for download in the AX5000 download package.

The TwinCAT Drive Manager for parameterizing an EL7211 is integrated in the System Manager, so that no separate configuration tool is required. Once an EP7211 has been detected or entered, the TwinCAT Drive Manager is available on the "Configuration" tab.

The following points are intended to enable you to start up the EP7211 quickly. More detailed information on the Drive Manager can be found in the corresponding documentation "AX5000 Introduction in the TCDrivemanager"

Start-up with the Drive Manager

- The box must already have been added manually under I/O devices or have been scanned in by the system (see chapter Configuration in TwinCAT)
- The box must already have been integrated in the NC (see chapter Integration into the NC configuration [▶ 33])
- Select the *Drive Manager* tab of the EP7211.
- Select the connected voltage under *Power Management*.

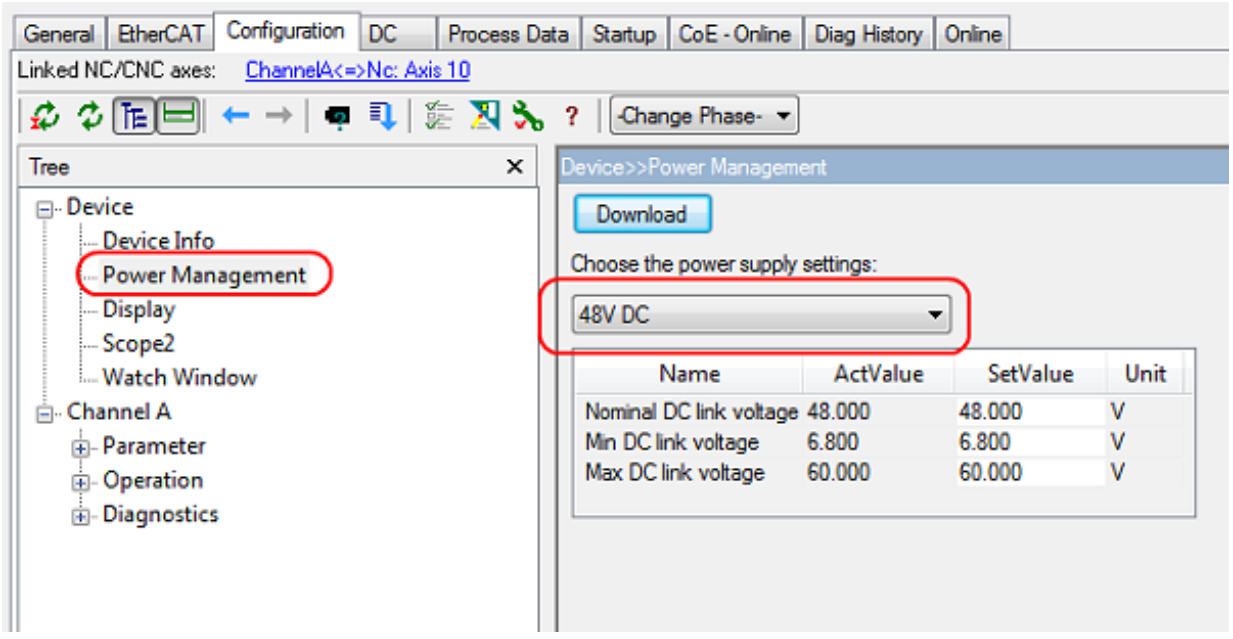


Fig. 26: Selecting the connected voltage

- You can subsequently scan or select the connected motor under *Channel A* > *Configuration* > *Motor and Feedback*. If you decide to use automatic scanning, click on *Scan motor and feedback*. The electronic identification plate of the AM81xx-x2xx motor will then be read automatically. To do this it is necessary for automatic scanning of the motor to be activated in the box (Index 0x8008 [▶ 89], MDP or Index 0x2018 [▶ 120], DS402)

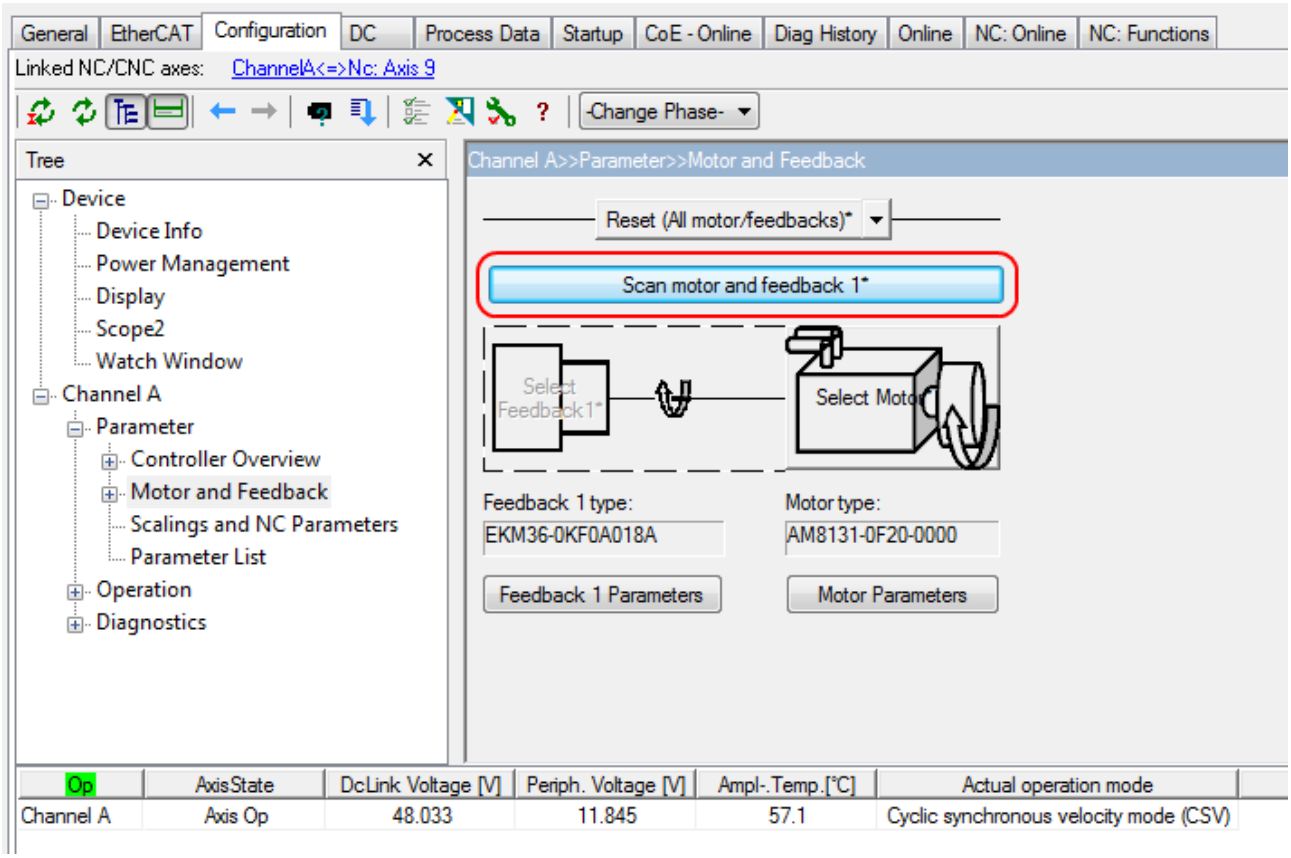


Fig. 27: Automatic scanning of the connected motor

- If you decide to manually input the connected motor, please click on *Select Motor*.

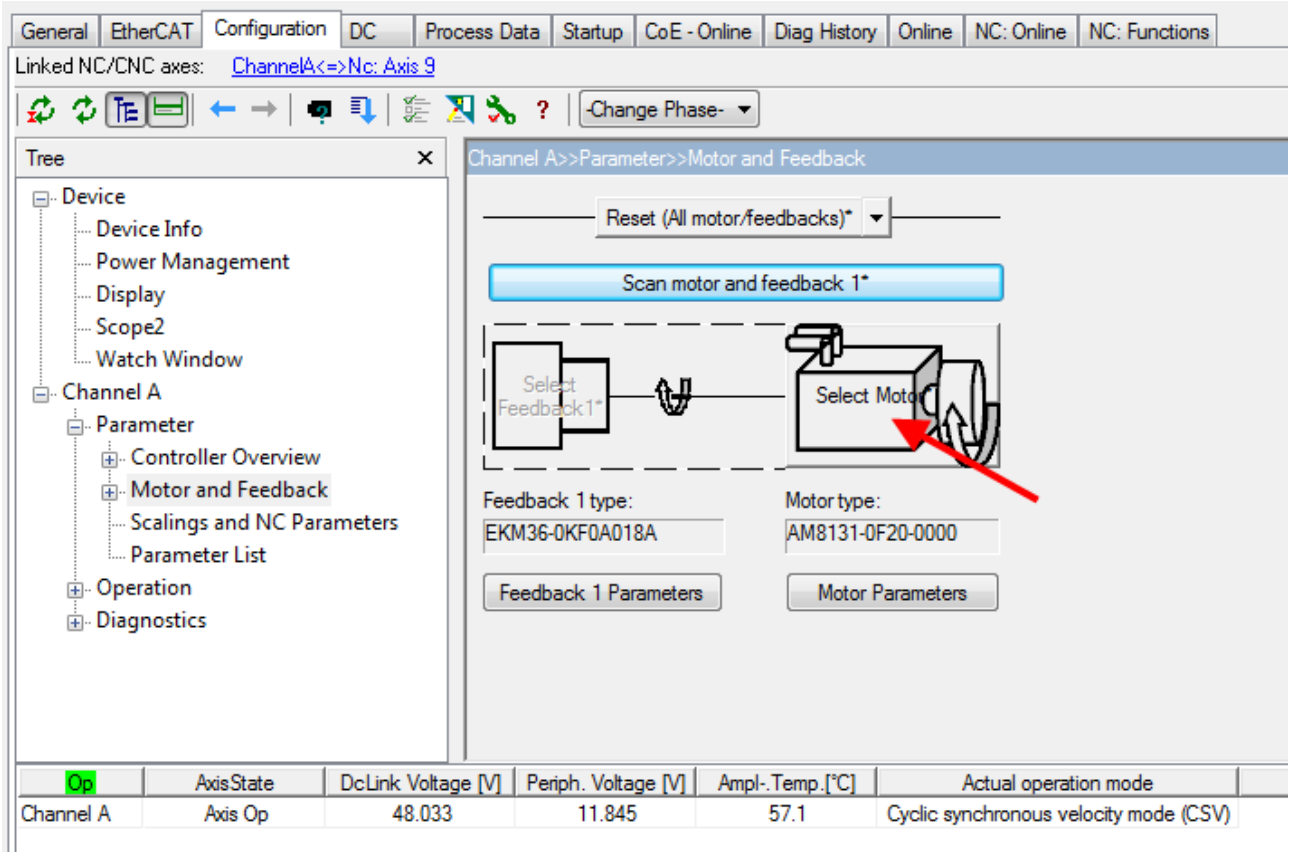


Fig. 28: Selecting the connected motor

- Select the suitable motor in the selection window and confirm with *Ok*.

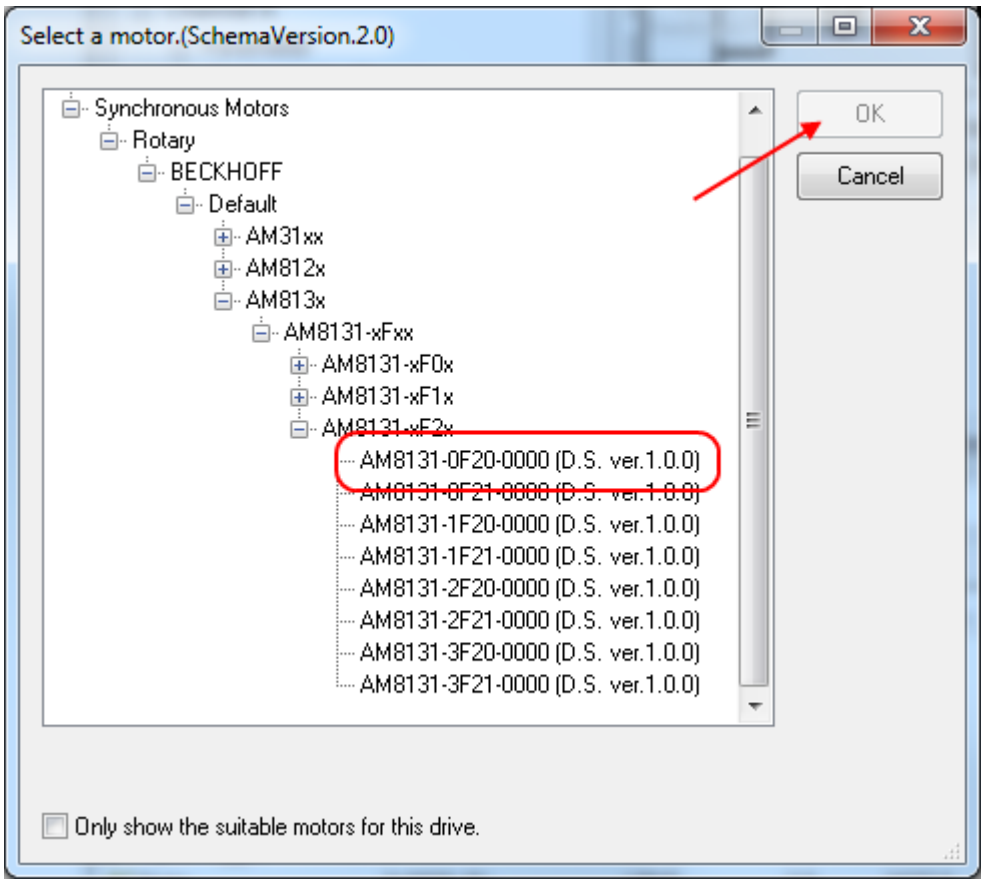


Fig. 29: List of available motors

- Confirm the next dialog box with OK. All required parameters are automatically entered in the NC, and the scaling factor is calculated. If this is not confirmed, these settings have to be entered manually. See section NC settings [▶ 45].

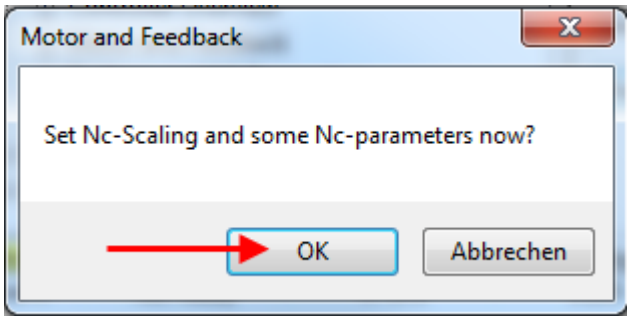


Fig. 30: Confirmation of the automatic NC settings parameters

- The scaling can be determined under *Scalings and NC Parameters*. A motor revolution is defined as 360° as an example. All required parameters are adjusted automatically. The setting only becomes active once the configuration is activated.

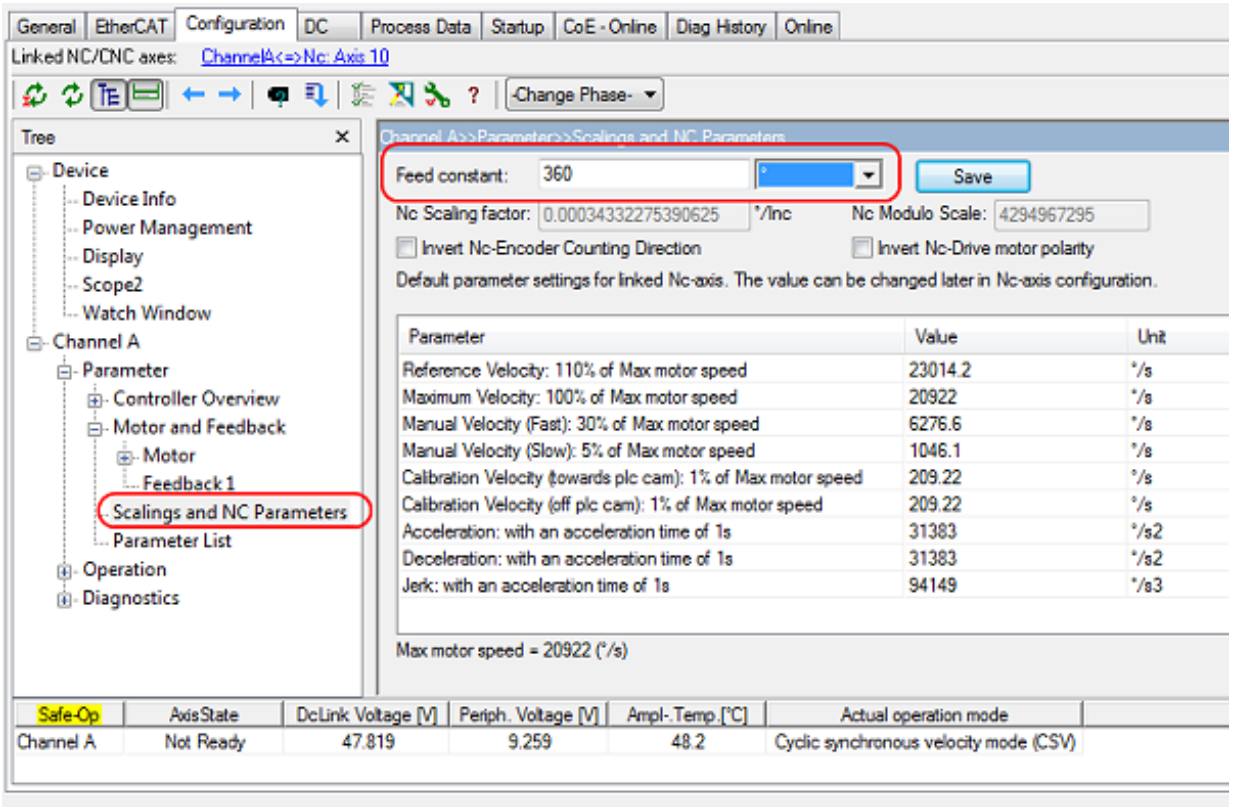


Fig. 31: Adapting the scaling

All main parameters for the commissioning the motor are now set. The motor can now be commissioned with the NC, for example. A brief description can be found in section "Commissioning the motor with the NC". Or the NC can be addressed from the PLC. A sample program has been added in the documentation for this also.
Some parameters can be adjusted manually for your particular application.

Setting further parameters with the Drive Manager

The values specified here are exemplary, although in most cases they have led to excellent results. Depending on the application, other values may yield better results.
These values can be changed during operation. Click on *Download* to apply the values.

Integral velocity controller component Tn

- Reduce the value, until the motor starts to oscillate slightly. Then increase the value by 10%.

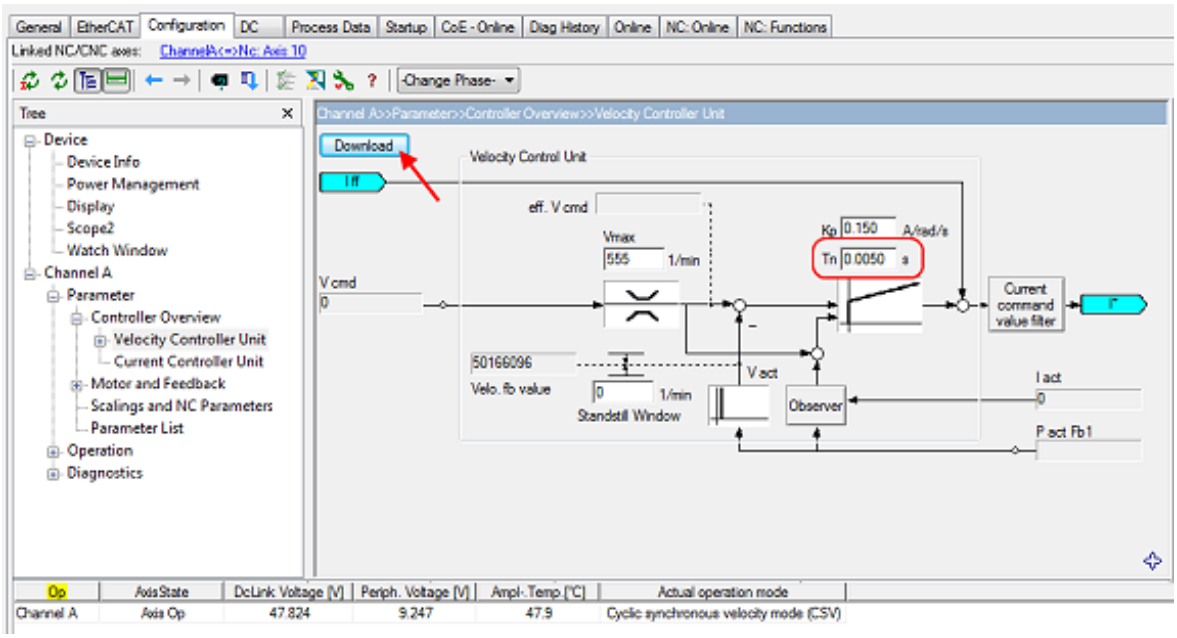


Fig. 32: Adapting Tn

Proportional velocity controller component Kp

- Increase the value, until the motor starts to oscillate slightly. Then reduce the value to 80%.

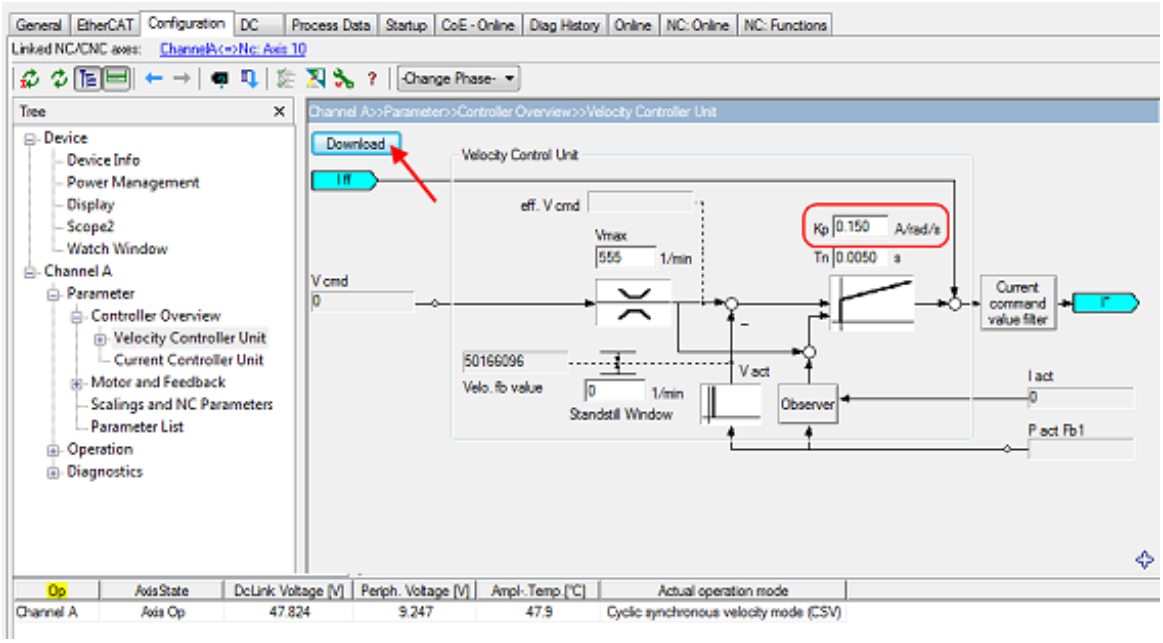


Fig. 33: Adapting Kp

5.3.3 Settings in the CoE register

(Master TwinCAT 2.11 R3)

The data given here serve as an example for a servomotor type AM8131-0F20-0001 from Beckhoff Automation. For other motors the values may vary, depending on the application.

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Inserting the motor XML file

Downloading the motor XML files

The motor XML files are available for download from the Beckhoff website.

To facilitate commissioning of the EP7211, motor XML files have been created for the servomotors that are supported by the EP7211. The XML files can be read in the System Manager.
All CoE parameters and DS402 parameters are then set as required.

- To read the motor XML file, select the EP7211 and open the *Startup* tab. Right-click in the empty field and select *Import from XML*...(see Fig. *Importing the motor XML file*).

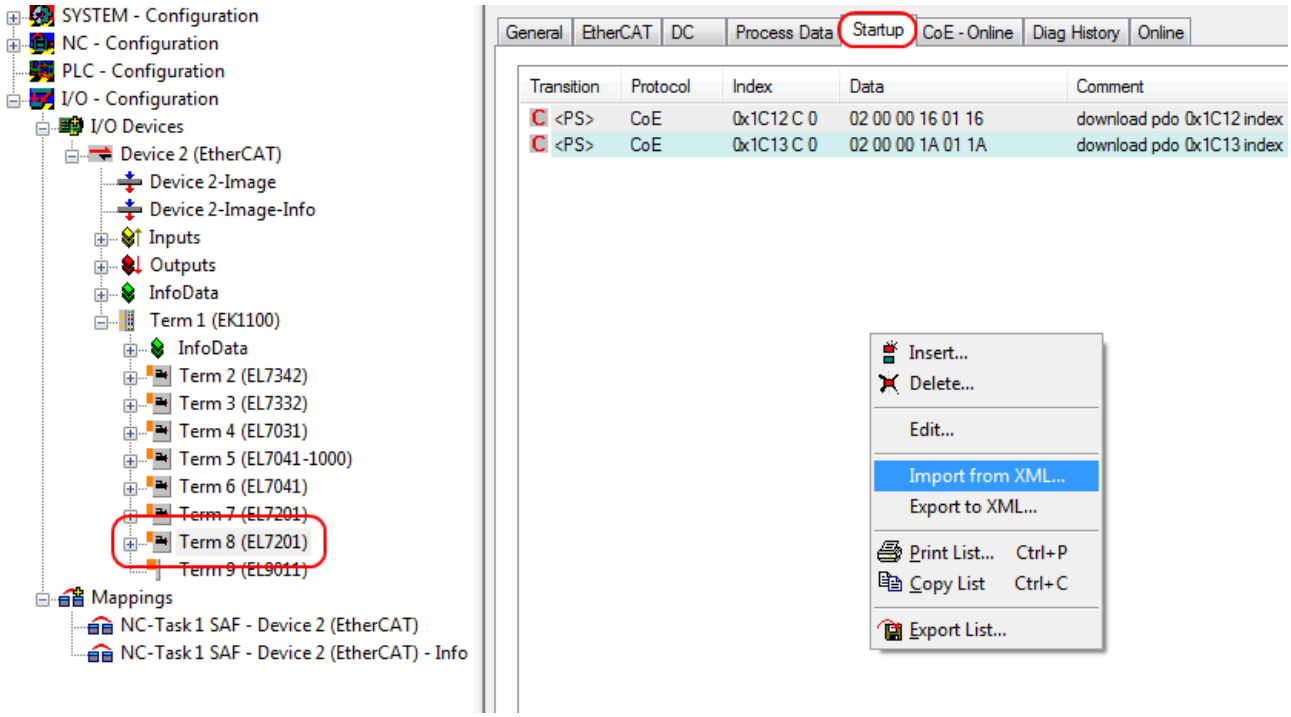

Fig. 34: Importing the motor XML file

- Select the motor XML file that matches the connected motor (see Fig. *Selecting the correct motor XML file*)

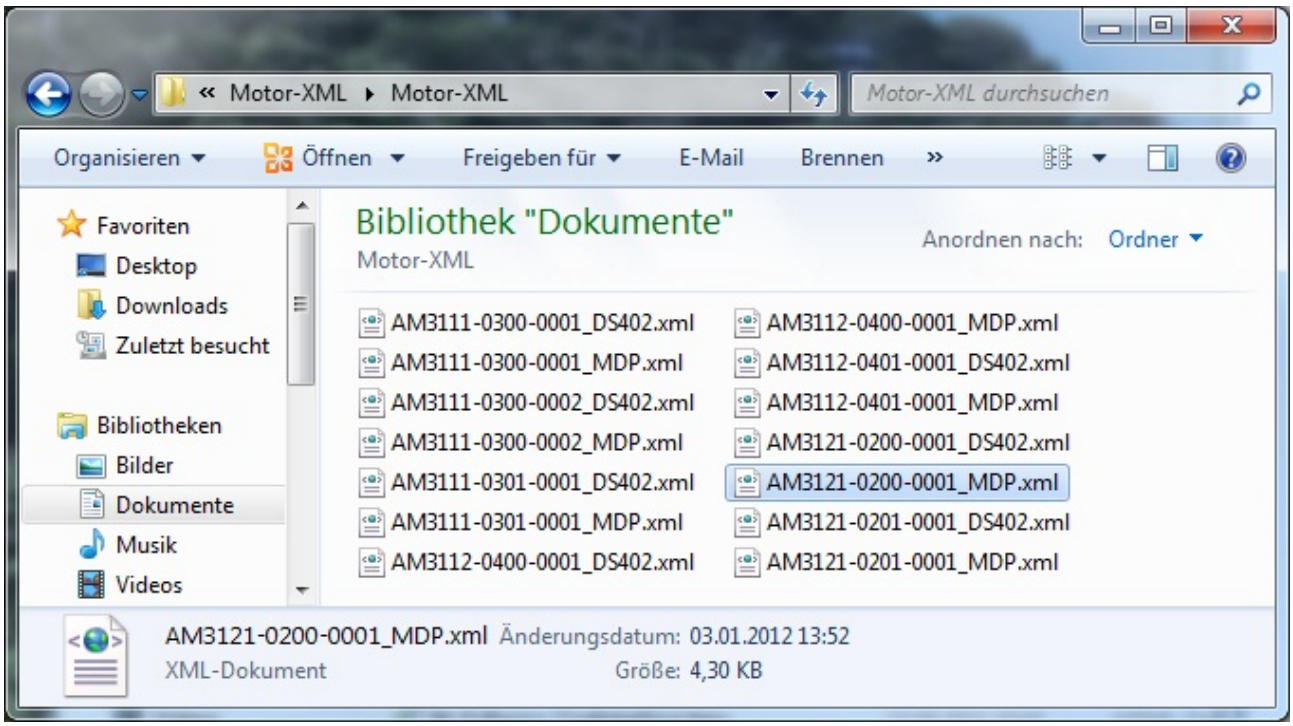

Fig. 35: Selecting the correct motor XML file

- All required parameters are then set, and the motor can be put into operation (see Fig. *CoE parameters of the motor XML file*).

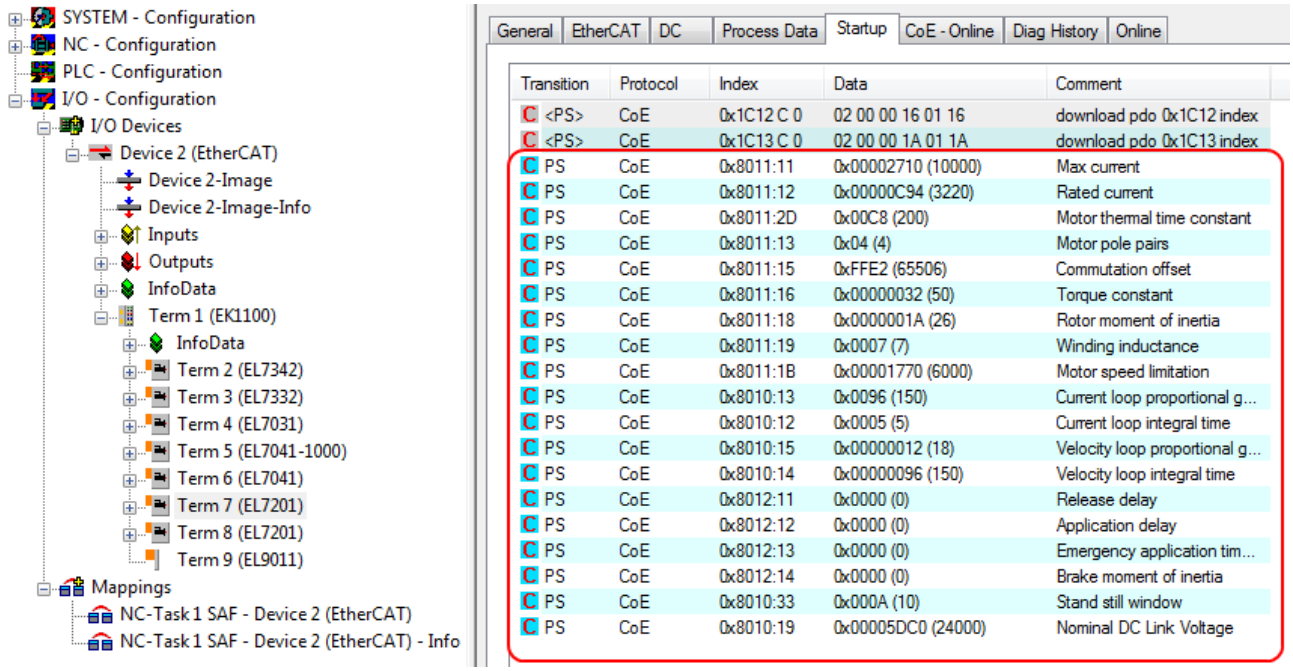

Fig. 36: CoE parameters of the motor XML file

Startup list

Any further application-specific settings should also be implemented in the Startup list. Otherwise the modified settings will be overwritten next time the box starts up.

Adaptation of current and voltage

NOTE

The motor may overheat!

In order to prevent overheating of the connected motor, it is important to adjust the output voltage of the box to the actually connected voltage.

This requires the index 0x8010:19 [▶ 90] (0x2002:19 [▶ 115], DS402 profile) "Nominal DC Link Voltage" of the connected voltage to be set accordingly

Setting further parameters

Single-turn bits (MDP742: Index 0x8000:12 [▶ 89] / DS402: Index 0x2010:12 [▶ 120]) / Multi-turn bits (MDP742: Index 0x8000:13 [▶ 89] / DS402: Index 0x2010:13 [▶ 120])

Here the user can specify how many single-turn and multi-turn bits the box should display. A total of 32 bits are available. These 32 bits can be subdivided as required.
The standard setting is 20 single-turn bits and 12 multi-turn bits.

Single-turn bits: number of bits relating to the resolution of one rotor rotation.

Multiturn bits: after a rotor rotation the multi-turn bits are incremented by one.

The motor may overheat!

If the number of single-turn bits is changed, the scaling factor [▶ 47] in the NC has to be adjusted.

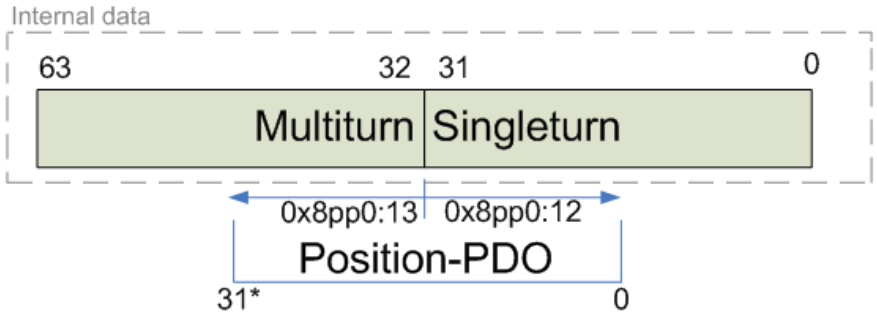

Fig. 37: Multi-turn / single-turn bits

Torque limitation (MDP742: Index 0x7010:0B [▶ 100] / DS402: Index 0x6072:0 [▶ 123])

Limits the current / torque to this value. The value is specified in 1000th of the rated current.

Integral velocity controller component Tn (MDP742: Index 0x8010:14 [▶ 90] / DS402: Index 0x2002:14 [▶ 115])

The values specified here are exemplary, although in most cases they have led to excellent results. Depending on the application, other values may yield better results.

- Reduce the value, until the motor starts to oscillate slightly. Then increase the value by 10%.

Proportional velocity controller component Kp (MDP742: Index 0x8010:15 [▶ 90] / DS402: Index 0x2002:15 [▶ 115])

The values specified here are exemplary, although in most cases they have led to excellent results. Depending on the application, other values may yield better results.

- Increase the value, until the motor starts to oscillate slightly. Then reduce the value to 80%.

5.3.4 NC settings

(Master TwinCAT 2.11 R3)

The data given here serve as an example for a servomotor type AM8122-0F20-0000 from Beckhoff Automation. For other motors the values may vary, depending on the application.

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Several important parameters are required for the commissioning with the NC. These should be set as follows before commissioning. A fundamental factor for setting the following parameters is the unit in which the NC is set to operate. For the following parameters it was assumed that one revolution corresponds to 360°.

Definition of the unit

The unit can be defined in the *Settings* tab for the axis.

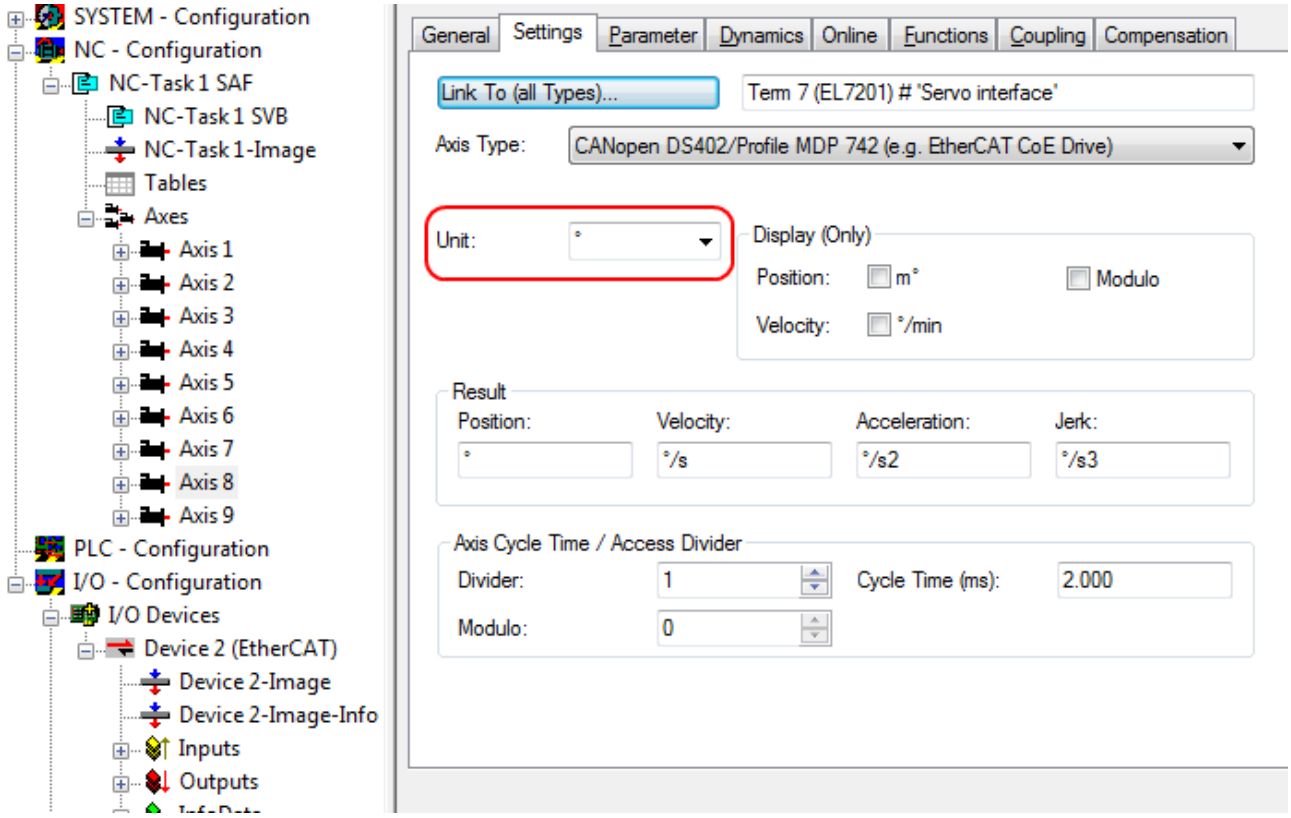

Fig. 38: Definition of the unit

Selecting the maximum velocity

The *maximum permitted velocity* is calculated based on the maximum motor speed (name plate) and the distance, in this case in relation to 360° per second.

$$v_{Bez} = \frac{v_{maxMotor} \times 360°}{60\ s} = \frac{2000\ {}^{1}/_{min} \times 360°}{60\ s} = 12000\ {}^{°}/_{s}$$

$$v_{max} = \frac{v_{maxMotor} \times 360°}{60\ s} = \frac{2000\ {}^{1}/_{min} \times 360°}{60\ s} = 12000\ {}^{°}/_{s}$$

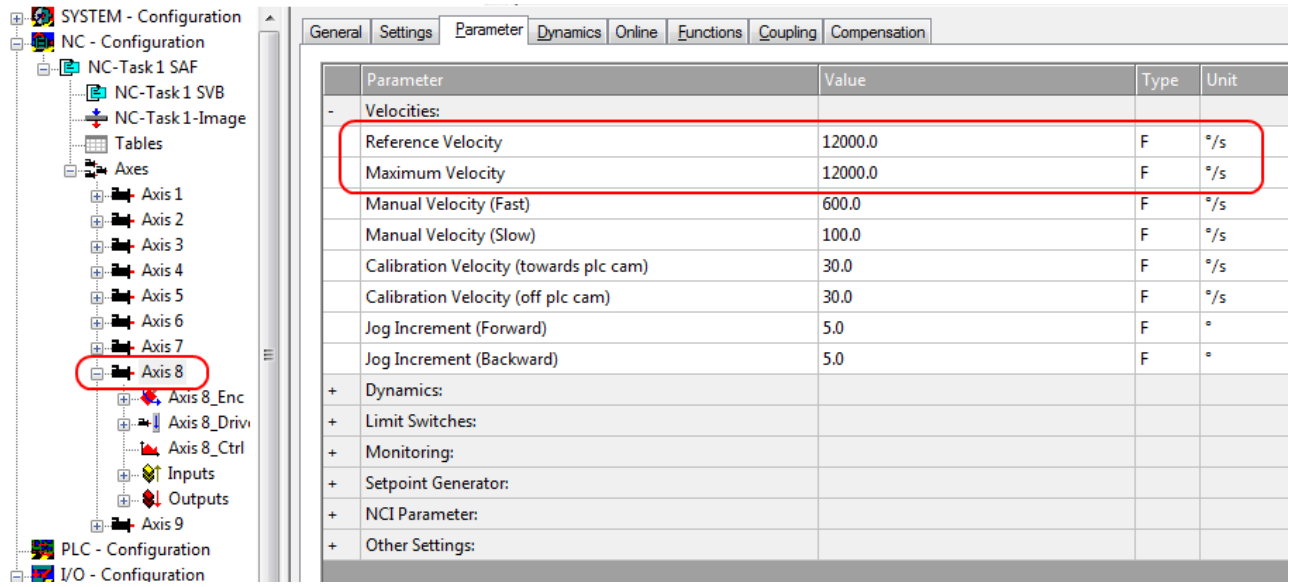

Fig. 39: Adjusting the reference velocity

The *reference velocity* matches the *maximum permitted velocity*.
Below that separate values for the maximum and minimum velocity for manual NC mode can be set.

Dead time compensation

The dead time compensation can be adjusted on the *Time Compensation* tab of *Axis1_ENC*.
It should theoretically be 3 cycles of the NC cycle time, although in practice 4 cycles are preferable.
Therefore, the settings of the parameters *Time Compensation Mode Encoder* should be ‚ON (with velocity)‘ and *Encoder Delay in Cycles* ‘4’.

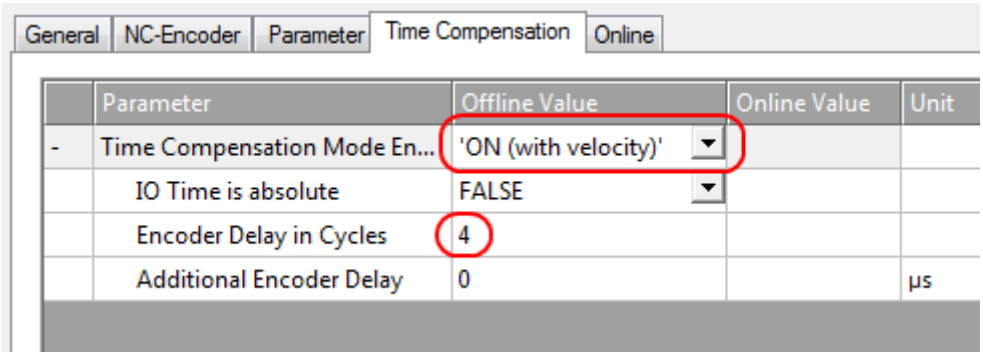

Fig. 40: Dead time compensation parameter

Setting the encoder mask

The maximum values for the encoder mask can be set in the *Parameter* tab for the *Axis1_ENC* encoder settings. EP7211 provides a maximum of 32 bits for the encoder.
The parameter Encoder Mask (maximum encoder value) can be used to set the maximum number of available bits. By default this is set to 0xFFFF FFFF, which corresponds to 32 bits (20 single-turn bits and 12 multi-turn bits). The calculation is based on the following equation.

$$GM_{max} = 2^{SingleturnBits+MultiturnBits} - 1 = 2^{20+12} - 1 = 4\,294\,967\,295 => 0x\ FFFF\ FFFF$$

The parameter Encoder Sub Mask (absolute range maximum value) indicates how many bits of the maximum encoder value are single-turn bits. The default setting is 20 (and therefore 12 multi-turn bits). The calculation is based on the following equation.

$$GM_{ST} = 2^{Singleturn\ Bits} - 1 = 2^{20} - 1 = 1\,048\,575 => 0x\ 000F\ FFFF$$

Further calculation example with 13 single-turn bits and 8 multi-turn bits.

$$GM_{max} = 2^{Singleturn\ Bits+Multiturn\ Bits} - 1 = 2^{13+8} - 1 = 2\,097\,151 => 0x\ 001F\ FFFF$$

$$GM_{ST} = 2^{Singleturn\ Bits} - 1 = 2^{13} - 1 = 8\,191 => 0x\ 0000\ 1FFF$$

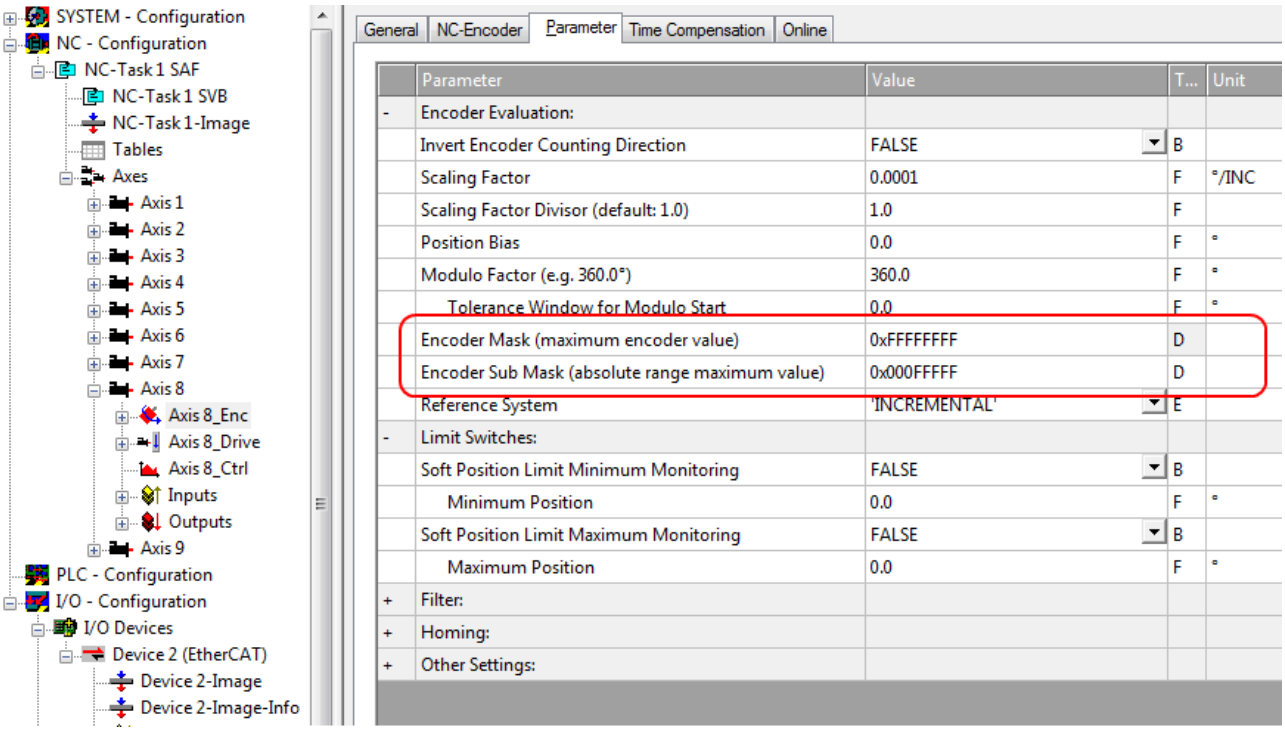

Fig. 41: Setting the encoder mask

Scaling factor

The scaling factor can be changed by selecting "*Axis 1_Enc*" and tab *Parameter* in the NC (see *Setting the Scaling Factor*). The value can be calculated with the formulas specified below. The calculation is based on the assumption that one revolution corresponds to 360°.
The number of single-turn bits is taken into account in the calculation of the scaling factor. As indicated above, the default setting for EP7211 is 20 single-turn bits. This value is also used for calculating the scaling factor. If the single-turn bit value is changed, the scaling factor must be adjusted.

Calculation of the scaling factor

$$SF = \frac{distance\ per\ round}{2^{Singleturn\ Bits}} = \frac{360^{\circ}}{2^{20}} = 0{,}000343322753906\ {}^{\circ}/_{INC}$$

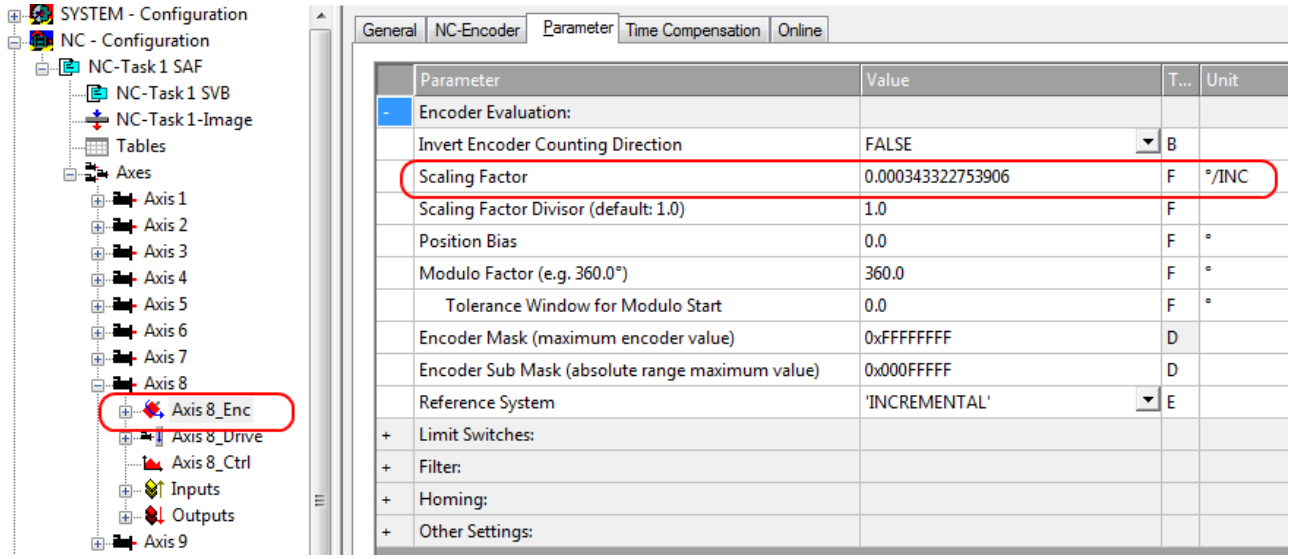

Fig. 42: Setting the Scaling Factor

Scaling output

Enter the value 32 in the *Parameter* tab for the drive settings under *Output Scaling (Velocity)*.

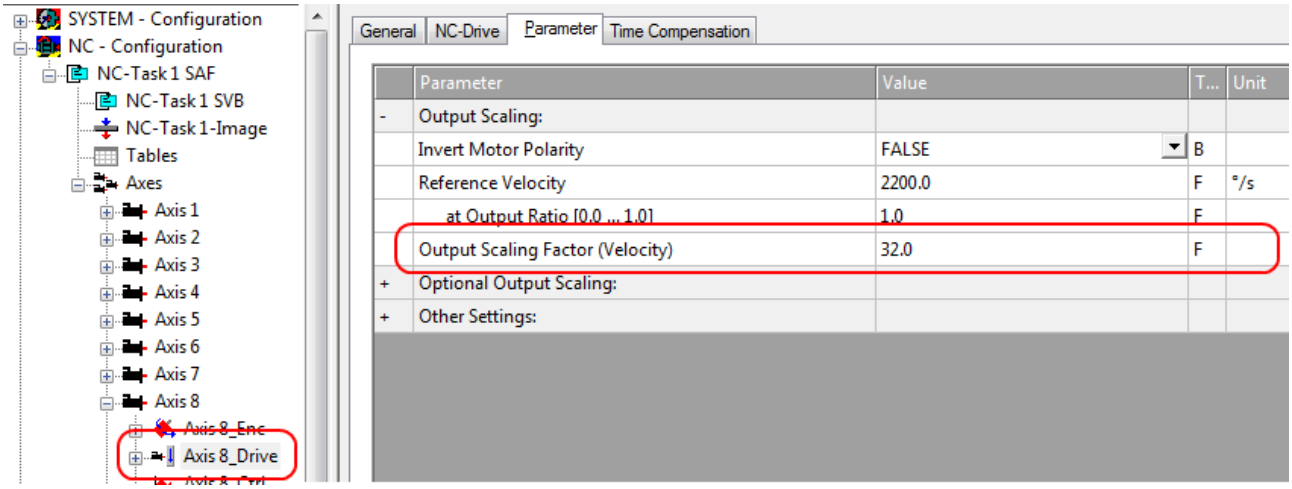

Fig. 43: Output scaling

Position lag monitoring

The position lag monitoring function checks whether the current position lag of an axis has exceeded the limit value. The position lag is the difference between the set value (control value) and the actual value reported back. If the box parameters are set inadequately, the position lag monitoring function may report an error when the axis is moved. During commissioning it may therefore be advisable to increase the limits of the *Position lag monitoring* slightly.

NOTE

Damage to equipment, machines and peripheral components possible!

Setting the position lag monitoring parameters too high may result in damage to equipment, machines and peripheral components.

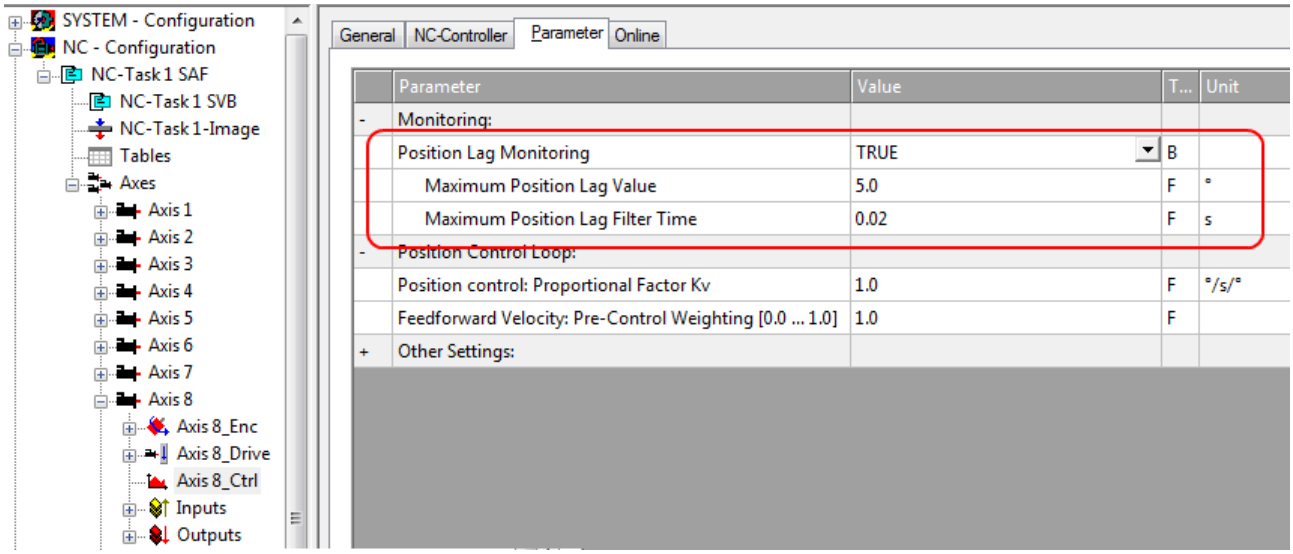

Fig. 44: Lag monitoring

Commissioning the motor with the NC

- Once the parameters are set, the motor is basically ready for operation. Individual further parameters have to be adapted to the respective application.
- To commission the axis, activate the configuration (Ctrl+Shift+F4), select the axis, select tab *Online* and enable the axis under Set.
- Set all tick marks and set *Override* to 100% (see Fig. *Enabling an axis*). The axis can then be moved.

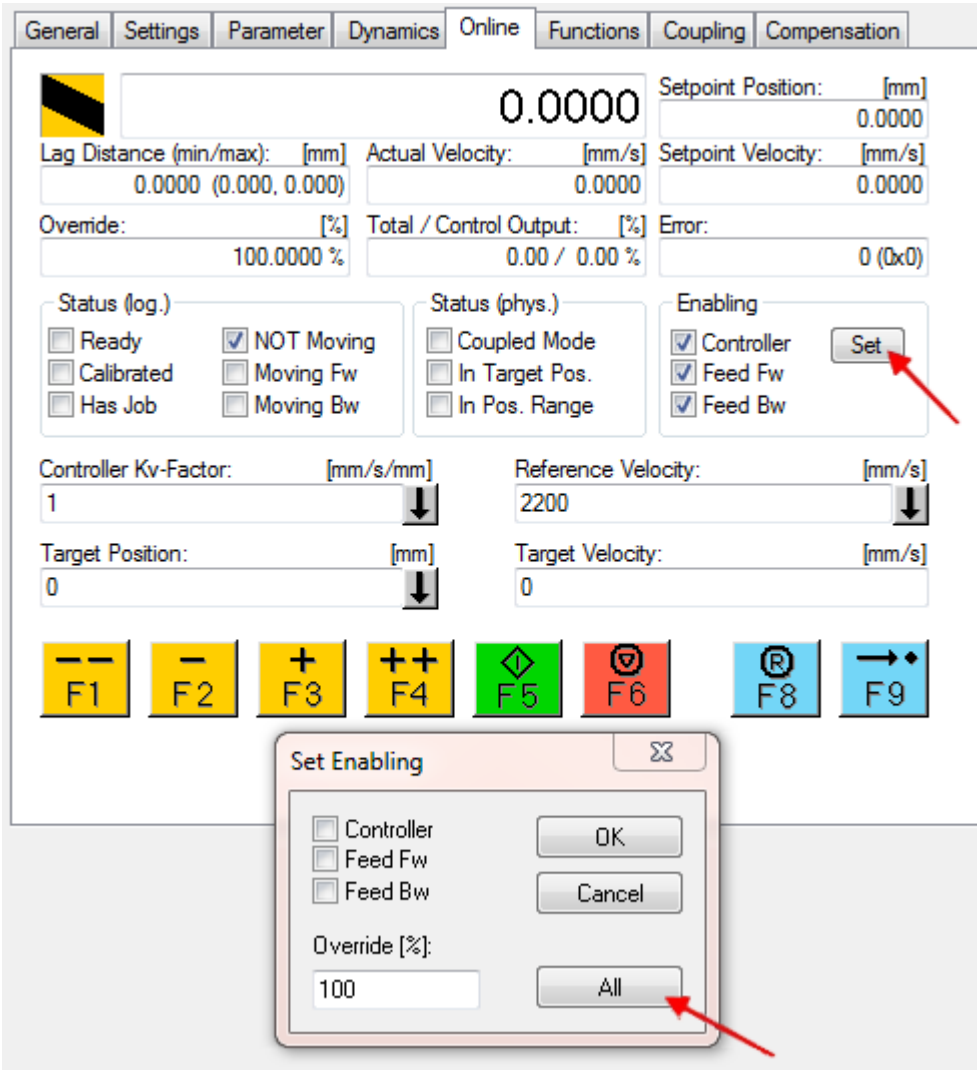

Fig. 45: Enabling an axis

You can now move the axis with the function keys F1, F2 (Backward) or F3, F4 (Forward).
You can adjust the Kv factor in order to approach a suitable factor. Set the value to 0 initially in order to set the correct reference velocity. For calculating the reference velocity please refer to section "Selecting the maximum velocity [▶ 45]". The calculation provides a relatively precise value, although the value may have to be corrected slightly. To this end move the motor with a Kv factor of 0 until the actual velocity matches the setpoint velocity.

Alternatively you can control the axis via the *Functions* tab. An example is provided below.

- Select as *Reversing Sequence* as the start type.
- Enter the required *Target Position2*, e.g. 12000°.
- Enter the required Target Velocity, e.g. 12000°/s.
- Enter the required Target Position1, e.g. 0°.
- Enter the required *Idle Time*, e.g. 2 s.
- Select Start.

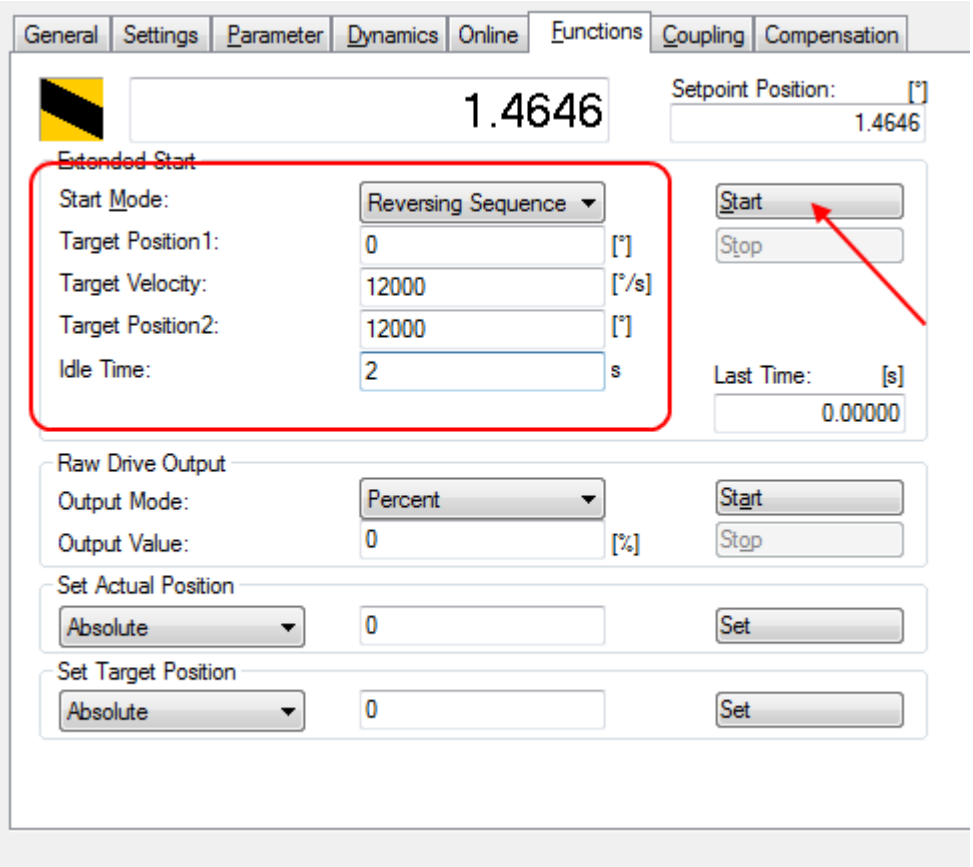

Fig. 46: Reversing Sequence

The motor now turns to position 2, remains there for 2 seconds and returns to position 1. This is repeated until Stop is pressed.

5.3.5 Commissioning without NC, status word/control word

(Master: TwinCAT 2.11 R3)

In principle, the operating modes CST, CSTCA, CSV and CSP can be used without TwinCAT NC.

Output stage enabled via control word

The output stage has to be enabled for each operation mode. To this end enter the following values in the specified order via the PLC control word (MDP742 [▶ 100] / DS402 [▶ 121]) (see Fig. *DS402 State Machine*). The respective status messages are output in the status word (MDP742 [▶ 97] / DS402 [▶ 122]).

0_{hex}
80_{hex} (Fault reset)
6_{hex} (Shutdown)
7_{hex} (Switch on)
F_{hex} (Enable operation)

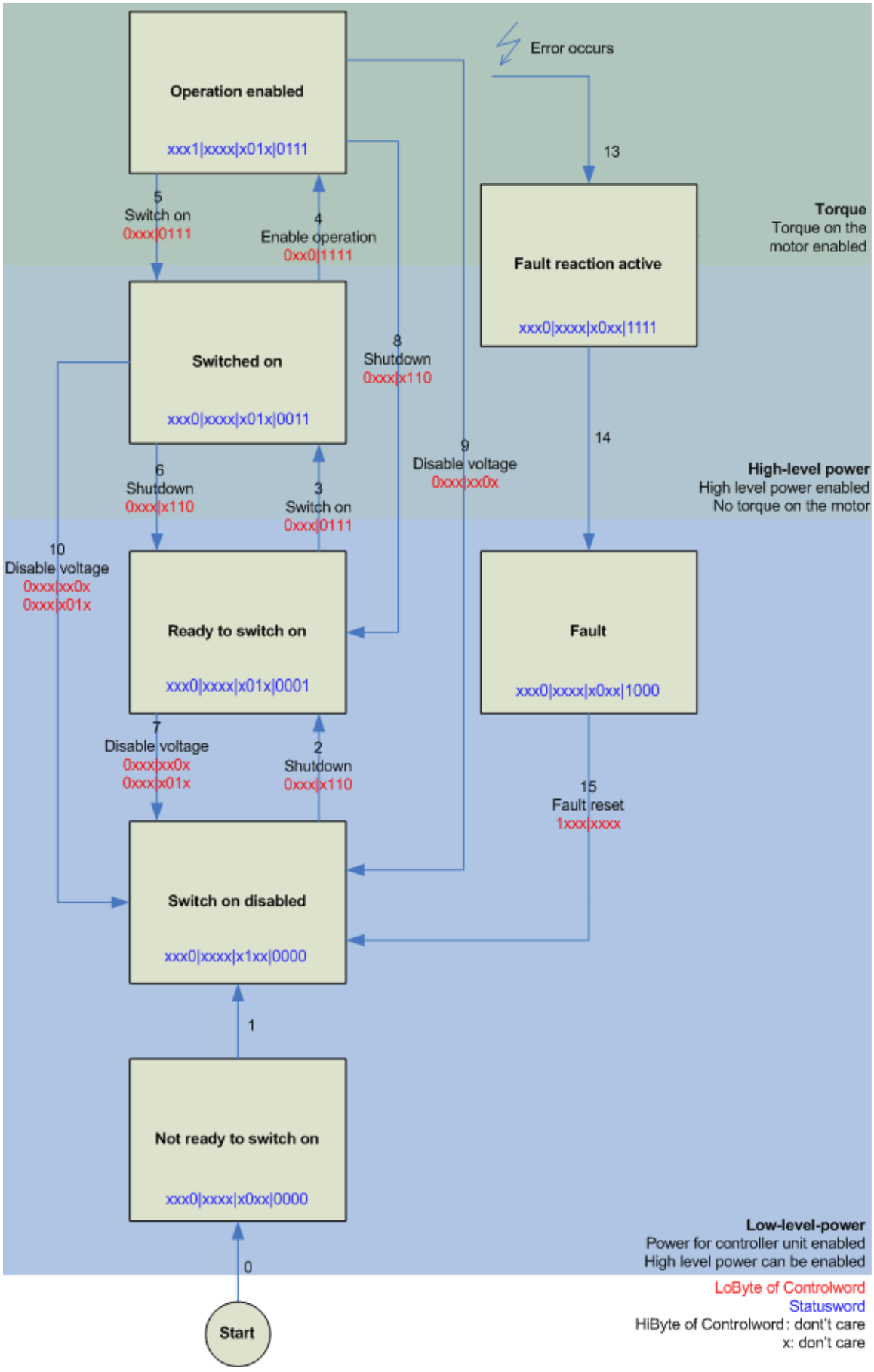

Fig. 47: DS402 State Machine

CST - cyclic synchronous torque

Select *Cyclic synchronous torque mode* in index 0x7010:03 [▶ 100] *Modes of operation* (MDP) or 0x6060:0 [▶ 122] *Modes of operation* (DS402). In the respective process data, the *Predefined PDO Assignment: 'Cyclic synchronous torque mode (CST)'* should also be selected (see Process data MDP 742 [▶ 80] or DS402 process data [▶ 84]). The configuration then has to be reloaded in order to activate the selection.
Index 0x6010:03 [▶ 97] *Modes of operation display* (MDP) or index 0x6061:0 [▶ 122] *Modes of operation display* (DS402) can be used to check the actual mode of the box.

Via the PLC a defined torque can be defined in the variable *Target torque* as a basis for the box control. The torque is specified in 1000th of the rated current. A value of 1000_{dec}, for example, corresponds to the set index 0x8011:12 [▶ 93] *Rated current* (MDP) or index 0x6075:0 [▶ 123] *Motor rated current* (DS402). The value 1_{dec} corresponds to one 1000th of the rated current.

CSTCA - cyclic synchronous torque with commutation angle

Select *Cyclic synchronous torque mode with commutation angle* in index 0x7010:03 [▶ 100] *Modes of operation (MDP)* or index 0x6060:0 [▶ 122] Modes of operation (DS402). In the respective process data, the *Predefined PDO Assignment: 'Cyclic synchronous torque mode with commutation angle mode (CSTCA)'* should also be selected (see Process data MDP 742 [▶ 80] or DS402 process data [▶ 84]). The configuration then has to be reloaded in order to activate the selection.
Index 0x6010:03 [▶ 97] *Modes of operation display* (MDP) or index 0x6061:0 [▶ 122] *Modes of operation display* (DS402) can be used to check the actual mode of the box.

Via the PLC a defined torque can be set in the *Target torque* variable as a basis for the box control and the angle to be maintained with the set torque can be specified in the *Commutation angle* variable. The torque is specified in 1000th of the rated current. A value of 1000_{dec}, for example, corresponds to the set index 0x8011:12 [▶ 93] *Rated current* (MDP) or index 0x6075:0 [▶ 123] *Motor rated current* (DS402). The value 1_{dec} corresponds to one 1000th of the rated current.
The angle value must be converted, 65536_{dec} corresponds to 360°.

CSV - cyclic synchronous velocity

Select *Cyclic synchronous velocity* in index 0x7010:03 [▶ 100] *Modes of operation* (MDP) or index 0x6060:0 [▶ 122] *Modes of operation* (DS402). In the respective process data, the *Predefined PDO Assignment: 'Cyclic synchronous velocity mode (CSV)'* should also be selected (see Process data MDP 742 [▶ 80] or DS402 process data [▶ 84]). The configuration then has to be reloaded in order to activate the selection.
Index 0x6010:03 [▶ 97] *Modes of operation display* (MDP) or index 0x6061:0 [▶ 122] *Modes of operation display* (DS402) can be used to check the actual mode of the box.

Via the PLC a defined speed can be set in the variable *Target velocity* 0x7010:06 [▶ 100] (MDP) or 0x60FF:0 [▶ 125] (DS402) as a basis for the box control. The constant value *Velocity encoder resolution* in CoE object 0x9010:14 [▶ 104] (MDP) or 0x6090:0 [▶ 124] (DS402) corresponds to 1 revolution per second. If this value is entered under *Target velocity*, the motor speed is 1 rpm. The velocity can be increased by entering a suitable multiple of the *Velocity encoder resolution* value under *Target velocity*.

CSP - cyclic synchronous position

Select *Cyclic synchronous position* in index 0x7010:03 [▶ 100] *Modes of operation* (MDP) or index 0x6060:0 [▶ 122] *Modes of operation* (DS402).
In the respective process data, the *Predefined PDO Assignment: 'Cyclic synchronous position mode (CSP)'* should also be selected (see Process data MDP 742 [▶ 80] or DS402 process data [▶ 84]). The configuration then has to be reloaded in order to activate the selection.
Index 0x6010:03 [▶ 97] *Modes of operation display* (MDP) or index 0x6061:0 [▶ 122] *Modes of operation display* (DS402) can be used to check the actual mode of the box.

Via the PLC a defined position can be set in the variable *Target position* 0x7010:05 [▶ 100] (MDP) or 0x607A:0 [▶ 124] (DS402) to which the motor is to drive. The calculated scaling factor is taken as the basis for the calculation of the position. The value entered in the *Target position* variable must be multiplied by the calculated scaling factor.

5.3.6 Settings for the automatic configuration

(Master TwinCAT 2.11 R3)

The EP7211 offers the option of automatically configuring the connected motor from the AM81xx series. The electronic identification plate integrated in the motor is read and the necessary parameters of the box are adapted accordingly.

The automatic configuration is switched off on delivery. The user has the possibility to adapt the automatic configuration according to the flow chart shown below (see fig. *Flow chart for the automatic configuration*).

Overwriting of the parameters during automatic configuration

The parameters manually changed by the user in the parameter list of the automatic configuration are automatically overwritten at the next start-up if automatic configuration is switched on.

- The automatic configuration can be switched on in the index 0x8001:01 [▶ 89] (0x2018:01 [▶ 120], DS402 Profile) *Enable autoconfig*.
- In the index 0x8008:02 [▶ 89] (0x2018:02 [▶ 120], DS402 Profile) *Reconfig identical motor*, the user can decide in the case of replacing an identical motor whether the box should automatically re-configure the motor (setting = *true*) or whether the motor should be operated with the stored settings (setting = *false*). The deactivation of this function can be advantageous, for example, if the user has specially adjusted the motor to his application and does not want to lose these settings after replacing the motor.
- In the index 0x8008:03 [▶ 89] (0x2018:03 [▶ 120], DS402 Profile) *Reconfig non-identical motor* , the user can decide in the case of replacing a non-identical motor whether the box should automatically re-configure the motor (setting = *true*) or whether the motor should be operated with the stored settings (setting = *false*).

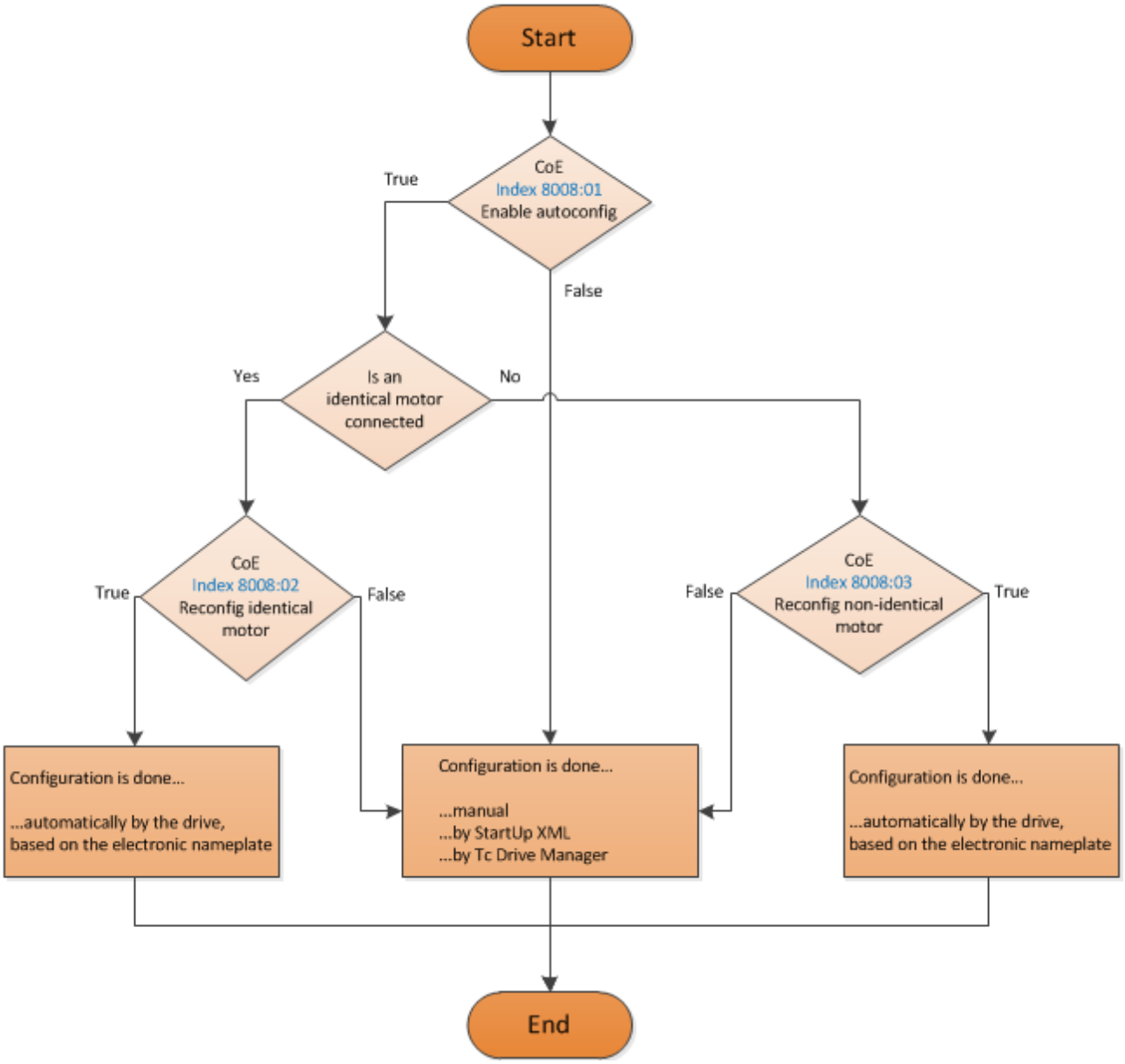

Fig. 48: Flow chart for the automatic configuration

Parameter list of the automatic configuration

The following parameters are affected by the automatic configuration.

Index (hex)		Name	Meaning
MDP 407 Profile	DS402 Profile		
8010:12 [▶ 90]	2002:12 [▶ 115]	Current loop integral time	is calculated according to the symmetrical optimum
8010:13 [▶ 90]	2002:13 [▶ 115]	Current loop proportional gain	is calculated according to the symmetrical optimum
8011:11 [▶ 93]	2003:11 [▶ 118]	Max. current	is adopted directly from the electronic identification plate of the connected motor
8011:12 [▶ 93]	2003:12 [▶ 118]	Rated current	is adopted directly from the electronic identification plate of the connected motor
8011:13 [▶ 93]	2003:13 [▶ 118]	Motor pole pairs	is adopted directly from the electronic identification plate of the connected motor
8011:15 [▶ 93]	2003:15 [▶ 118]	Commutation offset	is always set to -90°
8011:16 [▶ 93]	2003:16 [▶ 118]	Torque constant	is adopted directly from the electronic identification plate of the connected motor
8011:18 [▶ 93]	2003:18 [▶ 118]	Rotor moment of inertia	is adopted directly from the electronic identification plate of the connected motor
8011:19 [▶ 93]	2003:19 [▶ 118]	Winding inductance	is adopted directly from the electronic identification plate of the connected motor
8011:1B [▶ 93]	2003:1B [▶ 118]	Motor speed limitation	Calculation of the max. speed of the connected motor
8011:2B [▶ 93]	2003:2B [▶ 118]	Motor temperature warn level	is adopted directly from the electronic identification plate of the connected motor
8011:2C [▶ 93]	2003:2C [▶ 118]	Motor temperature error level	is adopted directly from the electronic identification plate of the connected motor
8011:2D [▶ 93]	2003:2D [▶ 118]	Motor thermal time constant	is adopted directly from the electronic identification plate of the connected motor
8012:11 [▶ 94]	2004:11 [▶ 119]	Release delay	is adopted directly from the electronic identification plate of the connected motor
8012:12 [▶ 94]	2004:12 [▶ 119]	Application delay	is adopted directly from the electronic identification plate of the connected motor
8012:14 [▶ 94]	2004:14 [▶ 119]	Brake moment of inertia	is adopted directly from the electronic identification plate of the connected motor

5.3.7 Configure end position monitoring

Software end position monitoring

The TwinCAT NC can be used to set software end position monitoring for EP7211 to ensure the safety of the system. The axis does not move beyond the set position (maximum/minimum end position). End position monitoring can be activated in the Parameter tab for the corresponding axis.

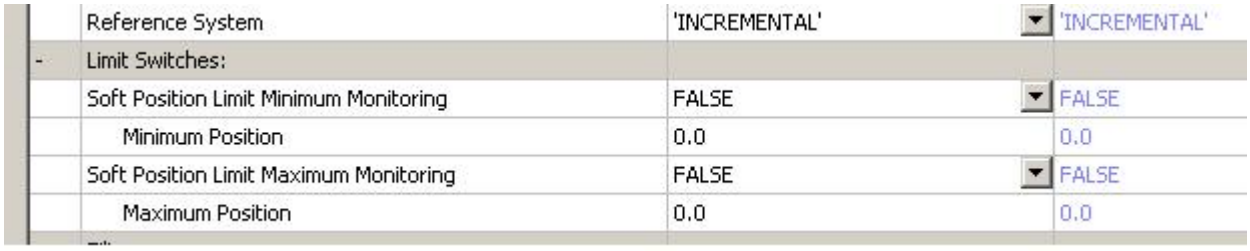

Fig. 49: Pull-down menu for activating end position monitoring

5.3.8 Homing

(Master TwinCAT 2.11 R3)

The data given here serve as an example for a servomotor type AM8131-0F20-0000 from Beckhoff Automation. For other motors the values may vary, depending on the application.

Table of contents

Referencing

Referencing does not work via the online commissioning tab of the axis (see Fig. *Online homing in the NC*).

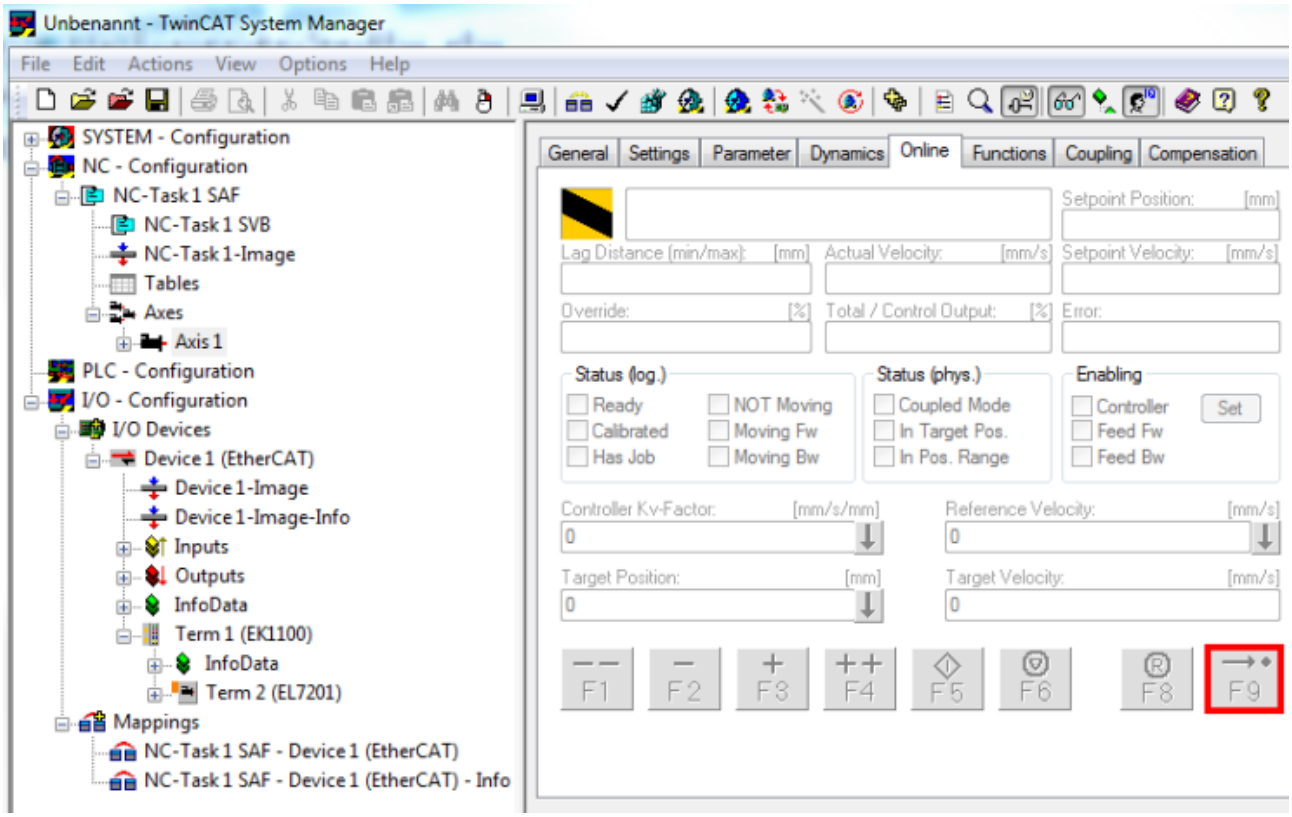

Fig. 50: Online homing in the NC

Function block "MC_Home"

- Referencing must be done from the PLC. The function block *MC_Home* from the TC MC2 Lib is used for this purpose.
- The following minimum configuration is required in *MC_Home*.
  - *HomingMode* enables selection of mode to be used for referencing.
  - *Execute* is used to initiate homing.
  - *bCalibrationCam*, which has to be linked with your reference cam, is used to stop homing.

```
0046 (*Homing*)
0047
0048 MC_Home(
0049     Execute:= bStartHoming,              (*start homing*)
0050     Position:= ,
0051     HomingMode:= MC_DefaultHoming,       (*execute a standard homing*)
0052     BufferMode:= ,
0053     Options:= ,
0054     bCalibrationCam:= bReferenceStop,    (*reference cam*)
0055     Axis:= axis1,
0056     Done=> ,
0057     Busy=> ,
0058     Active=> ,
0059     CommandAborted=> ,
0060     Error=> ,
0061     ErrorID=> );
0062
```

Fig. 51: Configuration of the MC_Home block

- The following figure *Extract from the functional description for MC_Home* shows an extract from the functional description of *MC_Home*. Full information can be found in the corresponding functional description.

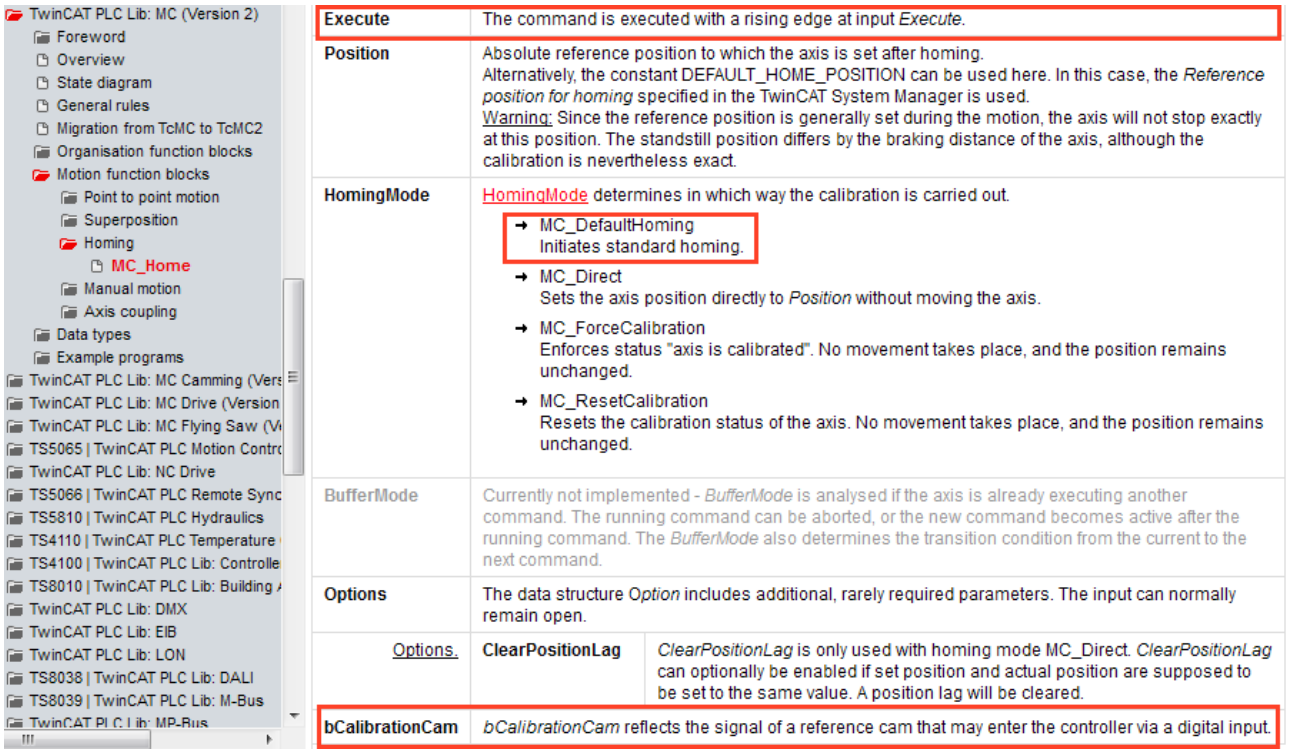

Fig. 52: Extraction from the functional description for MC_Home

Reference modes

- EP7211 can be operated with the following NC reference modes (see Fig. *Selection of the reference modes in the NC*).
- **Default:** Is suitable as a general setting and for most applications.
  Once the motor reaches the reference cam, the direction is reversed. The declining cam signal causes the motor to stop. The reference position is then set.
- **Software Sync:** The C track is modelled virtually.

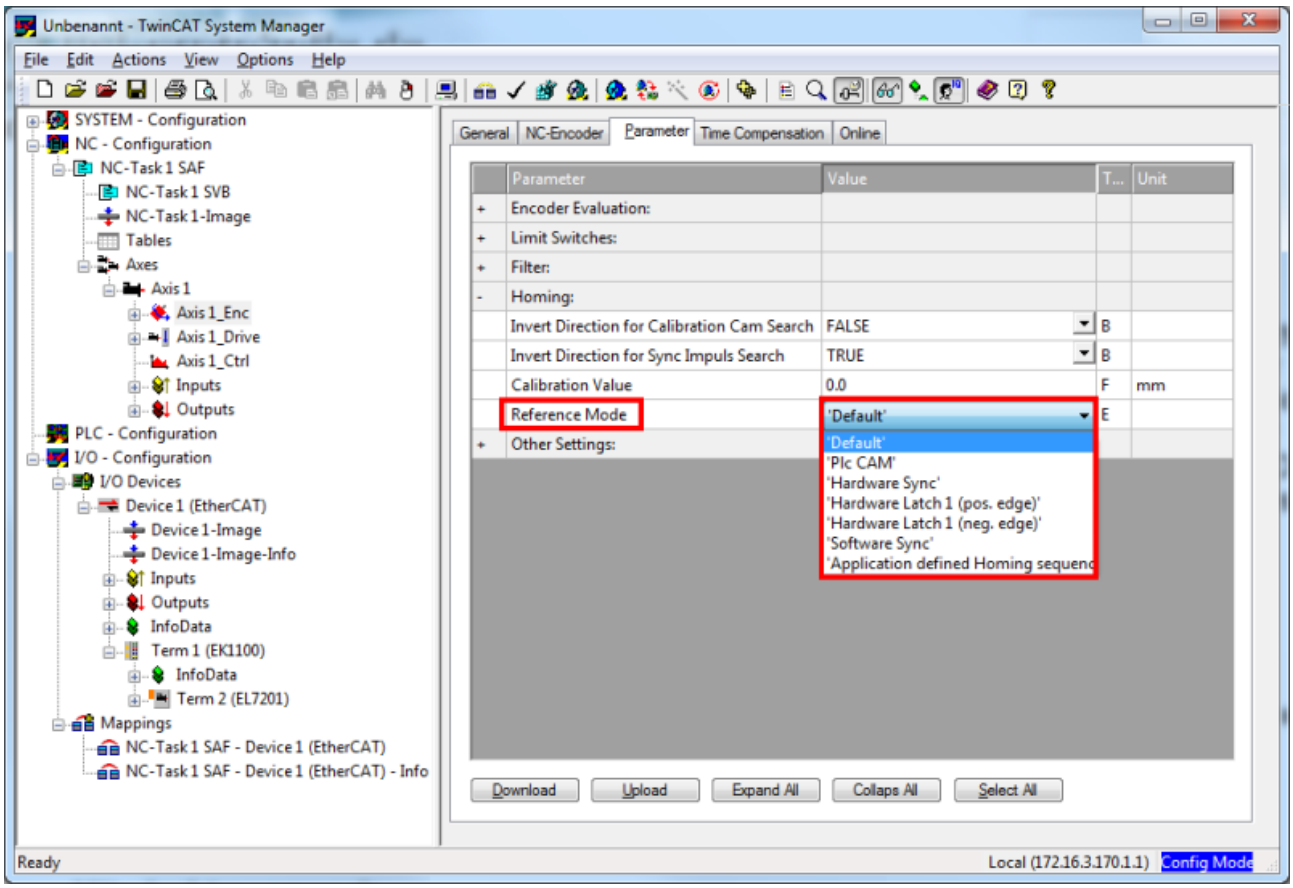

Fig. 53: Selection of the reference modes in the NC

The velocity to be used for homing can also be set in the NC (Fig. *Setting the reference velocity*).

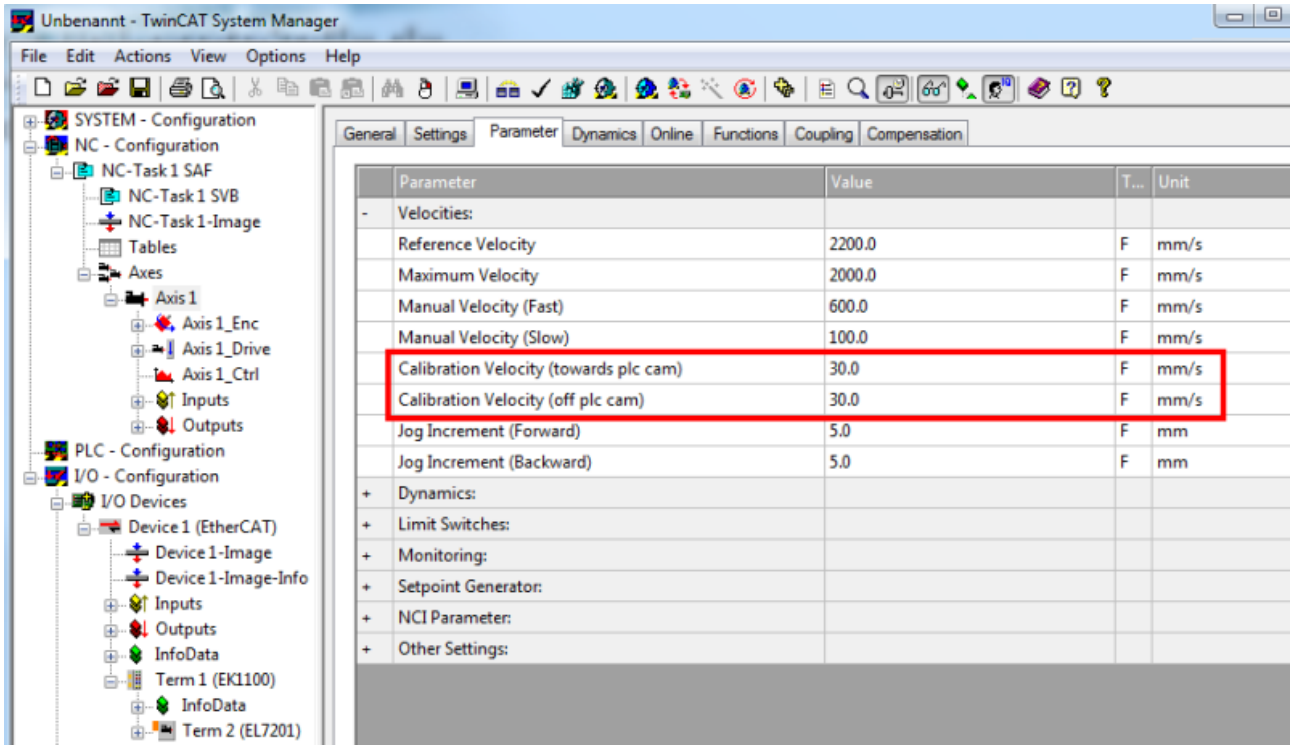

Fig. 54: Setting the reference velocity

5.3.9 Touch Probe

(Master TwinCAT 2.11 R3)

Functional description

The touch probe function saves the current position of the motor when a signal edge is detected on a digital input [▶ 28].

The process data objects required for this can be activated on the Process data tab (see figs. *Touch Probe inputs* and *Touch Probe outputs*).

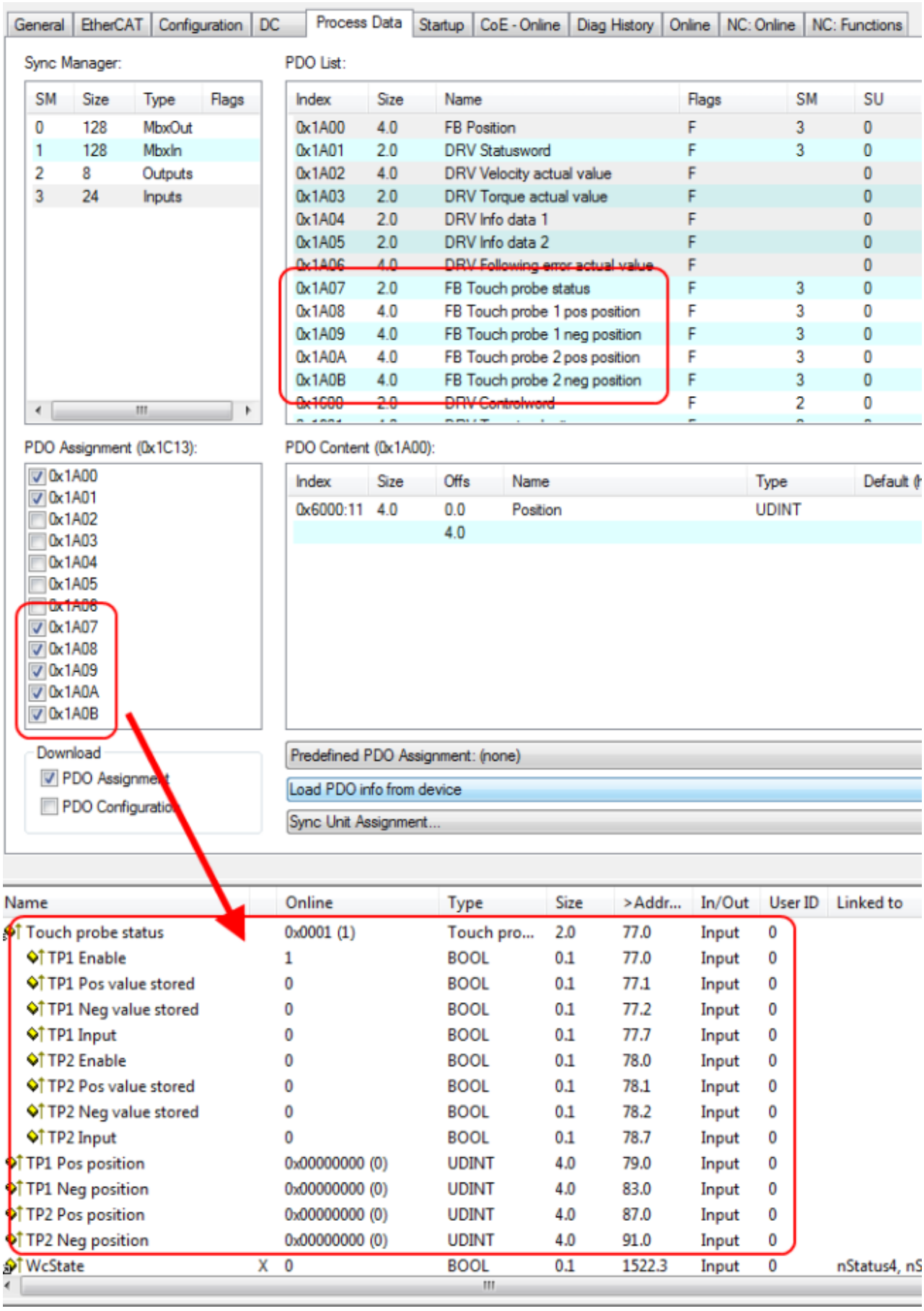

Fig. 55: Touch Probe inputs

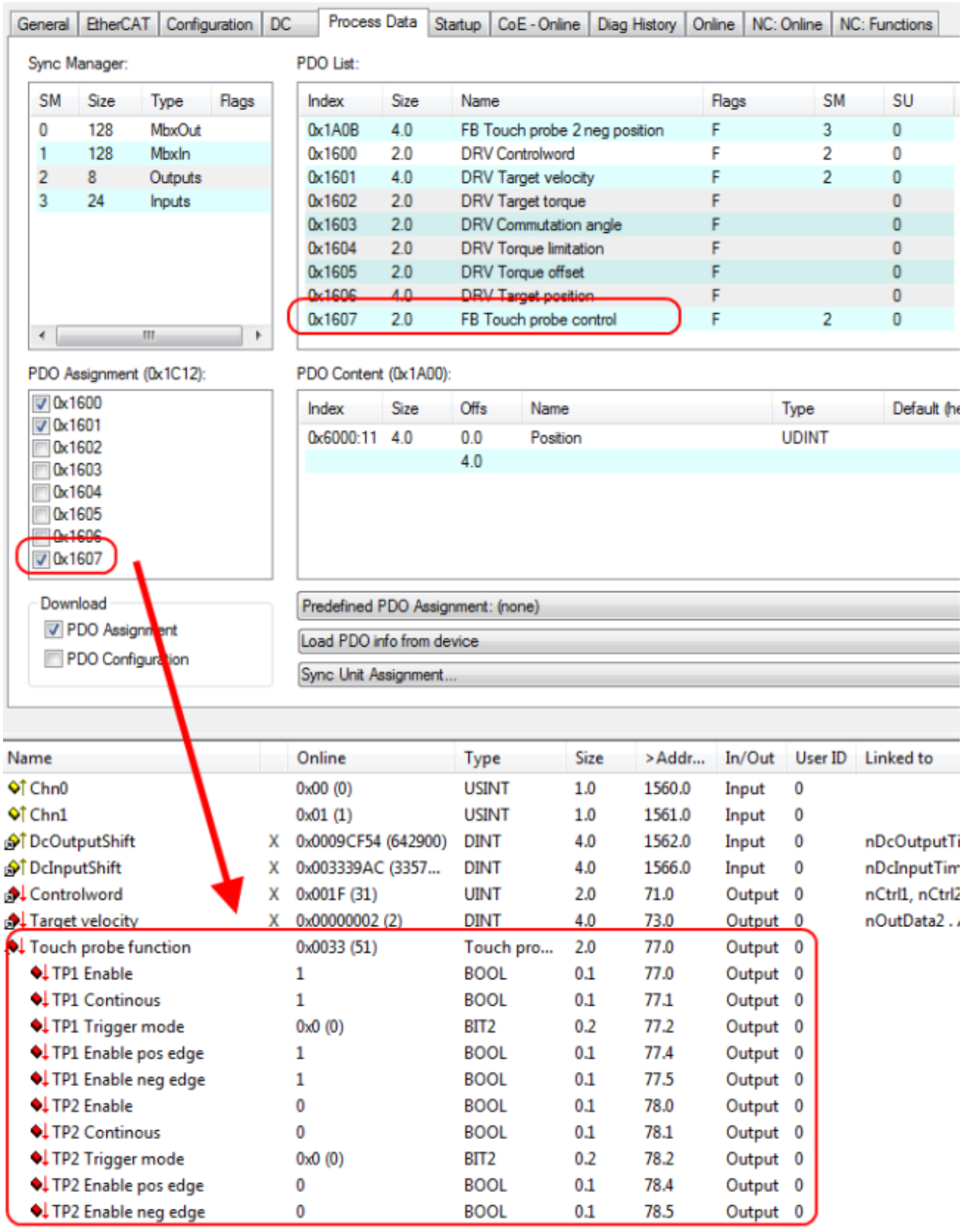

Fig. 56: Touch Probe outputs

Step-by-step

TP1 is used here as an example for the description of the function.

- *TP1 Enable* must be set to true in order to generally activate the Touch Probe function.
- Subsequently, you must decide whether the position is to be saved on a positive edge at input 1 (*TP1 Enable pos edge* = true), on a negative edge (*TP1 Enable neg edge* = true), or in both cases (both set to 'true').
- With *TP1 Continuous* you can decide whether the position is to be saved only at the first event (*TP1 Continuous* = false) or whether this should take place at every event (*TP1 Continuous* = true).
  For example, if *TP1 Continous* and *TP1 Enablepos edge* are set, the position is saved on each positive edge at input 1 of the box.
  If *TP1 Enable neg edge* is set and *TP1 Continuous* is not set, the position will only be saved on the first negative edge at input 1 of the box. If you wish to repeat this procedure, you must first deactivate *TP1 Enable* and then activate it again. Then the position is saved again on the first negative edge.
- The *TP1 Trigger mode* has no function with the EP7211.
- The saved position of the positive edge can be read in the inputs of the process data under *TP1 Pos position*, that of the negative edge under *TP1 Neg position*.
- The variables under *Touch probe status* are for the diagnosis.
- The Touch Probe inputs must be addressed with a 1-wire +24 V signal.

5.4 Drive profiles

The EP7211 supports the MDP 742 and DS402 drive profiles. Both drive profiles contain the same parameters. The drive profiles define the presentation of the parameters in TwinCAT and the index, under which the respective parameters are arranged in the object directory.

- The CoE objects in the MDP 742 (Modular Device Profile) are allocated in the way that is common for the Beckhoff I/O modules.
- The DS402 drive profile is specified in IEC61800-7-200 (CiA402) and uses a different allocation of the object directory structure.

The drive state machine in both profiles is based on the CiA402 State Machine [▶ 52], which means the functional behavior is identical.

Changing the drive profile

You can change the drive profile by carrying out an EEPROM Update. Select the EEPROM description on the basis of the following table.

Drive profile	EEPROM description
MDP 742	EP7211-0034
DS402	EP7211-0035

The EEPROM description is also the name of the I/O module in the Solution Explorer of TwinCAT.

The CoE object description and the process data of the drive profiles are different. The motor XML files that match the set profile must be used.

5.5 Operation modes

5.5.1 Overview

Operation modes CST, CSTCA, CSV and CSP are supported. The operation mode is set in the CoE directory in index 0x7010:03 [▶ 100] Modes of operation (MDP) or index 0x6060:0 [▶ 122] Modes of operation (DS402). In the respective process data the user can additionally select the respective *Predefined PDO Assignment*. All required variables are then in the process data.

CSV [▶ 67] - cyclic synchronous velocity (velocity control)

EP7211 operates in the cyclic velocity interface in the CSV operation mode. A defined velocity can be set via the *Target velocity* variable.

CST [▶ 70] - cyclic synchronous torque (torque control)

EP7211 operates in the cyclic torque interface in the CST operation mode. A defined torque can be set via the *Target torque* variable.

CSTCA [▶ 73] - cyclic synchronous torque with commutation angle (torque control with commutation angle)

This operation mode is also intended for use with the cyclic torque interface. In addition the user can specify the commutation angle. The variable *Commutation angle* can be used to set an angle which is to be maintained with a defined torque set in variable *Target torque*.

CSP [▶ 76] - cyclic synchronous position (position control)

EP7211 operates in the cyclic position interface in the CSP operation mode. A defined position can be set via the *Target position* variable.

For further information on the three operation modes described above please refer to section Commissioning without NC [▶ 52].

5.5.2 CSV

EP7211 operates in the cyclic velocity interface in the CSV operation mode. A defined velocity can be set via the *Target velocity* variable.

Step-by-Step

- Add the box to the configuration as described in the chapter Configuration in TwinCAT.
- Link the box with the NC as described in the chapter Integration into the NC configuration [▶ 33].
- Import the motor XML file into the Startup directory as described in the chapter Settings in the CoE [▶ 42].
- Set the mode of operation in the CoE directory to *Cyclic synchronous velocity mode (CSV), Fig. Selection of the mode of operation*.

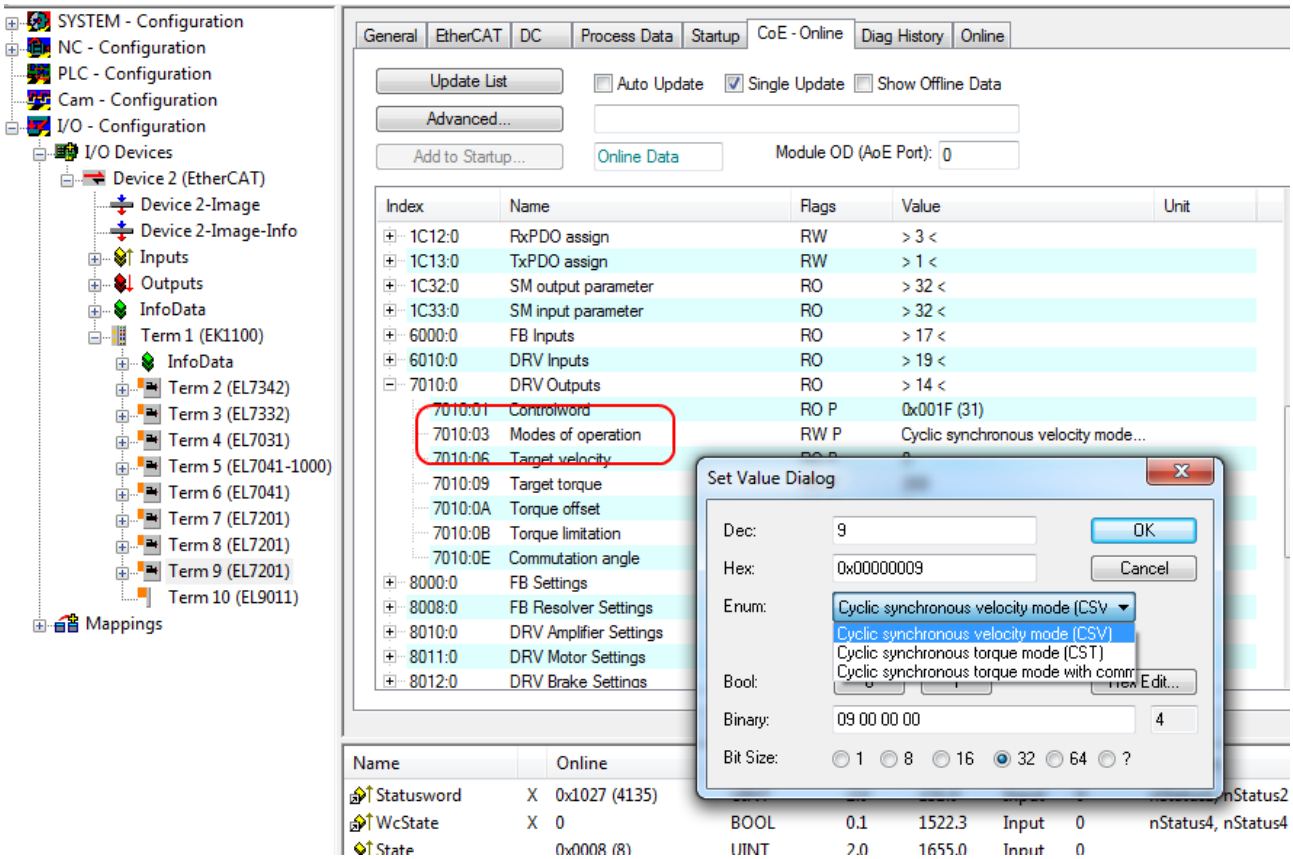

Fig. 57: Selection of the mode of operation

- Under Predefined PDO assignment, also select *Cyclic synchronous velocity mode (CSV)*, Fig. *Selecting a predefined PDO assignment*.

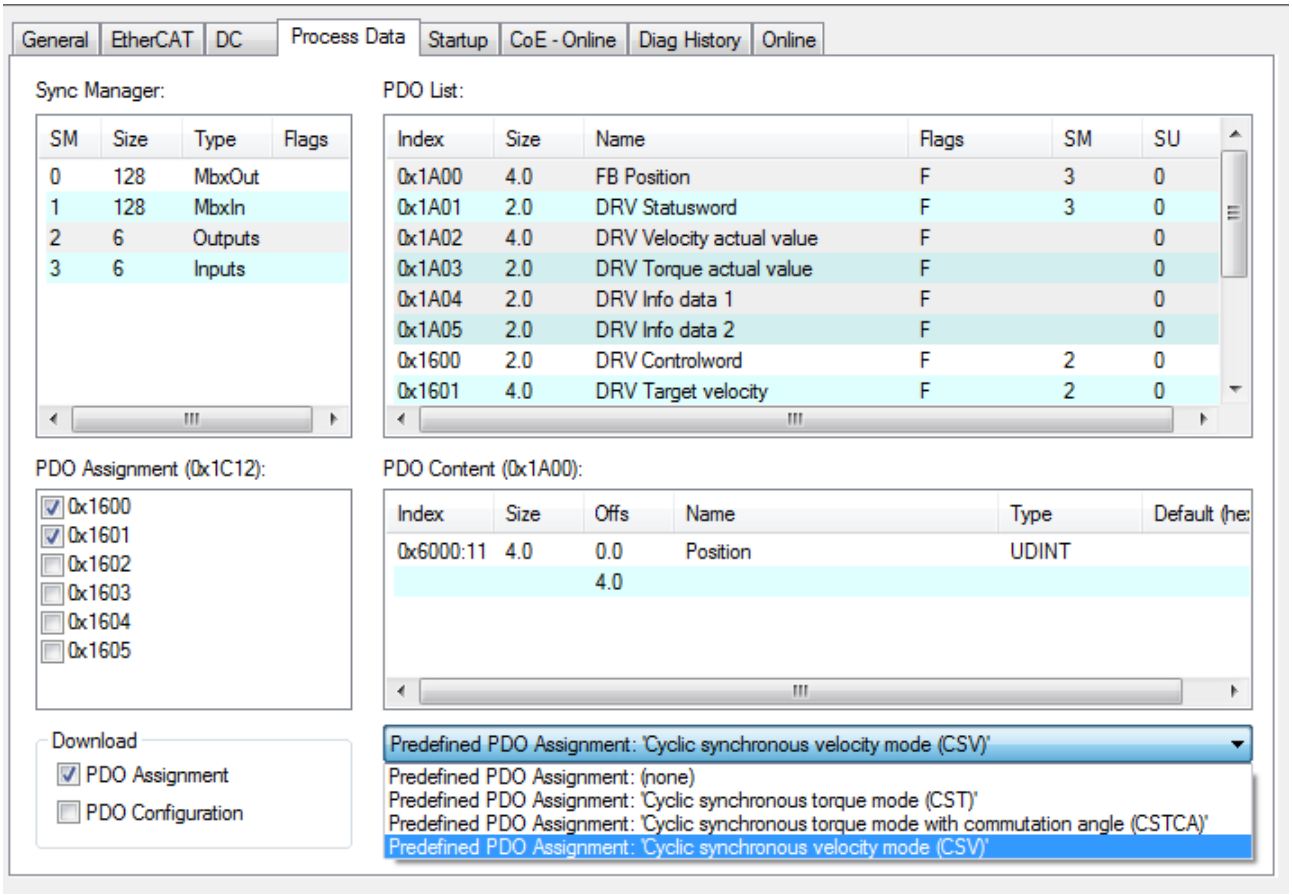

Fig. 58: Selecting a predefined PDO assignment

- Activate the configuration (Ctrl+Shift+F4)
- Run through the State Machine of the box. There are two ways to do this:
  - If you use the TwinCAT NC.
    The State Machine is run through automatically by the NC. You can enable the axis in the *Online* tab of the axis.
    Set all tick marks and set *Override* to 100% (see Fig. *Set enables*). The axis can then be moved.

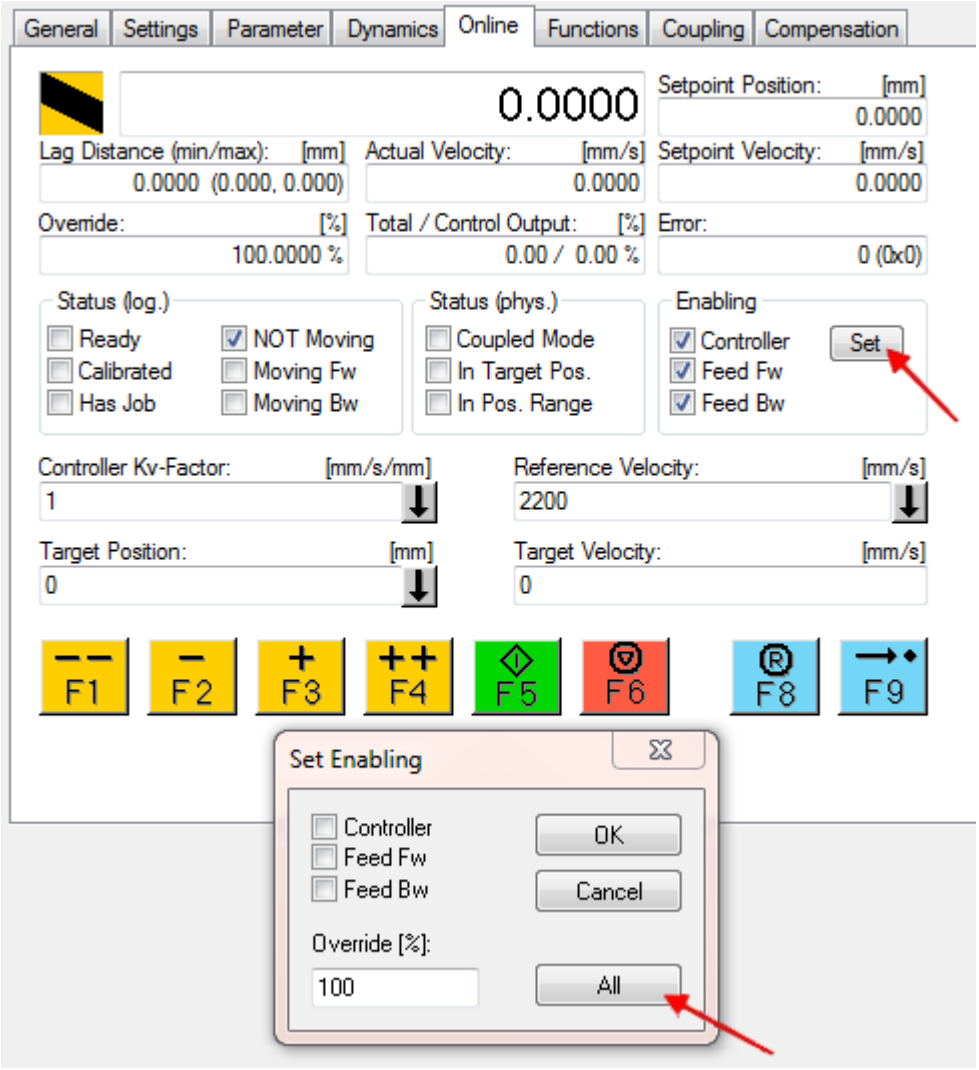

Fig. 59: Set enables

- If you don't use the TwinCAT NC.
  In this case you must run through the State Machine manually. To do this, follow the instructions in the chapter Commissioning without the NC [▶ 52].

- The cyclic variable *Target velocity* (Fig. *Torque specification*) can be used to specify a defined velocity. The value in the index 0x9010:14 [▶ 104] (0x6090 [▶ 124], DS402) *Velocity encoder resolution* corresponds to 1 rpm.

Name		Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Position	X	0x00000000 (0)	UDINT	4.0	132.0	Input	0	nInData1 . Axis 10_Enc_I...
Statusword	X	0x0000 (0)	UINT	2.0	136.0	Input	0	nStatus1, nStatus2
WcState	X	1	BOOL	0.1	1522.3	Input	0	nStatus4, nStatus4
State		0x0042 (66)	UINT	2.0	1655.0	Input	0	
AdsAddr		AC 11 28 29 03 01 ...	AMSADDR...	8.0	1657.0	Input	0	
Chn0		0x00 (0)	USINT	1.0	1665.0	Input	0	
Chn1		0x01 (1)	USINT	1.0	1666.0	Input	0	
DcOutputShift	X	0x0009E854 (649300)	DINT	4.0	1667.0	Input	0	nDcOutputTime . Axis 1...
DcInputShift	X	0x003320AC (3350...	DINT	4.0	1671.0	Input	0	nDcInputTime . Axis 10_...
Controlword	X	0x0006 (6)	UINT	2.0	132.0	Output	0	nCtrl1, nCtrl2
Target velocity		0x00000000 (0)	DINT	4.0	134.0	Output	0	

Fig. 60: Torque specification

5.5.3 CST

EP7211 operates in the cyclic torque interface in the CST operation mode. A defined torque can be set via the *Target torque* variable.

Step-by-Step

- Add the box to the configuration as described in the chapter Configuration in TwinCAT.
- Link the box with the NC as described in the chapter Integration into the NC configuration [▶ 33].
- Import the motor XML file into the Startup directory as described in the chapter Settings in the CoE [▶ 42].
- Set the mode of operation in the CoE directory to *Cyclic synchronous torque mode (CST)*, Fig. *Selection of the mode of operation*

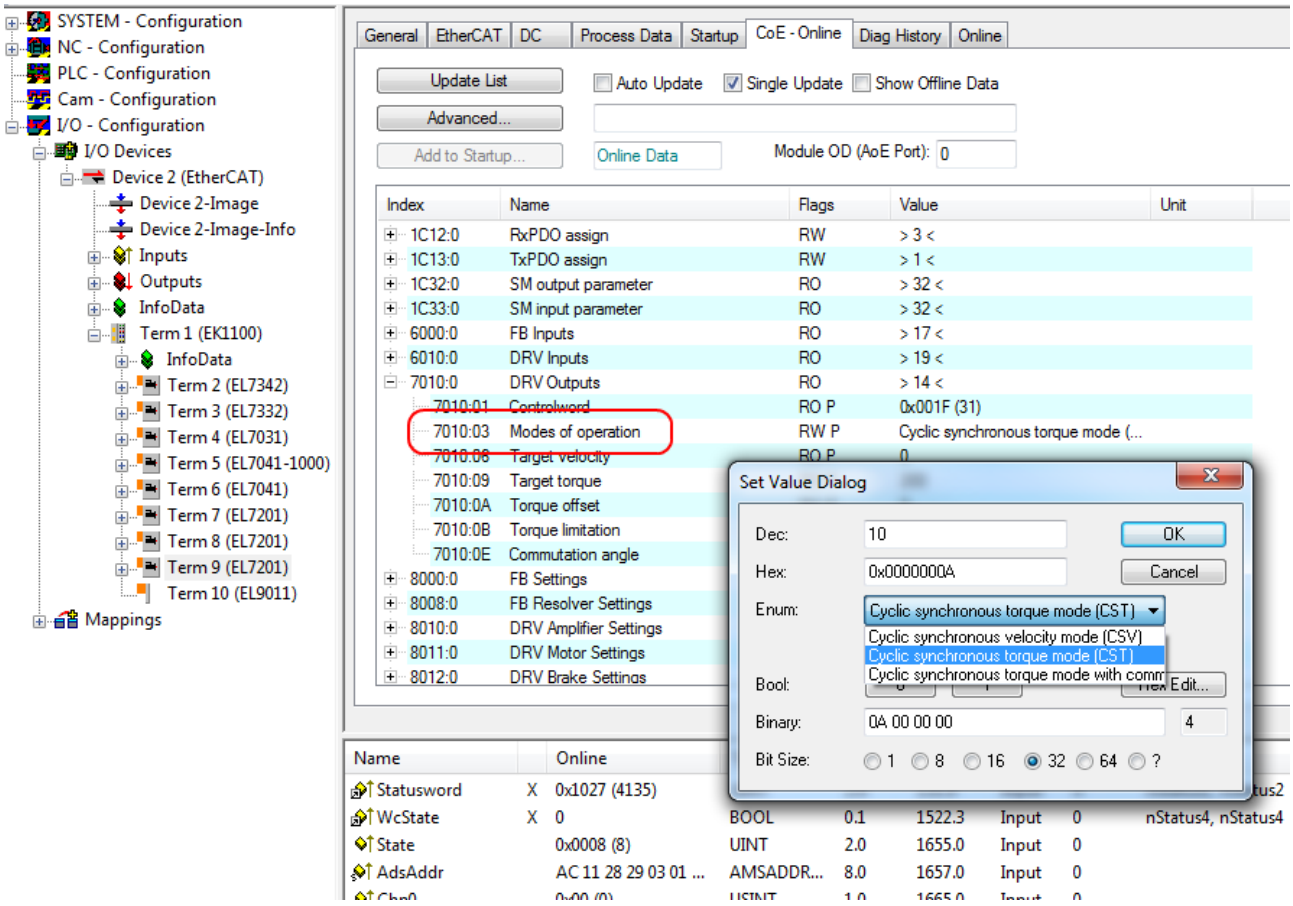

Fig. 61: Selection of the mode of operation

- Under Predefined PDO assignment, also select *Cyclic synchronous torque mode (CST)*, Fig. *Selecting a predefined PDO assignment*

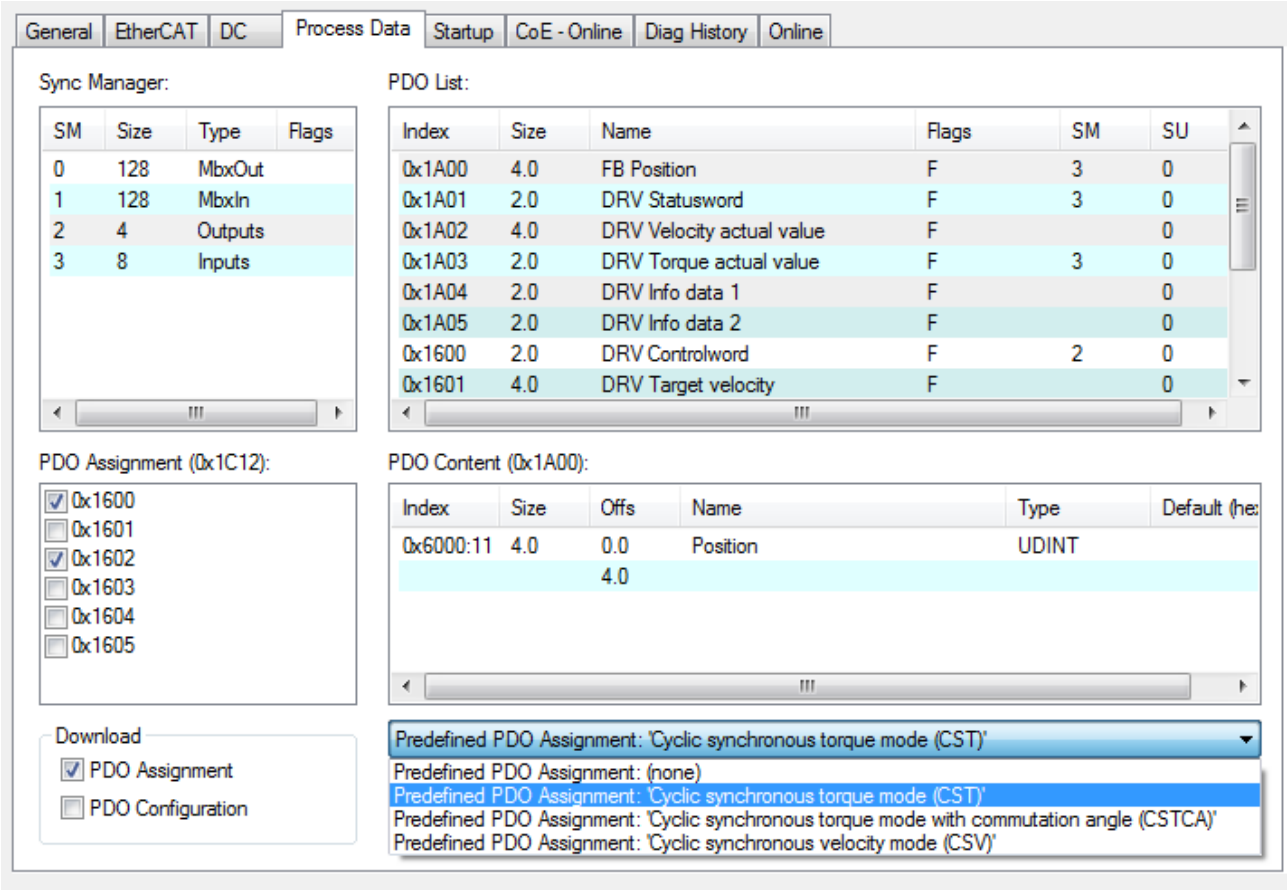

Fig. 62: Selecting a predefined PDO assignment

- Activate the configuration (Ctrl+Shift+F4)
- Run through the State Machine of the box. There are two ways to do this:
  - If you use the TwinCAT NC.
    The State Machine is run through automatically by the NC. You can enable the axis in the *Online* tab of the axis.
    Set all tick marks and set *Override* to 100% (see Fig. *Set enabling*). The axis can then be moved.
  - If you don't use the TwinCAT NC.
    In this case you must run through the State Machine manually. To do this, follow the instructions in the chapter Commissioning without the NC [▶ 52].

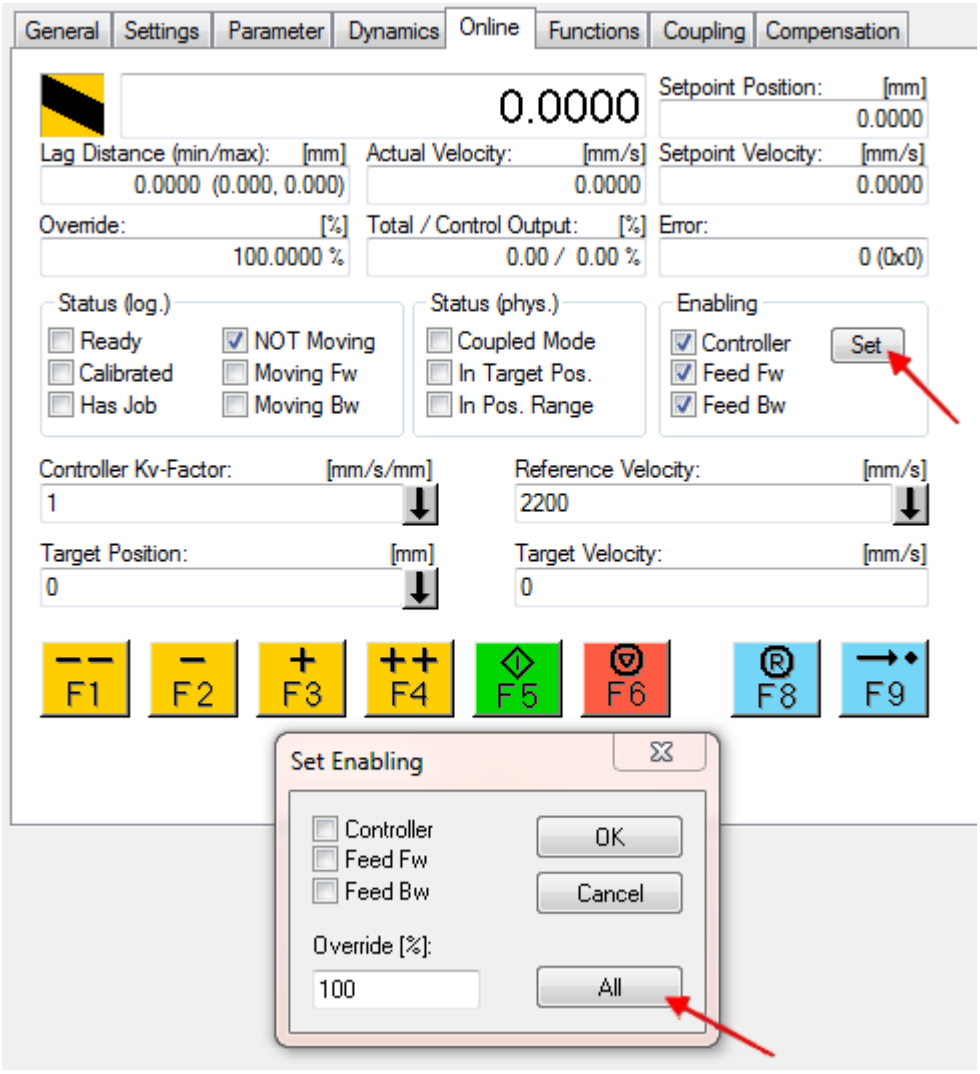

Fig. 63: Set enabling

- The cyclic variable *Target torque* (Fig. *Torque specification*) can be used to specify a defined torque.

Name		Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Position	X	0x00000000 (0)	UDINT	4.0	132.0	Input	0	nInData1 . Axis 10_Enc_I...
Statusword	X	0x0000 (0)	UINT	2.0	136.0	Input	0	nStatus1, nStatus2
Torque actual v...		0x0000 (0)	INT	2.0	138.0	Input	0	
WcState	X	1	BOOL	0.1	1522.3	Input	0	nStatus4, nStatus4
State		0x0042 (66)	UINT	2.0	1655.0	Input	0	
AdsAddr		AC 11 28 29 03 01 ...	AMSADDR...	8.0	1657.0	Input	0	
Chn0		0x00 (0)	USINT	1.0	1665.0	Input	0	
Chn1		0x01 (1)	USINT	1.0	1666.0	Input	0	
DcOutputShift	X	0x0009E854 (649300)	DINT	4.0	1667.0	Input	0	nDcOutputTime . Axis 1...
DcInputShift	X	0x003320AC (3350...	DINT	4.0	1671.0	Input	0	nDcInputTime . Axis 10_...
Controlword	X	0x0006 (6)	UINT	2.0	132.0	Output	0	nCtrl1, nCtrl2
Target torque		0x0000 (0)	INT	2.0	134.0	Output	0	

Fig. 64: Torque specification

5.5.4 CSTCA

This operation mode is also intended for use with the cyclic torque interface. In addition the user can specify the commutation angle. The variable *Commutation angle* can be used to set an angle which is to be maintained with a defined torque set in variable *Target torque*.

Step-by-Step

- Add the box to the configuration as described in the chapter Configuration in TwinCAT.
- Link the box with the NC as described in the chapter Integration into the NC configuration [▶ 33].
- Import the motor XML file into the Startup directory as described in the chapter Settings in the CoE [▶ 42].
- Set the mode of operation in the CoE directory to *Cyclic synchronous torque mode with commutation angle (CSTCA),* Fig. *Selection of the mode of operation*

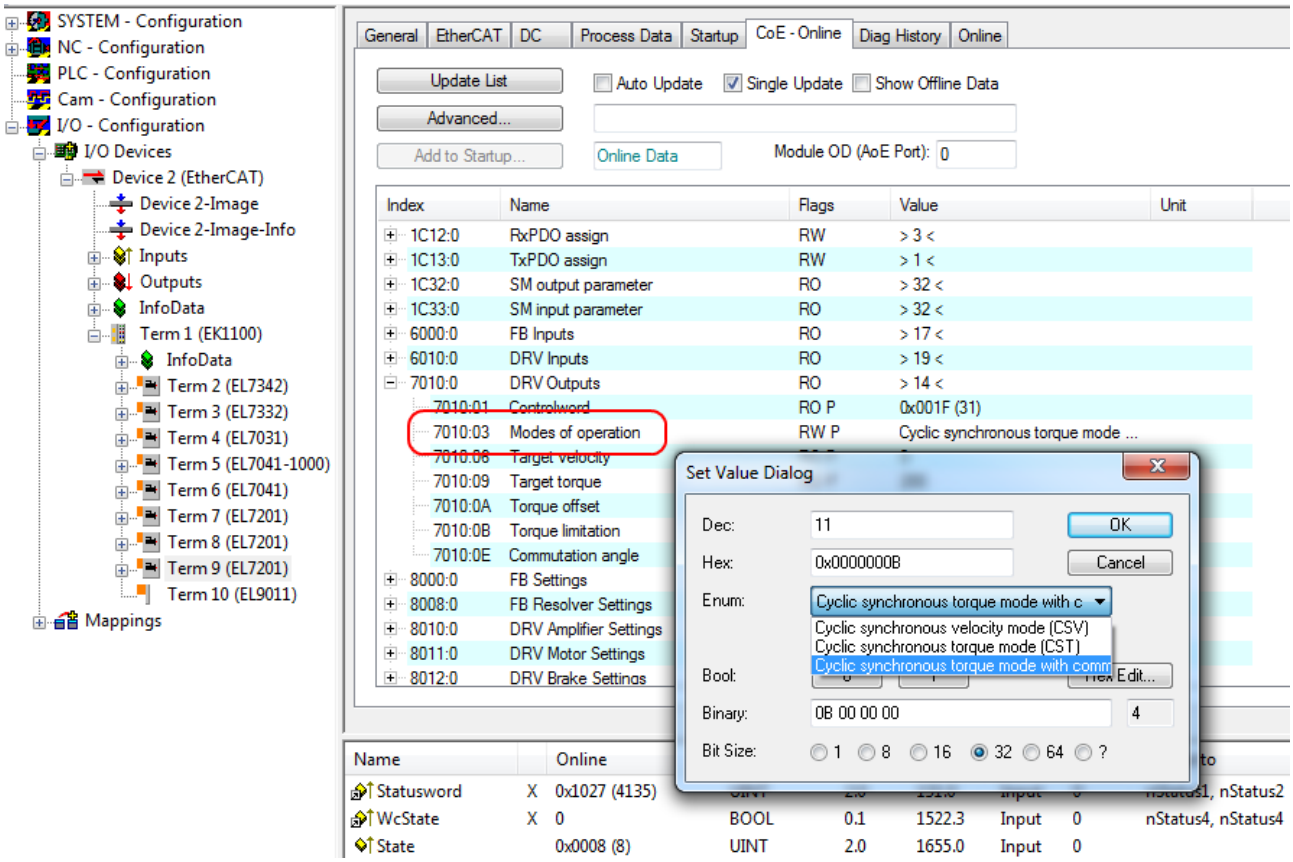

Fig. 65: Selection of the mode of operation

- Under Predefined PDO assignment, also select *Cyclic synchronous torque mode with commutation angle (CSTCA*), Fig. *Selecting a predefined PDO assignment*.

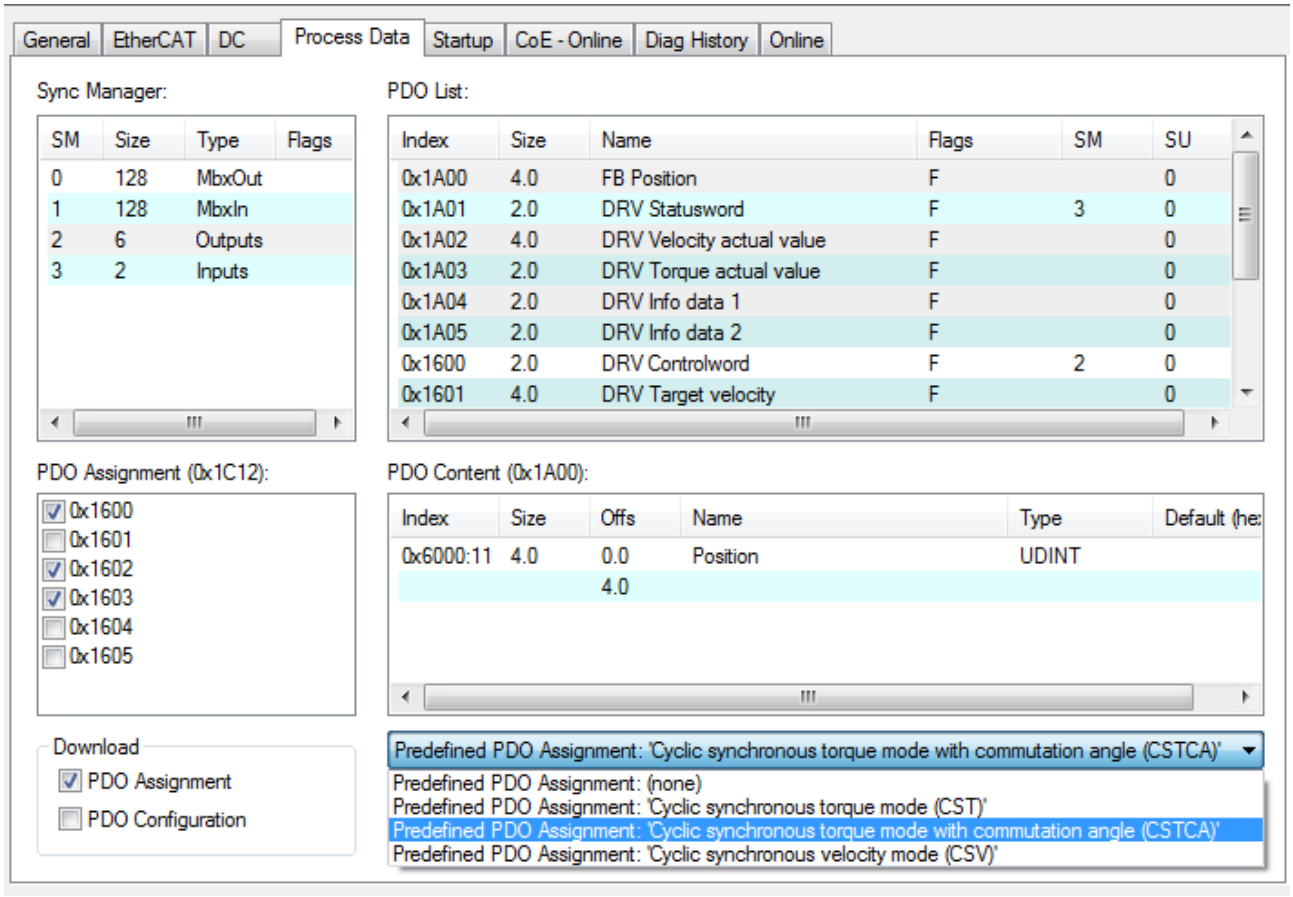

Fig. 66: Selecting a predefined PDO assignment

- Activate the configuration (Ctrl+Shift+F4)
- Run through the State Machine of the box. There are two ways to do this:
  - If you use the TwinCAT NC.
    The State Machine is run through automatically by the NC. You can enable the axis in the *Online* tab of the axis.
    Set all tick marks and set *Override* to 100% (see Fig. *Set enables*). The axis can then be moved.

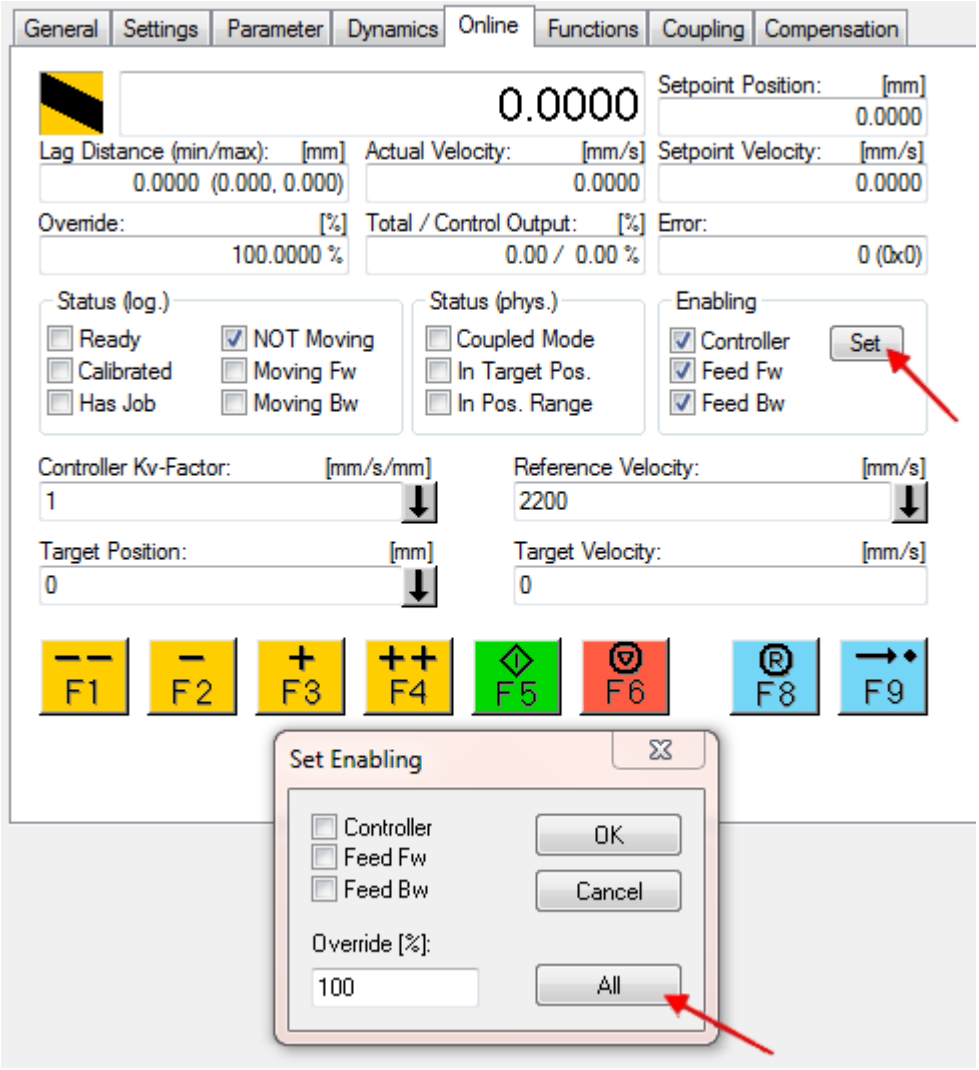

Fig. 67: Set enables

- If you don't use the TwinCAT NC.
  In this case you must run through the State Machine manually. To do this, follow the instructions in the chapter Commissioning without the NC [▶ 52].

- You can specify a defined torque via the cyclic variable *Target torque*. The value is specified in 1000ths of the *rated current* and the torque is calculated according to the following equation, where the rated current refers to the value in the index 0x8011:12 [▶ 93] *rated current*.

You can specify a defined angle via the cyclic variable *Commutation angle*. The value is specified in $360°/2^{16}$.

Name		Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Statusword	X	0x0000 (0)	UINT	2.0	132.0	Input	0	nStatus1, nStatus2
WcState	X	1	BOOL	0.1	1522.3	Input	0	nStatus4, nStatus4
State		0x0042 (66)	UINT	2.0	1655.0	Input	0	
AdsAddr		AC 11 28 29 03 01 ...	AMSADDR...	8.0	1657.0	Input	0	
Chn0		0x00 (0)	USINT	1.0	1665.0	Input	0	
Chn1		0x01 (1)	USINT	1.0	1666.0	Input	0	
DcOutputShift	X	0x0009E854 (649300)	DINT	4.0	1667.0	Input	0	nDcOutputTime . Axis 1...
DcInputShift	X	0x003320AC (3350...	DINT	4.0	1671.0	Input	0	nDcInputTime . Axis 10_...
Controlword	X	0x0006 (6)	UINT	2.0	132.0	Output	0	nCtrl1, nCtrl2
Target torque		0x0000 (0)	INT	2.0	134.0	Output	0	
Commutation angle		0x0000 (0)	UINT	2.0	136.0	Output	0	

Fig. 68: Specification of torque and commutation angle

5.5.5 CSP

EP7211 operates in the cyclic position interface in the CSP operation mode. A defined position can be set via the *Target position* variable.

Minimum cycle time

The cycle time in CSP modus must be 2^n * 125 µs (where n = 1 to 8), i.e. 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms or 32 ms.

Step-by-Step

- Add the box to the configuration as described in the chapter Configuration in TwinCAT.
- Link the box with the NC as described in the chapter Integration into the NC configuration [▶ 33].
- Configure the motor with the help of the automatic configuration [▶ 55] (OCT types only) using the Drive Manager [▶ 37] or import the motor XML file into the Start-up directory as described in the chapter Settings in the CoE [▶ 42].
- Set the mode of operation in the CoE directory to *Cyclic synchronous position mode (CSP), Fig. Selection of the mode of operation*.

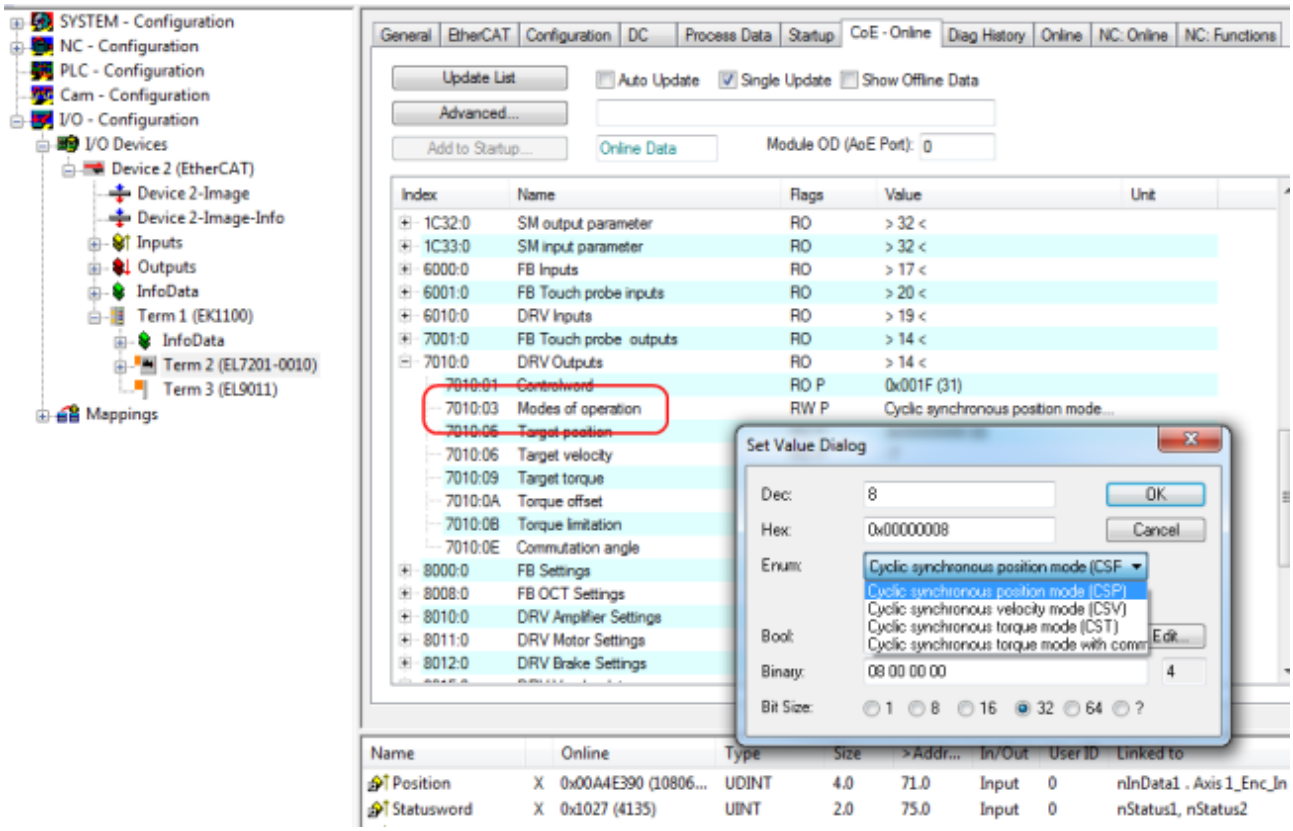

Fig. 69: Selection of the mode of operation

- Under Predefined PDO assignment, also select *Cyclic synchronous position mode (CSP)*, Fig. *Selecting a predefined PDO assignment*.

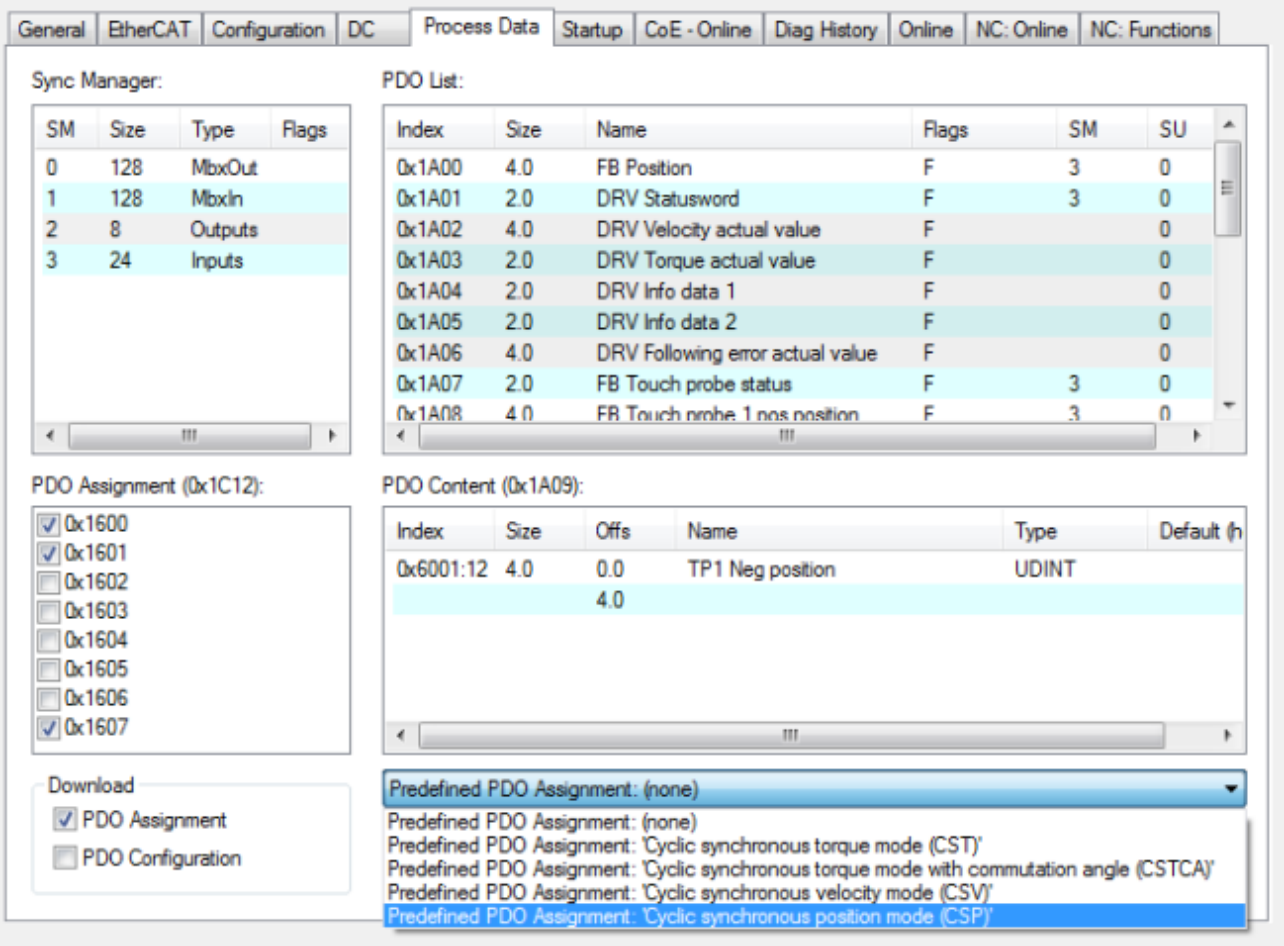

Fig. 70: Selecting a predefined PDO assignment

- Activate the configuration (Ctrl+Shift+F4)
- Run through the State Machine of the box. There are two ways to do this:
  - If you use the TwinCAT NC.
    The State Machine is run through automatically by the NC. You can enable the axis in the “Online” tab of the axis.
    Set all tick marks and set Override to 100% (see Fig. *Set enabling*). The axis can then be moved.

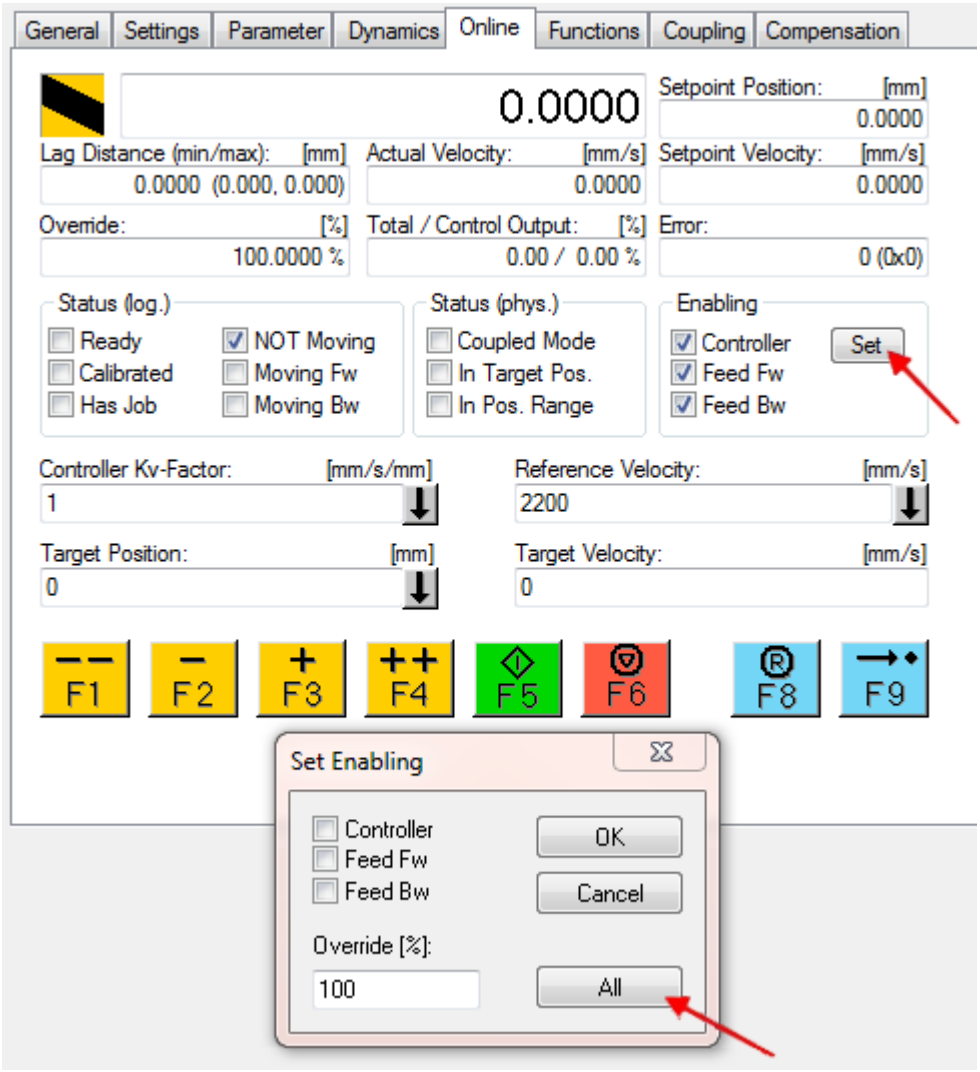

Fig. 71: Set enabling

- If you don't use the TwinCAT NC.
  In this case you must run through the State Machine manually. To do this, follow the instructions in the chapter Commissioning without the NC [▶ 52].

- You can specify a position via the cyclic variable *Target position* (fig. *Position specification*). The value must be multiplied by the calculated scaling factor [▶ 47] in order to obtain the correct position.

Name		Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Position	X	0x00A4BB64 (10795876)	UDINT	4.0	71.0	Input	0	nInData1 . Axis 1
Statusword	X	0x0021 (33)	UINT	2.0	75.0	Input	0	nStatus1, nStatu
WcState	X	0	BOOL	0.1	1522.3	Input	0	nStatus4, nStatu
InputToggle	X	1	BOOL	0.1	1524.3	Input	0	nStatus4, nStatu
State		0x0008 (8)	UINT	2.0	1550.0	Input	0	
AdsAddr		AC 11 28 29 03 01 EA 03	AMSADDR...	8.0	1552.0	Input	0	
Chn0		0x00 (0)	USINT	1.0	1560.0	Input	0	
Chn1		0x01 (1)	USINT	1.0	1561.0	Input	0	
DcOutputShift	X	0x0009CB6C (641900)	DINT	4.0	1562.0	Input	0	nDcOutputTime
DcInputShift	X	0x00333D94 (3358100)	DINT	4.0	1566.0	Input	0	nDcInputTime .
Controlword	X	0x0006 (6)	UINT	2.0	71.0	Output	0	nCtrl1, nCtrl2
Target position		0x00000000 (0)	UDINT	4.0	73.0	Output	0	

Fig. 72: Position specification

Following error monitor

Furthermore, there is an option in *CSP* mode to activate a following error monitor. The following error monitor is switched off on delivery. In all other modes this is not used and is ignored.

- The window of the following error monitor can be adjusted with the *Following error window* (Index 0x8010:50 MDP742 / Index 0x6065 DS402). The value set here – multiplied by the scaling factor – specifies by what position the actual position may differ from the set position, positively and negatively. The total accepted tolerance is thus twice as large as the position entered in the *Following error window* (see fig. *Following error window*).

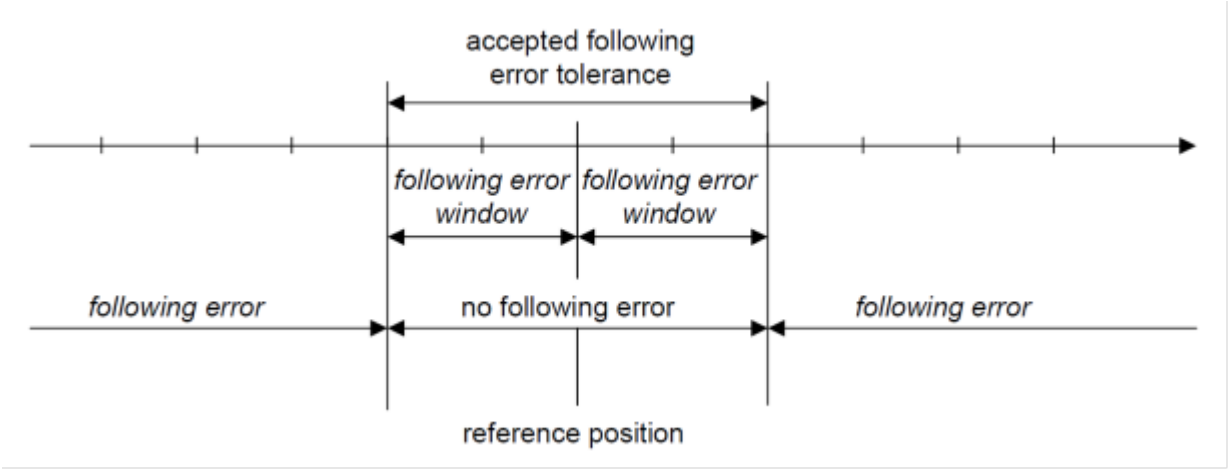

Fig. 73: Following error window

- The time (in ms) allowed for a following error exceedance can be set with the *Following error time out* (Index 0x8010:51 MDP742 / Index 0x6066 DS402). As soon as the target position is exceeded by more than the position entered in the *Following error window* for the time entered in the *Following error time out*, the box outputs an error and stops immediately.
- The current following error can be read in the *Following error actual value* (Index 0x6010:09 MDP742 / Index 0x60F4 DS402).

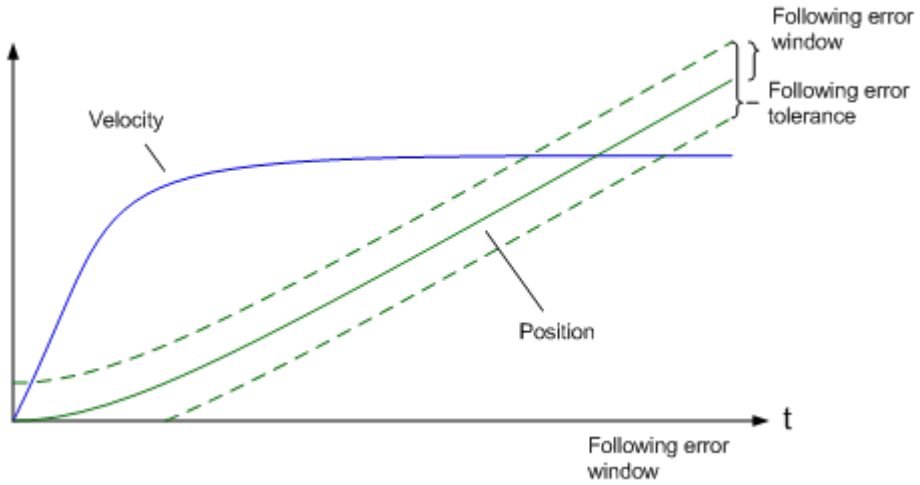

Fig. 74: Following error time out

The value 0xFFFFFF (- 1) in the *Following error window* means that the following error monitor is switched off and corresponds to the delivery state.
The *Following error time out* is 0x0000 (0) on delivery.

5.6 Process data MDP 742

Table of contents

Sync Manager (SM)

Sync Manager (SM) The extent of the process data that is made available can be changed through the "Process data" tab (see following Fig.).

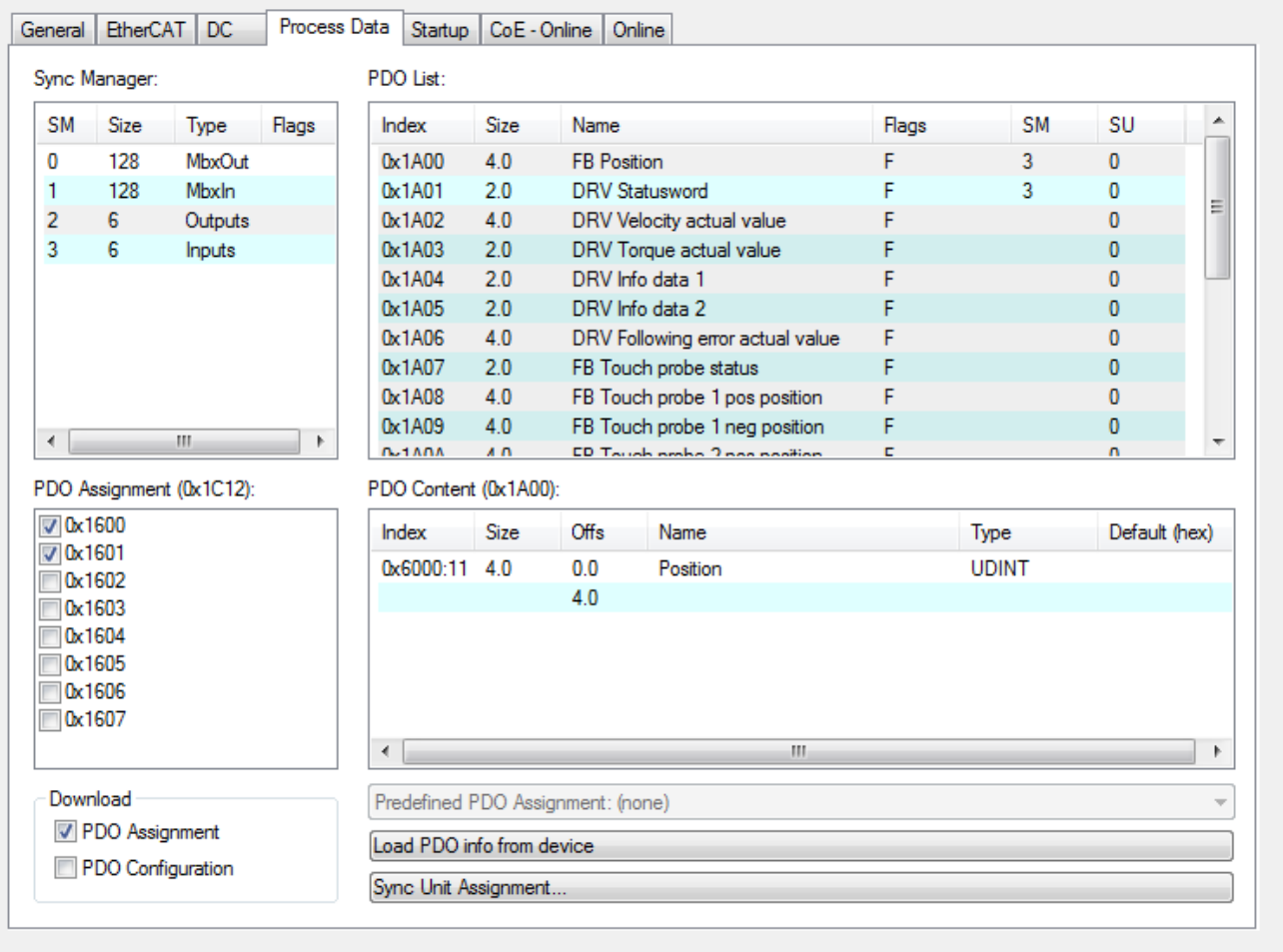

Fig. 75: Process Data tab SM2, EP7211 (default)

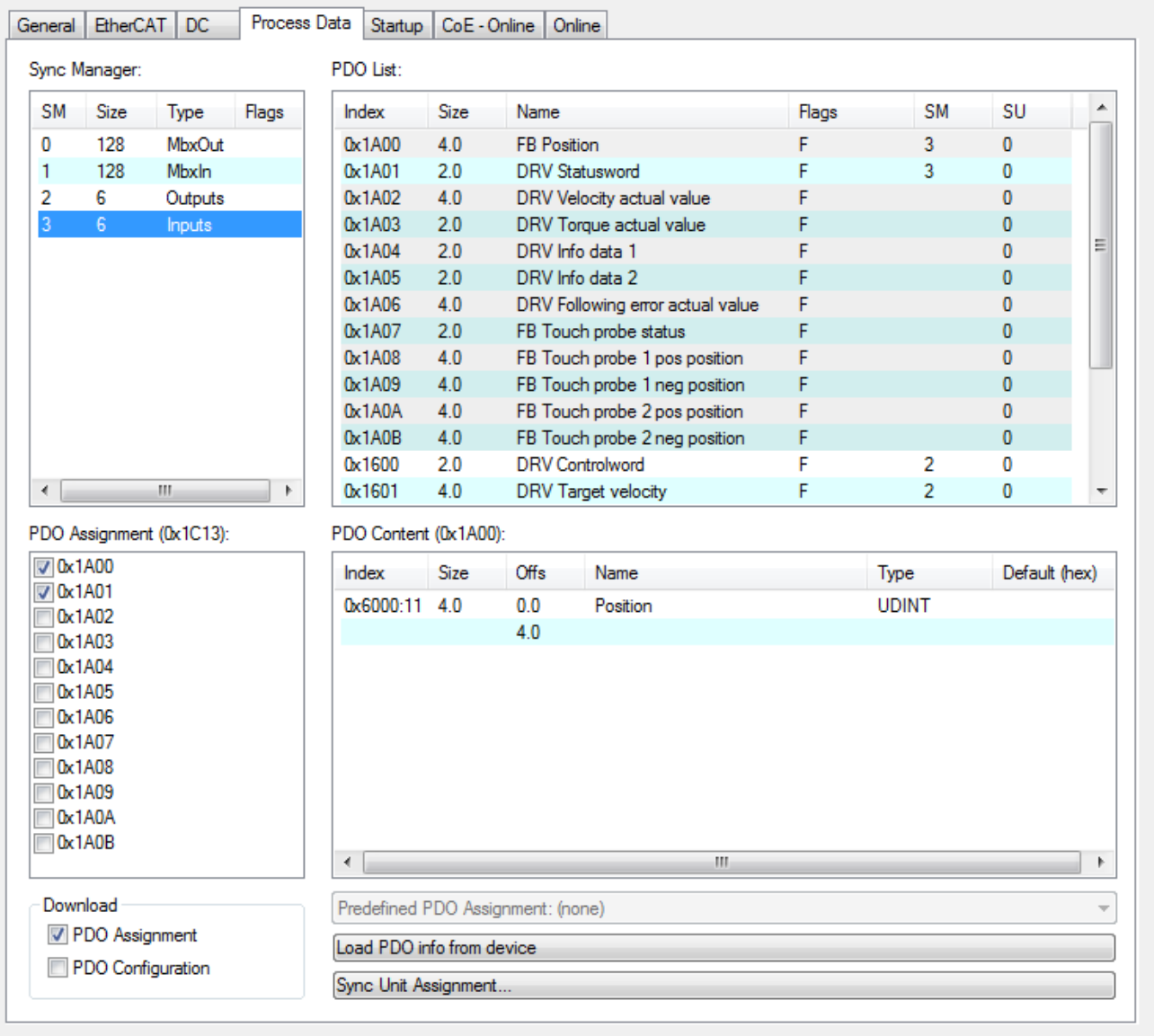

Fig. 76: Process Data tab SM3, EP7211 (default)

PDO Assignment

In order to configure the process data, select the desired Sync Manager (SM 2 & 3 can be edited here) in the upper left-hand "Sync Manager" box (see fig. *Process data SM3 tab*). The process data assigned to this Sync Manager can then be switched on or off in the “PDO Assignment” box underneath. Restarting the EtherCAT system, or reloading the configuration in Config mode (F4), causes the EtherCAT communication to restart, and the process data is transferred from the box.

SM2, PDO Assignment 0x1C12				
Index	**Size (byte.bit)**	**Name**	**PDO Content**	
0x1600 (default)	2.0	DRV Controlword	Index 0x7010:01 [▶ 100]	
0x1601 (default)	4.0	DRV Target velocity	Index 0x7010:06 [▶ 100]	
0x1602	2.0	DRV Target torque	Index 0x7010:09 [▶ 100]	
0x1603	2.0	DRV Commutation angle	Index 0x7010:0E [▶ 100]	
0x1604	2.0	DRV Torque limitation	Index 0x7010:0B [▶ 100]	
0x1605	2.0	DRV Torque offset	Index 0x7010:0A [▶ 100]	
0x1606	4.0	DRV Target position	Index 0x7010:05 [▶ 100]	
0x1607	2.0	FB Touch probe control	Index 0x7001:0	
			Index 0x7001:01 [▶ 99] Index 0x7001:02 [▶ 99] Index 0x7001:03 [▶ 99] Index 0x7001:05 [▶ 99] Index 0x7001:06 [▶ 99] Index 0x7001:09 [▶ 99] Index 0x7001:0A [▶ 99] Index 0x7001:0B [▶ 99] Index 0x7001:0D [▶ 99] Index 0x7001:0E [▶ 99]	TP1 Enable TP1 Continous TP1 Trigger mode TP1 Enable pos. edge TP1 Enable neg. edge TP2 Enable TP2 Continous TP2 Trigger mode TP2 Enable pos. edge TP2 Enable neg. edge

SM3, PDO Assignment 0x1C13				
Index	**Size (byte.bit)**	**Name**	**PDO Content**	
0x1A00 (default)	4.0	FB position	Index 0x6000:11	
0x1A01 (default)	2.0	DRV Statusword	Index 0x6010:01 [▶ 97]	
0x1A02	4.0	DRV Velocity actual value	Index 0x6010:07 [▶ 97]	
0x1A03	2.0	DRV Torque actual value	Index 0x6010:08 [▶ 97]	
0x1A04	2.0	DRV Info data 1	Index 0x6010:12 [▶ 97]	
0x1A05	2.0	DRV Info data 2	Index 0x6010:13 [▶ 97]	
0x1A06	4.0	DRV Following error actual value	Index 0x6010:09 [▶ 97]	
0x1A07	2.0	FB Touch probe status	Index 0x6001:0	
			Index 0x6001:01 [▶ 97] Index 0x6001:02 [▶ 97] Index 0x6001:03 [▶ 97] Index 0x6001:08 [▶ 97] Index 0x6001:09 [▶ 97] Index 0x6001:0A [▶ 97] Index 0x6001:0B [▶ 97] Index 0x6001:10 [▶ 97]	TP1 Enable TP1 Pos. value stored TP1 Neg. value stored TP1 Input TP2 Enable TP2 Pos. value stored TP2 Neg. value stored TP2 Input
0x1A08	4.0	FB Touch probe 1 pos. position	Index 0x6001:11 [▶ 97]	
0x1A09	4.0	FB Touch probe 1 neg. position	Index 0x6001:12 [▶ 97]	
0x1A0A	4.0	FB Touch probe 2 pos. position	Index 0x6001:13 [▶ 97]	
0x1A0B	4.0	FB Touch probe 2 neg. position	Index 0x6001:14 [▶ 97]	

Predefined PDO Assignment

The "Predefined PDO Assignment" enables a simplified selection of the process data. The desired function is selected on the lower part of the "Process Data" tab. As a result, all necessary PDOs are automatically activated and the unnecessary PDOs are deactivated.

The following PDO assignments are available:

Name	SM2, PDO assignment	SM3, PDO assignment
Cyclic synchronous velocity mode (CSV)	0x1600 [▶ 105] (DRV Controlword) 0x1601 [▶ 105] (DRV Target velocity)	0x1A00 [▶ 107] (FB Position) 0x1A01 [▶ 107] (DRV Statusword)
Cyclic synchronous torque mode (CST)	0x1600 [▶ 105] (DRV Controlword) 0x1602 [▶ 106] (DRV Target torque)	0x1A00 [▶ 107] (FB Position) 0x1A01 [▶ 107] (DRV Statusword) 0x1A03 [▶ 107] (DRV Torque actual value)
Cyclic synchronous torque mode with commutation angle (CSTCA)	0x1600 [▶ 105] (DRV Controlword) 0x1602 [▶ 106] (DRV Target torque) 0x1603 [▶ 106] (DRV Commutation angle)	0x1A01 [▶ 107] (DRV Statusword)
Cyclic synchronous position mode (CSP)	0x1600 [▶ 105] (DRV Controlword) 0x1606 [▶ 106] (DRV Target position)	0x1A00 [▶ 107](FB Position) 0x1A01 [▶ 107](DRV Statusword)

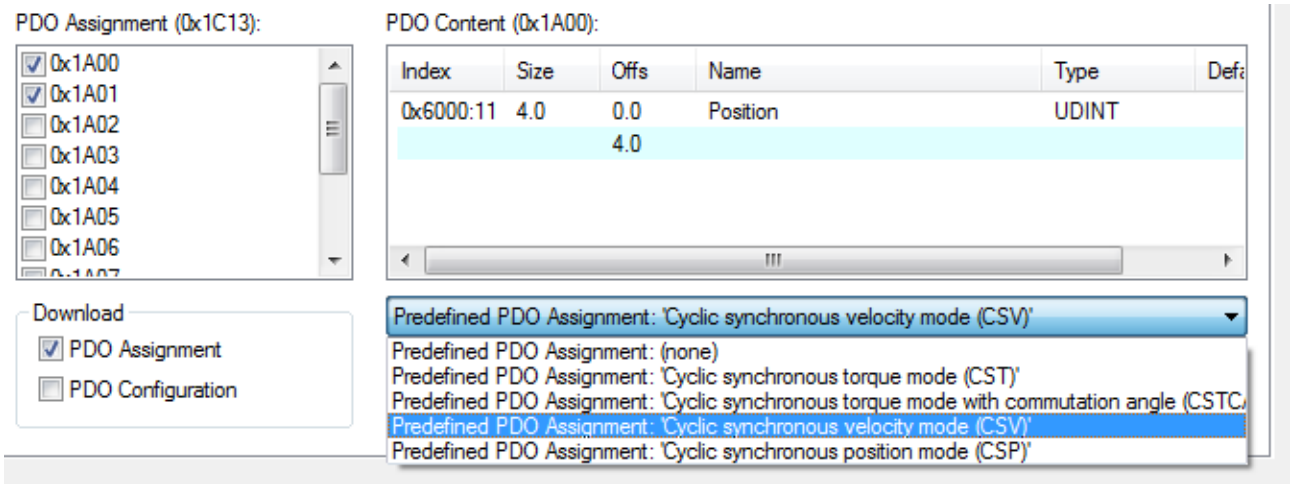

Fig. 77: Process data tab - Predefined PDO Assignment

5.7 DS402 process data

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Sync Manager (SM)

Sync Manager (SM). The extent of the process data that is made available can be changed via the "Process data" tab (see Fig. Process data tab SM2 (default)).

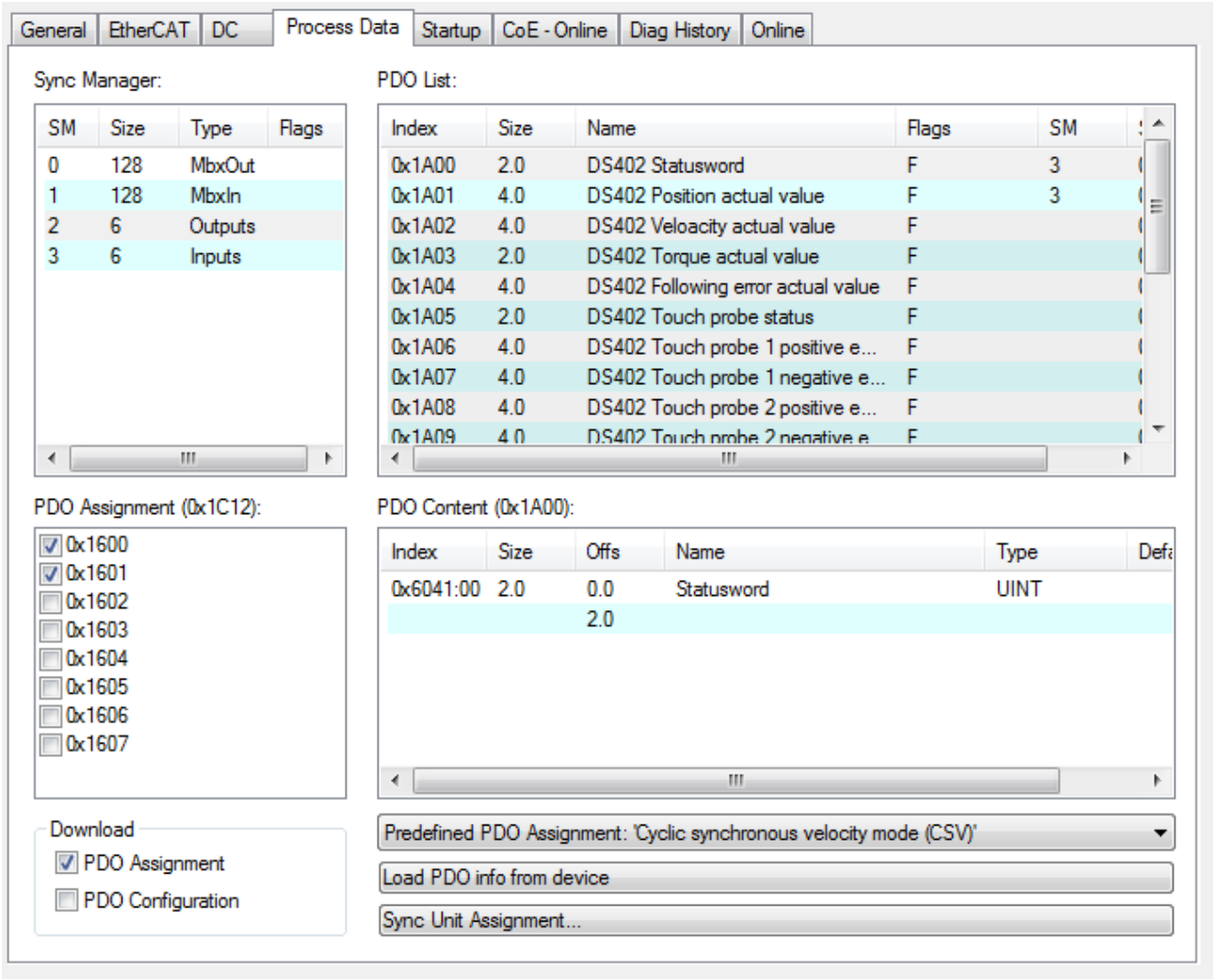


Fig. 78: Process Data tab SM2 (default)

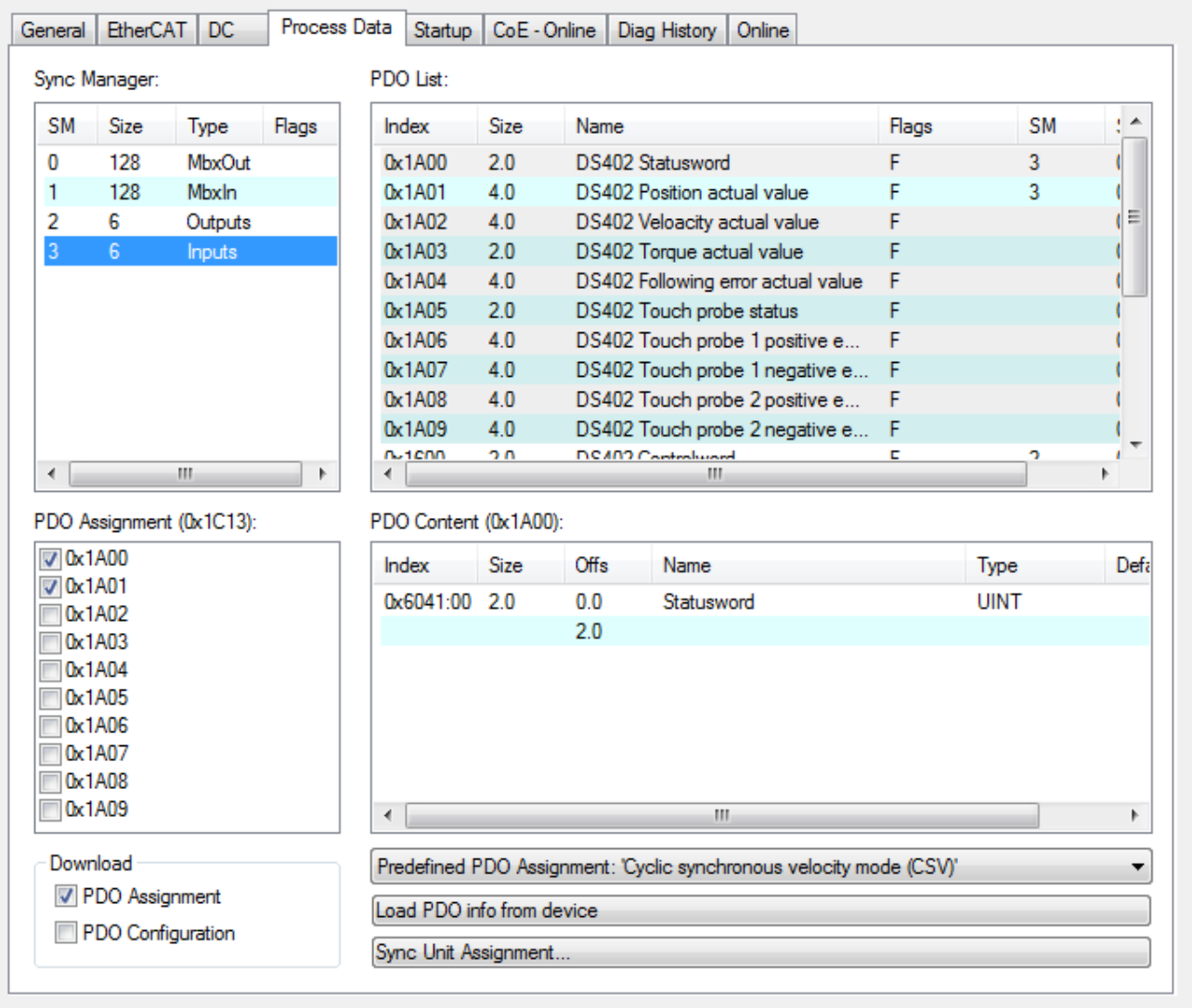


Fig. 79: Process Data tab SM3 (default)

PDO Assignment

In order to configure the process data, select the desired Sync Manager (SM 2 & 3 can be edited) in the upper left-hand "Sync Manager" box (see fig.). The process data assigned to this Sync Manager can then be switched on or off in the “PDO Assignment” box underneath. Restarting the EtherCAT system, or reloading the configuration in Config mode (F4), causes the EtherCAT communication to restart, and the process data is transferred from the box.

SM2, PDO Assignment 0x1C12				
Index	**Size (byte.bit)**	**Name**	**PDO Content**	
0x1600 (default)	2.0	DS402 Controlword	Index 0x6040 [▶ 121]	
0x1601 (default)	4.0	DS402 Target velocity	Index 0x60FF [▶ 125]	
0x1602	2.0	DS402 Target torque	Index 0x6071 [▶ 123]	
0x1603	2.0	DS402 Commutation angle	Index 0x60EA [▶ 125]	
0x1604	2.0	DS402 Torque limitation	Index 0x6072 [▶ 123]	
0x1605	2.0	DS402 Torque offset	Index 0x2001:11 [▶ 121]	
0x1606	4.0	DS402 Target position	Index 0x607A [▶ 124]	
0x1607	2.0	DS402 FB Touch probe function	Index 0x60B8 [▶ 124]	
			Bit 0 Bit 1 Bit 2 Bit 4 Bit 5 Bit 8 Bit 9 Bit 10 Bit 12 Bit 13	TP1 Enable TP1 Continous TP1 Trigger mode TP1 Enable pos. edge TP1 Enable neg. edge TP2 Enable TP2 Continous TP2 Trigger mode TP2 Enable pos. edge TP2 Enable neg. edge

SM3, PDO Assignment 0x1C13				
Index	**Size (byte.bit)**	**Name**	**PDO Content**	
0x1A00 (default)	2.0	DS402 Statusword	Index 0x6041 [▶ 122]	
0x1A01 (default)	4.0	DS402 Position actual value	Index 0x6064 [▶ 122]	
0x1A02	4.0	DS402 Velocity actual value	Index 0x606C [▶ 123]	
0x1A03	2.0	DS402 Torque actual value	Index 0x6077 [▶ 123]	
0x1A04	4.0	DS402 Following error actual value	Index 0x60F4 [▶ 125]	
0x1A05	2.0	DS402 Touch probe status	Index 0x60B9 [▶ 124]	
			Bit 0 Bit 1 Bit 2 Bit 7 Bit 8 Bit 9 Bit 10 Index 6001:10	TP1 Enable TP1 Pos. value stored TP1 Neg. value stored TP1 Input TP2 Enable TP2 Pos. value stored TP2 Neg. value stored TP2 Input
0x1A06	4.0	DS402 Touch probe 1 pos. position	Index 0x60BA [▶ 124]	
0x1A07	4.0	DS402 Touch probe 1 neg. position	Index 0x60BB [▶ 124]	
0x1A08	4.0	DS402 Touch probe 2 pos. position	Index 0x60BC [▶ 125]	
0x1A09	4.0	DS402 Touch probe 2 neg. position	Index 0x60BD [▶ 125]	

Predefined PDO Assignment

The "Predefined PDO Assignment" enables a simplified selection of the process data. The desired function is selected on the lower part of the "Process Data" tab. As a result, all necessary PDOs are automatically activated and the unnecessary PDOs are deactivated.

The following PDO assignments are available:

Name	SM2, PDO assignment	SM3, PDO assignment
Cyclic synchronous velocity mode (CSV)	0x1600 [▶ 130] (DS402 Controlword) 0x1601 [▶ 130] (DS402 Target velocity)	0x1A00 [▶ 130] (DS402 Statusword) 0x1A01 [▶ 131] (DS402 Position actual value)
Cyclic synchronous torque mode (CST)	0x1600 [▶ 130] (DS402 Controlword) 0x1602 [▶ 130] (DS402 Target torque)	0x1A00 [▶ 130] (DS402 Statusword) 0x1A01 [▶ 131] (DS402 Position actual value) 0x1A03 [▶ 131] (DS402 Torque actual value)
Cyclic synchronous torque mode with commutation angle (CSTCA)	0x1600 [▶ 130] (DS402 Controlword) 0x1602 [▶ 130] (DS402 Target torque) 0x1603 [▶ 130] (DS402 Commutation angle)	0x1A00 [▶ 130] (DS402 Statusword)
Cyclic synchronous position mode (CSP)	0x1600 [▶ 130] (DS402 Controlword) 0x1606 [▶ 130] (DS402 Target position)	0x1A00 [▶ 130] (DS402 Statusword) 0x1A01 [▶ 131] (DS402 Position actual value)

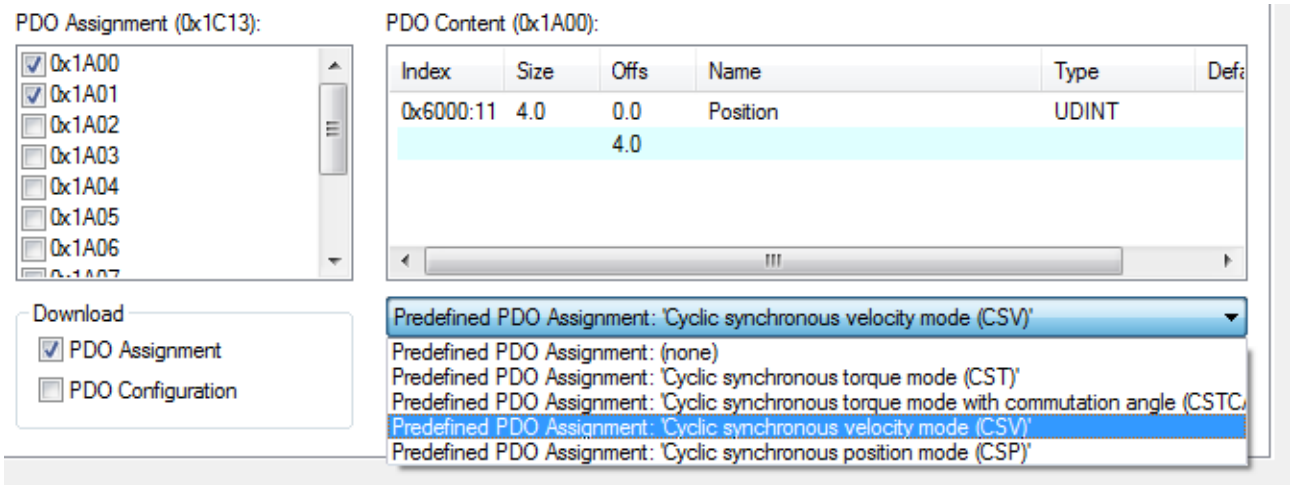


Fig. 80: Process data tab - Predefined PDO Assignment

5.8 Object description (MDP 742)

EtherCAT XML Device Description

The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area of the Beckhoff website and installing it according to installation instructions.

Parameterization via the CoE list (CAN over EtherCAT)

The box is parameterized via the CoE - Online tab (double-click on the respective object) or via the Process Data tab (assignment of PDOs).
Please note the following general CoE information when using/manipulating the CoE parameters:

- Keep a **startup list** if components have to be replaced
- Differentiation between online/offline dictionary, existence of current XML description
- use "CoE reload" for resetting changes

NOTE

Risk of damage to the device!

We strongly advise not to change settings in the CoE objects while the axis is active, since this could impair the control.

5.8.1 Restore object

Index 1011 Restore default parameters

Index (hex)	Name	Meaning	Data type	Flags	Default
1011:0	Restore default parameters	Restore default parameters	UINT8	RO	0x01 (1_{dec})
1011:01	SubIndex 001	If this object is set to “**0x64616F6C**” in the set value dialog, all backup objects are reset to their delivery state.	UINT32	RW	0x00000000 (0_{dec})

5.8.2 Configuration data

Index 8000 FB settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	FB Settings	Maximum subindex	UINT8	RO	0x13 (19_{dec})
8000:01	Invert feedback direction	Inverting the count direction	BOOLEAN	RW	0x00 (0_{dec})
8000:02	Referenced	The box sets this parameter to FALSE in two cases: • If a motor with a different serial number was detected. • If a motor with single-turn encoder was connected. If you want to use this function, set the parameter to TRUE and monitor it. The value of this parameter is retained if the power supply is interrupted.	BOOLEAN	RW	0x00 (0_{dec})
8000:11	Device type	3: OCT (not changeable)	UINT32	RW	0x00000003 (3_{dec})
8000:12	Singleturn bits	Number of single-turn bits [▶ 44]	UINT8	RW	0x14 (20_{dec})
8000:13	Multi-turn bits	Number of multi-turn bits [▶ 44]	UINT8	RW	0x0C (12_{dec})
8000:14	Observer bandwidth	Bandwidth of the speed observer [Hz]	UINT16	RW	0x01F4 (500_{dec})
8000:15	Observer feed-forward	Load ratio [%] 100% = load-free 50% = mass moments of inertia of input and output are equal	UINT8	RW	0x01 (0_{dec})
8000:17	Position Offset		UINT32	RW	0x00000000 (0_{dec})

Index 8008 FB OCT Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8008:0	FB OCT Settings	Maximum subindex	UINT8	RO	0x00 (0_{dec})
8008:01	Enable autoconfig	Configuration takes place automatically after the reading of the electronic type plate (see Automatic scanning of the electronic type plates [▶ 55])	BOOLEAN	RW	0x00 (0_{dec})
8008:02	Reconfig identical motor	When replacing identical motors, reconfiguration takes place automatically after reading the electronic type plate. *Enable autoconfig* must be activated. (see Automatic scanning of the electronic type plates [▶ 55])	BOOLEAN	RW	0x00 (0_{dec})
8008:03	Reconfig non-identical motor	When replacing non-identical motors, reconfiguration takes place automatically after reading the electronic type plate. *Enable autoconfig* must be activated. (see Automatic scanning of the electronic type plates [▶ 55])	BOOLEAN	RW	0x00 (0_{dec})

Index 8010 DRV Amplifier Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0	DRV Amplifier Settings	Maximum subindex	UINT8	RO	0x42 (66_{dec})
8010:01	Enable TxPDOToggle	Show TxPDO toggle in status word (bit 10)	BOOLEAN	RW	0x00 (0_{dec})
8010:02	Enable input cycle counter	1: enabled Two-bit counter that is incremented with each process data cycle up to a maximum value of 3, after which it starts again at 0 The low bit is represented in bit 10 and the high bit in bit 14 of the Status word.	BOOLEAN	RW	0x00 (0_{dec})
8010:11	Device type	1: Servo drive (cannot be changed)	UINT32	RW	0x00000001 (1_{dec})
8010:12*	Current loop integral time	Integral component of current controller **Unit**: 0.1 ms This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x000A (10_{dec})
8010:13*	Current loop proportional gain	Proportional component of current controller **Unit**: 0.1 V/A This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0064 (100_{dec})
8010:14	Velocity loop integral time	Integral component of velocity controller Unit: 0.1 ms	UINT32	RW	0x00000032 (50_{dec})
8010:15	Velocity loop proportional gain	Proportional component of velocity controller **Unit**: mA / (rad/s)	UINT32	RW	0x00000096 (150_{dec})
8010:17	Position loop proportional gain	Proportional component position controller **Unit**: (rad/s) / rad	UINT32	RW	0x0000000A (10_{dec})
8010:19	Nominal DC link voltage	Nominal DC link voltage **Unit**: mV	UINT32	RW	0x0000BB80 (48000_{dec})
8010:1A	Min DC link voltage	Minimum DC link voltage **Unit**: mV	UINT32	RW	0x00001A90 (6800_{dec})
8010:1B	Max DC link voltage	Maximum DC link voltage **Unit**: mV	UINT32	RW	0x0000EA60 (60000_{dec})
8010:29	Amplifier I2T warn level	I²T model warning threshold **Unit**: %	UINT8	RW	0x50 (80_{dec})
8010:2A	Amplifier I2T error level	I²T model error threshold **Unit**: %	UINT8	RW	0x69 (105_{dec})
8010:2B	Amplifier Temperature warn level	Overtemperature warning threshold **Unit**: 0.1 °C	UINT16	RW	0x0320 (800_{dec})
8010:2C	Amplifier Temperature error level	Overtemperature error threshold **Unit**: 0.1 °C	UINT16	RW	0x03E8 (1000_{dec})
8010:31	Velocity limitation	Velocity limitation **Unit**: rpm	UINT32	RW	0x00040000 (262144_{dec})
8010:32	Short-Circuit Brake duration max	Max. duration of armature short circuit brake **Unit**: ms	UINT16	RW	0x03E8 (1000_{dec})
8010:33	Stand still window	Standstill window **Unit**: rpm	UINT16	RW	0x0000 (0_{dec})

*) see index 9009 FB OCT Nameplate

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:39	Select info data 1	Selection "Info data 1" Optional display of additional information in the cyclic process data. The following parameters are available.	UINT8	RW	0x01 (1_{dec})
		Torque current (filtered 1ms) [1000th of rated current]			
		DC link voltage [mV]			
		PCB temperature [0.1 °C]			
		Errors: Bit0: ADC Error Bit1: Overcurrent Bit 2: Undervoltage Bit 3: Overvoltage Bit 4: Overtemperature Bit 5: I2T Amplifier Bit 6: I2T Motor Bit 7: Encoder Bit 8: Watchdog			
		Warnings: Bit 2: Undervoltage Bit 3: Overvoltage Bit 4: Overtemperature Bit 5: I2T Amplifier Bit 6: I2T Motor Bit 7: Encoder			
		I2T Motor [%]			
		I2T Amplifier [%]			
		Input Level: Bit0: Digital Input 1 Level Bit1: Digital Input 2 Level Bit8: HWE Level			
		Feature Bits: Bit0: Referenced (Parameter 8000:02 [▶ 89])			
8010:3A	Select info data 2	Selection "Info data 2" Optional display of additional information in the cyclic process data. The following parameters are available.	UINT8	RW	0x01 (1_{dec})
		Torque current (filtered 1ms) [1000th of rated current]			
		DC link voltage [mV]			
		PCB temperature [0.1 °C]			
		Errors: Bit0: ADC Error Bit1: Overcurrent Bit 2: Undervoltage Bit 3: Overvoltage Bit 4: Overtemperature Bit 5: I2T Amplifier Bit 6: I2T Motor Bit 7: Encoder Bit 8: Watchdog			
		Warnings: Bit 2: Undervoltage Bit 3: Overvoltage Bit 4: Overtemperature Bit 5: I2T Amplifier Bit 6: I2T Motor Bit 7: Encoder			
		I2T Motor [%]			
		I2T Amplifier [%]			
		Input Level: Bit0: Digital Input 1 Level Bit1: Digital Input 2 Level Bit8: HWE Level			
		Feature Bits: Bit0: Referenced (Parameter 8000:02 [▶ 89])			

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:41	Low-pass filter frequency	Low-pass filter frequency **Unit**: Hz The following values can be set: 0 Hz = off 160 Hz 320 Hz	UINT16	RW	0x0140 (320_{dec})
8010:49	Halt ramp deceleration	Halt ramp deceleration **Unit**: 0.1 rad / s²	UINT32	RW	0x0000F570 (62832_{dec})
8010:50	Following error window	Following error monitor: Following error window **Unit**: the given value must be multiplied by the corresponding scaling factor 0xFFFFFFFF (-1_{dec}) = following error monitor off Any other value = following error monitor on	UINT32	RW	0xFFFFFFFF (-1_{dec})
8010:51	Following error time out	Following error monitor: Timeout **Unit:** ms If the following error is larger than the following error window for a time that exceeds the timeout, this leads to an error reaction	UINT16	RW	0x0000 (0_{dec})
8010:52	Fault reaction option code	Permitted values 0: Disable drive function, motor is free to rotate 1: Slow down on slow down ramp	UINT16	RW	0x0000 (0_{dec})
8010:53	Position loop proportional gain	Proportional component position controller **Unit:** mA / (rad/s)	UINT32	RW	0x00000000 (0_{dec})
8010:54	Feature bits	The adjustable motor current values can be interpreted as peak values or rms values. The feature bit enables the conversion. Peak value → Bit 0 = 0 (default) RMS value → Bit 0 = 1 normal output current → Bit 1 = 0 (default) increased output current → Bit 1 = 1 From these, the following combinations can be set: 0_{dec} → normal output current interpreted as peak value 1_{dec} → normal output current interpreted as rms value 2_{dec} → increased output current interpreted as peak value 3_{dec} → increased output current interpreted as rms value	UINT32	RW	0x00000000 (0_{dec})

*) see index 9009 FB OCT Nameplate

Index 8011 DRV Motor Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8011:0	DRV Motor Settings	Maximum subindex	UINT8	RO	0x2D (45_{dec})
8011:11*	Max current	Peak current **Unit**: mA The adjustable motor current values can be interpreted as peak values or rms values. The feature bit (8010:54 [▶ 90]) enables the conversion. Peak value → Bit 0 = 0 (default) RMS value → Bit 0 = 1 This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00001770 (6000_{dec})
8011:12*	Rated current	Nominal current **Unit**: mA The adjustable motor current values can be interpreted as peak values or rms values. The feature bit (8010:54 [▶ 90]) enables the conversion. Peak value → Bit 0 = 0 (default) RMS value → Bit 0 = 1 This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x000003E8 (1000_{dec})
8011:13*	Motor pole pairs	Number of pole pairs This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT8	RW	0x03 (3_{dec})
8011:15*	Commutation offset	Commutation offset (between electrical zero position and mechanical single-turn zero position) **Unit**: This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	INT16	RW	0x0000 (0_{dec})
8011:16*	Torque constant	Torque constant **Unit**: mNm / A This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00000000 (0_{dec})
8011:18*	Rotor moment of inertia	Mass moment of inertia of the motor **Unit**: g cm^2 This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00000000 (0_{dec})
8011:19*	Winding inductance	Inductance **Unit**: 0.1 mH This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x000E (14_{dec})
8011:1B*	Motor speed limitation	Velocity limitation **Unit**: rpm This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00040000 (262144_{dec})

*) see index 9009 FB OCT Nameplate

Index (hex)	Name	Meaning	Data type	Flags	Default
8011:29	I2T warn level	I2T model warning threshold **Unit**: %	UINT8	RW	0x50 (80_{dec})
8011:2A	I2T error level	I2T model error threshold **Unit**: %	UINT8	RW	0x69 (105_{dec})
8011:2B*	Motor Temperature warn level	Overtemperature warning threshold **Unit**: 0.1 °C This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x03E8 (1000_{dec})
8011:2C*	Motor Temperature error level	Overtemperature error threshold **Unit**: 0.1 °C This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x05DC (1500_{dec})
8011:2D*	Motor thermal time constant	Thermal time constant **Unit**: 0.1 s This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0028 (40_{dec})

*) see index 9009 FB OCT Nameplate

Index 8012 DRV Brake Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8012:0	DRV Brake Settings	Maximum subindex	UINT8	RO	0x14 (20_{dec})
8012:01	Enable manual override	Manual release of the motor holding brake	BOOLEAN	RW	0x00 (0_{dec})
8012:02	Manual brake state	0: Release Release the brake 1: Apply Apply the brake	BOOLEAN	RW	0x00 (0_{dec})
8012:11*	Release delay	Time the holding brake requires for opening (releasing) after the current was applied This value is affected by automatic scanning. (see Automatic scanning of the electronic type plates)	UINT16	RW	0x0000 (0_{dec})
8012:12*	Application delay	Time the holding brake requires for closing (holding) after the current was switched off This value is affected by automatic scanning. (see Automatic scanning of the electronic type plates)	UINT16	RW	0x0000 (0_{dec})
8012:13	Emergency application timeout	Time the amplifier waits, until the rotation speed reaches the stand still window after stop request (set rotation speed 0 or Torque off). If the set waiting time is exceeded, the holding brake is triggered independently of the rotation speed. **Note:** For rotatory axes and the setting „torque off“ in error case, this parameter has to be set at least to the „coast to the stop“ time of the axis. For suspended (hanging) axes and the setting „torque off“ in error case, this parameter has to be set to an appropriate short time, to prevent the axis/load from drop/fall.	UINT16	RW	0x0000 (0_{dec})
8012:14*	Brake moment of inertia	Mass moment of inertia of the brake **Unit**: g cm^2 This value is affected by automatic scanning. (see Automatic scanning of the electronic type plates)	UINT16	RW	0x0000 (0_{dec})

*) see index 0x9009 FB OCT Nameplate

Index 8030 DMC settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8030:0	DMC settings	Maximum subindex	UINT8	RO	0x14 (20_{dec})
8030:07	Emergency deceleration	Deceleration for the emergency stop ramp. (In ms from rated motor speed to standstill) **Unit:** 1 ms	UINT16	RW	0x64 (100_{dec})
8030:08	Calibration position	If homing is successful, the "Actual position" is set to this value.	INT64	RW	0x0000000000000000 (0_{dec})
8030:09	Calibration velocity (towards plc cam)	Velocity on contact with the cam in 10000ths of the rated motor speed	INT16	RW	0x0064 (100_{dec})
8030:0A	Calibration velocity (off plc cam)	Velocity on separation from the cam in 10000ths of the rated motor speed	INT16	RW	0x000A (10_{dec})
8030:0E	Modulo factor	Feedback increments for one mechanical revolution	INT64	RW	0x0000000100000000 (4294967296_{dec})
8030:12	Block calibration torque limit	Torque limitation for approaching the end stop. In 1000ths of the rated motor current.	UINT16	RW	0x64 (100_{dec})
8030:13	Block calibration stop distance	After reaching the calibration position, the axis moves out of the end position by this distance.	INT64	RW	0x0000000100000000 (4294967296_{dec})
8030:14	Block calibration lag threshold	If this lag distance is exceeded, the axis is in the end position	INT64	RW	0x0000000100000000 (4294967296_{dec})
8030:15	Target position window	Target position window: The In-Target bit is set when the axis is within this window for at least the time set under 0x8030:16.	INT64	RW	0x16c16c1
8030:16	Target position monitor time	s. 0x8030:15 time in **Unit:** ms	UINT16	RW	0x0014 (20_{dec})
8030:17	Target position timeout	When the set value generator has reached its end position and the axis is not in the target window after this time has elapsed, the task is terminated and the in-target bit is not set.	UINT16	RW	0x1770 (6000_{dec})

Index 8031 DMC features

Index (hex)	Name	Meaning	Data type	Flags	Default
8031:0	DMC features	Maximum subindex	UINT8	RO	0x1B (27_{dec})
8031:13	Invert calibration cam search direction	Invert travel direction to search for limit switch (Default: FALSE = search with positive direction of rotation)	BOOLEAN	RW	0x00 (0_{dec})
8031:14	Invert sync impulse search direction		BOOLEAN	RW	0x01 (1_{dec})
8031:19	Calibration cam source	Source for the reference switch 0: Input 1 1: Input 2	ENUM8	RW	0x00 (0_{dec})
8031:1A	Calibration cam active level	State of the reference switch in the actuated state 0: Hi 1: Low	ENUM8	RW	0x00 (0_{dec})
8031:B	Latch source	Source for the latch unit 0: Input 1 1: Input 2	ENUM8	RW	0x00 (0_{dec})

5.8.3 Configuration data (vendor-specific)

Index 801F DRV Vendor data

Index (hex)	Name	Meaning	Data type	Flags	Default
801F:0	DRV Vendor data	Maximum subindex	UINT8	RO	0x14 (20_{dec})
801F:11	Amplifier peak current	Peak current of the amplifier (peak value) **Unit**: mA	UINT32	RW	0x00001F40 (8000_{dec})
801F:12	Amplifier rated current	Tated current of the amplifier (peak value) **Unit**: mA	UINT32	RW	0x00000FA0 (4000_{dec})
801F:13	Amplifier thermal time constant	Thermal time constant of the amplifier **Unit**: 0.1 ms	UINT16	RW	0x0023 (35_{dec})
801F:14	Amplifier overcurrent threshold	Threshold value for short-circuit detection **Unit**: mA	UINT32	RW	0x00002EE0 (12000_{dec})

5.8.4 Command object

Index FB00 command

Index (hex)	Name	Meaning			Data type	Flags	Default
FB00:0	DCM Command	Max. subindex			UINT8	RO	0x03 (3_{dec})
FB00:01	Request	0x1000	Clear the Diag History	Clear the Diag History	OCTET-STRING[2]	RW	{0}
		0x1100	Get build number	Read out the build number			
		0x1101	Get build date	Read out the build date			
		0x1102	Get build time	Read out the build time			
		0x8000	Software reset	Perform a software reset (hardware is re-initialized with the current CoE configuration; this otherwise happens only during the transition to INIT)			
FB00:02	Status	0	Finished, no error, no response	Command terminated without error and without response	UINT8	RO	0x00 (0_{dec})
		1	Finished, no error, response	Command terminated without error and with response			
		2	Finished, error, no response	Command terminated with error and without response			
		3	Finished, error, response	Command terminated with error and with response			
		255	Executing	Command is being executed			
FB00:03	Response	dependent on the request			OCTET-STRING[4]	RO	{0}

5.8.5 Input data

Index 6000 FB Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	FB Inputs	Maximum subindex	UINT8	RO	0x11 (17_{dec})
6000:11	Position	Position	UINT32	RO	0x00000000 (0_{dec})

Index 6001 FB Touch probe inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6001:0	FB Touch probe inputs	Maximum subindex	UINT8	RO	0x14 (20_{dec})
6001:01	TP1 Enable	Touchprobe 1 switched on	BOOLEAN	RO	0x00 (0_{dec})
6001:02	TP1 pos value stored	Positive value of Touchprobe 1 saved	BOOLEAN	RO	0x00 (0_{dec})
6001:03	TP1 Neg value stored	Negative value of Touchprobe 1 saved	BOOLEAN	RO	0x00 (0_{dec})
6001:09	TP2 Enable	Touchprobe 2 switched on	BOOLEAN	RO	0x00 (0_{dec})
6001:0A	TP2 pos value stored	Positive value of Touchprobe 2 saved	BOOLEAN	RO	0x00 (0_{dec})
6001:0B	TP2 neg value stored	Negative value of Touchprobe 2 saved	BOOLEAN	RO	0x00 (0_{dec})
6001:11	TP1 pos position	Positive value of Touchprobe 1 **Unit**: the given value must be multiplied by the corresponding scaling factor [▶ 47]	UINT32	RO	0x00000000 (0_{dec})
6001:12	TP1 neg position	Negative value of Touchprobe 1 **Unit**: the given value must be multiplied by the corresponding scaling factor [▶ 47]	UINT32	RO	0x00000000 (0_{dec})
6001:13	TP2 pos position	Positive value of Touchprobe 2 **Unit**: the given value must be multiplied by the corresponding scaling factor [▶ 47]	UINT32	RO	0x00000000 (0_{dec})
6001:14	TP2 neg position	Negative value of Touchprobe 2 **Unit**: the given value must be multiplied by the corresponding scaling factor [▶ 47]	UINT32	RO	0x00000000 (0_{dec})

Index 6010 DRV Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	DRV Inputs	Maximum subindex	UINT8	RO	0x13 (19_{dec})
6010:01	Statusword	Statusword Bit 0: Ready to switch on Bit 1: Switched on Bit 2: Operation enabled Bit 3: Fault Bit 4: reserved Bit 5: Quick stop (inverse) Bit 6: Switch on disabled Bit 7: Warning Bit 8 + 9: reserved Bit 10: TxPDOToggle (selection/deselection via 0x8010:01 [▶ 90]) Bit 11: Internal limit active Bit 12: Drive follows the command value Bit 13 - 15: reserved	UINT16	RO	0x0000 (0_{dec})
6010:03	Modes of operation display	Modes of operation display. Permitted values: 9: Cyclic synchronous velocity mode (CSV) 10: Cyclic synchronous torque mode (CST) 11: Cyclic synchronous torque mode with commutation angle (CSTCA)	UINT8	RO	0x00 (0_{dec})
6010:06	Following error actual value	Following error **Unit**: the given value must be multiplied by the corresponding scaling factor [▶ 47]	INT32	RO	0x00000000 (0_{dec})
6010:07	Velocity actual value	Display of the current velocity value **Unit:** see Index 0x9010:14 [▶ 104]	INT32	RO	0x00000000 (0_{dec})
6010:08	Position actual value	Display of current torque value The value is specified in 1000th of the *rated current* (0x8011:12) Equation for index 8010:54 [▶ 90] = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (8011:16 [▶ 93]) Equation for index 8010:54 [▶ 90] = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (8011:16 [▶ 93])	INT16	RO	0x0000 (0_{dec})
6010:12	Info data 1	Synchronous information (selection via subindex 0x8010:39 [▶ 90])	UINT16	RO	0x0000 (0_{dec})
6010:13	Info data 2	Synchronous information (selection via subindex 0x8010:3A [▶ 90])	UINT16	RO	0x0000 (0_{dec})

Index 6030 DMC inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6030:0	DMC inputs	Maximum subindex	UINT8	RO	0x3C (60_{dec})
6030:02	DMC_FeedbackStatus__Latch extern valid	An edge was detected on the external input and latched	BOOLEAN	RO	0x00 (0_{dec})
6030:03	DMC_FeedbackStatus__Set counter done	The setting of the feedback position was successful. This bit remains present until "Set counter" is released again	BOOLEAN	RO	0x00 (0_{dec})
6030:0D	DMC_FeedbackStatus__Status of extern Latch	Status of the external latch input	BOOLEAN	RO	0x00 (0_{dec})
6030:11	DMC_DriveStatus__Ready to enable	The drive hardware is ready for activation.	BOOLEAN	RO	0x00 (0_{dec})
6030:12	DMC_DriveStatus__Ready	The drive hardware is activated.	BOOLEAN	RO	0x00 (0_{dec})
6030:13	DMC_DriveStatus__Warning	A warning is pending in the drive.	BOOLEAN	RO	0x00 (0_{dec})
6030:14	DMC_DriveStatus__Error	An error is pending in the drive. The "Ready to enable" bit and the "Ready" bit are set to FALSE.	BOOLEAN	RO	0x00 (0_{dec})
6030:15	DMC_DriveStatus__Moving positive	The axis moves in positive direction.	BOOLEAN	RO	0x00 (0_{dec})
6030:16	DMC_DriveStatus__Moving negative	The axis moves in negative direction	BOOLEAN	RO	0x00 (0_{dec})
6030:1C	DMC_DriveStatus__Digital Input 1	Status of the first digital input	BOOLEAN	RO	0x00 (0_{dec})
6030:1D	DMC_DriveStatus__Digital Input 2	Status of the second digital input	BOOLEAN	RO	0x00 (0_{dec})
6030:21	DMC_PositioningStatus__Busy	The positioning task is running.	BOOLEAN	RO	0x00 (0_{dec})
6030:22	DMC_PositioningStatus__In-Target	The axis is at the target position.	BOOLEAN	RO	0x00 (0_{dec})
6030:23	DMC_PositoningStatus__Warning	Warning	BOOLEAN	RO	0x00 (0_{dec})
6030:24	DMC_PositoningStatus__Error	error	BOOLEAN	RO	0x00 (0_{dec})
6030:25	DMC_PositoningStatus__Calibrated	The axis is calibrated.	BOOLEAN	RO	0x00 (0_{dec})
6030:26	DMC_PositioningStatus__Accelerate	The axis accelerates.	BOOLEAN	RO	0x00 (0_{dec})
6030:27	DMC_PositioningStatus__Decelerate	The axis is decelerating.	BOOLEAN	RO	0x00 (0_{dec})
6030:28	DMC_PositoningStatus__Ready to execute	The path control is ready to accept a command. This bit is FALSE if: • The drive has a fault • The drive is not activated • As long as "PositioningControl__Execute" is pending.	BOOLEAN	RO	0x00 (0_{dec})
6030:31	DMC__Set position	Current target position specified by the ramp generator in feedback increments	INT64	RO	0x0000000000000000 (0_{dec})
6030:32	DMC__Set velocity	Current velocity specified by the ramp generator in 10000ths of the rated motor speed	INT16	RO	0x0000 (0_{dec})
6030:33	DMC__Actual drive time	Time since the start of the motion command in ms. Stops when the target position is reached	UINT32	RO	0x00000000 (0_{dec})
6030:34	DMC__Actual position lag	Following error	INT64	RO	0x0000000000000000 (0_{dec})
6030:35	DMC__Actual velocity	Current velocity in 10000ths of the rated motor speed	INT16	RO	0x0000 (0_{dec})
6030:36	DMC__Actual position	Current position from the feedback (incl. possible offsets due to homing, ...)	INT64	RO	0x0000000000000000 (0_{dec})
6030:37	DMC__Error id	Error Id (identical to Diag History)	UINT32	RO	0x00000000 (0_{dec})
6030:38	DMC__Input cycle counter	Incremented with each process data cycle	UINT8	RO	0x00 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
6030:3A	DMC__Latch value	Feedback position at latch time	INT64	RO	0x0000000000000000 (0_{dec})
6030:3B	DMC__Cyclic info data 1	Synchronous info data	INT16	RO	0x0000 (0_{dec})
6030:3C	DMC__Cyclic info data 2	Synchronous info data	INT16	RO	0x0000 (0_{dec})

5.8.6 Output data

Index 7001 FB Touch probe outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7001:0	FB Touch probe outputs	Maximum subindex	UINT8	RO	0x0E (14_{dec})
7001:01	TP1 Enable	Switch on Touchprobe 1	BOOLEAN	RO	0x00 (0_{dec})
7001:02	TP1 Continous	0: triggered only on the first event 1. triggered on every event	BOOLEAN	RO	0x00 (0_{dec})
7001:03	TP1 Trigger mode	Input 1 is triggered (not changeable).	BIT2	RO	0x00 (0_{dec})
7001:05	TP1 Enable pos edge	Trigger on positive edge	BOOLEAN	RO	0x00 (0_{dec})
7001:06	TP1 Enable neg edge	Trigger on negative edge	BOOLEAN	RO	0x00 (0_{dec})
7001:09	TP2 Enable	Switch on Touchprobe 2	BOOLEAN	RO	0x00 (0_{dec})
7001:0A	TP2 Continous	0: triggered only on the first event 1. triggered on every event	BOOLEAN	RO	0x00 (0_{dec})
7001:0B	TP2 Trigger mode	Input 2 is triggered (not changeable).	BIT2	RO	0x00 (0_{dec})
7001:0D	TP2 Enable pos edge	Trigger on positive edge	BOOLEAN	RO	0x00 (0_{dec})
7001:0E	TP2 Enable neg edge	Trigger on negative edge	BOOLEAN	RO	0x00 (0_{dec})

Index 7010 DRV Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	DRV Outputs	Maximum subindex	UINT8	RO	0x0E (14_{dec})
7010:01	Controlword	Controlword Bit 0: Switch on Bit 1: Enable voltage Bit 2: Quick stop (inverse) Bit 3: Enable operation Bit 4 - 6: reserved Bit 7: Fault reset Bit 8 - 15: reserved	UINT16	RO	0x0000 (0_{dec})
7010:03	Modes of operation	Permitted values: 0x08: Cyclic synchronous position mode (CSP) 0x09: Cyclic synchronous velocity mode (CSV) 0x0A: Cyclic synchronous torque mode (CST) 0x0B: Cyclic synchronous torque mode with commutation angle (CSTCA)	UINT8	RW	0x00 (0_{dec})
7010:05	Target position	Configured target position **Unit**: the value must be multiplied by the corresponding scaling factor	UINT32	RW	0x00000000 (0_{dec})
7010:06	Target velocity	Configured target velocity The velocity scaling can be found in index 0x9010:14 (Velocity encoder resolution).	INT32	RO	0x00000000 (0_{dec})
7010:09	Target torque	Configured input value for torque monitoring The value is specified in 1000th of the *rated current* (0x8011:12 [▶ 94]). Equation for index 0x8010:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x8011:16) Equation for index 0x8010:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x8011:16)	INT16	RO	0x0000 (0_{dec})
7010:0A	Torque offset	Torque value offset The value is specified in 1000th of the *rated current* (0x8011:12 [▶ 94]). Equation for index 0x8010:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x8011:16) Equation for index 0x8010:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x8011:16)	INT16	RO	0x0000 (0_{dec})
7010:0B	Torque limitation	Torque threshold value for torque monitoring (bipolar limit) The value is specified in 1000th of the *rated current* (0x8011:12 [▶ 94]). Equation for index 0x8010:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x8011:16) Equation for index 0x8010:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x8011:16)	UINT16	RW	0x7FFF (32767_{dec})
7010:0E	Commutation angle	Commutation angle (for CSTCA mode) **Unit:** 360° / 2^{16}	UINT16	RO	0x0000 (0_{dec})

Index 7030 DMC outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7030:0	DMC outputs	Maximum subindex	UINT8	RO	0x36 (54_{dec})
7030:02	DMC_FeedbackControl__Enable latch extern on positive edge	Latches to the positive edge of the external input	BOOLEAN	RO	0x00 (0_{dec})
7030:03	DMC_FeedbackControl__Set counter	With a rising edge, "Actual position" is set to the value of "Set counter value".	BOOLEAN	RO	0x00 (0_{dec})
7030:04	DMC_FeedbackControl__Enable latch extern on negative edge	Latches to the negative edge of the external input	BOOLEAN	RO	0x00 (0_{dec})
7030:11	DMC_DriveControl__Enable	Activate drive	BOOLEAN	RO	0x00 (0_{dec})
7030:12	DMC_DriveControl__Reset	Perform a reset of the drive hardware	BOOLEAN	RO	0x00 (0_{dec})
7030:21	DMC_PositionControl__Execute	Start motion command with rising edge The task runs as long as this bit is set or until the command is completed. If the level drops during travel, the axis is brought to a standstill with the deceleration specified for the task.	BOOLEAN	RO	0x00 (0_{dec})
7030:22	DMC_PositionControl__Emergency stop	In the event of a rising edge, decelerate to a standstill with the emergency stop ramp	BOOLEAN	RO	0x00 (0_{dec})
7030:31	DMC__Set counter value	s. 0x7030:03	INT64	RO	0x0000000000000000 (0_{dec})
7030:32	DMC__Target position	Position specification in feedback increments	INT64	RO	0x0000000000000000 (0_{dec})
7030:33	DMC__Target velocity	Maximum velocity during the motion command in 10000ths of the rated motor speed	INT16	RO	0x0000 (0_{dec})
7030:34	DMC__Start type	Type of positioning task: 0x0001: Absolute 0x0002: Relative 0x0003: Endless + 0x0004: Endless - 0x0105: Modulo short 0x0205: Modulo + 0x0305: Modulo - 0x6000: Cali PLC cam 0x6200: Cali block 0x6E00: Cali set 0x6F00: Cali clear	UINT16	RO	0x0000 (0_{dec})
7030:35	DMC__Target acceleration	Acceleration: Time in ms from standstill to reaching the rated motor speed	UINT16	RO	0x0000 (0_{dec})
7030:36	DMC__Target deceleration	Delay: Time in ms for deceleration from rated motor speed to standstill	UINT16	RO	0x0000 (0_{dec})

5.8.7 Information / diagnosis data

Index 10F3 Diagnosis History

Index (hex)	Name	Meaning	Data type	Flags	Default
10F3:0	Diagnosis History	Maximum subindex	UINT8	RO	0x37 (55_{dec})
10F3:01	Maximum Messages	Maximum number of stored messages. A maximum of 50 messages can be stored	UINT8	RO	0x00 (0_{dec})
10F3:02	Newest Message	Subindex of the latest message	UINT8	RO	0x00 (0_{dec})
10F3:03	Newest Acknowledged Message	Subindex of the last confirmed message	UINT8	RW	0x00 (0_{dec})
10F3:04	New Messages Available	Indicates that a new message is available	BOOLEAN	RO	0x00 (0_{dec})
10F3:05	Flags	not used	UINT16	RW	0x0000 (0_{dec})
10F3:06	Diagnosis Message 001	Message 1	OCTET-STRING[28]	RO	{0}
...	...	...	...	...	...
10F3:37	Diagnosis Message 050	Message 50	OCTET-STRING[28]	RO	{0}

Index 10F8 Actual Time Stamp

Index (hex)	Name	Meaning	Data type	Flags	Default
10F8:0	Actual Time Stamp	Time stamp	UINT64	RO	

Index 9008 FB OCT Info data

(these data are always read in automatically from the electronic identification plate of the motor and serve purely informative purposes)

Index (hex)	Name	Meaning	Data type	Flags	Default
9008:0	FB OCT Info data	Maximum subindex	UINT8	RO	0x1F (31_{dec})
9008:11	Encoder type	Feedback type 2: rotary encoder, unipolar counting	UINT16	RO	0x0000 (0_{dec})
9008:12	Resolution	Resolution of the feedback **Unit**: Steps per revolution	UINT32	RO	0x00000000 (0_{dec})
9008:13	Range	Working area of the feedback. On leaving this range there is an overflow of the position. **Unit**: Revolutions	UINT32	RO	0x00000000 (0_{dec})
9008:14	Type Code Name	Name of the feedback	STRING	RO	
9008:15	Serial No	Serial number of the feedback	STRING	RO	
9008:16	Firmware Revision No	Revision of the firmware	STRING	RO	
9008:17	Firmware Date	Date of the firmware	STRING	RO	
9008:18	EEPROM Size	EEPROM size	UINT16	RO	0x0000 (0_{dec})
9008:19	Temperature	Temperature **Unit**: 0.1°	INT16	RO	0x0000 (0_{dec})
9008:1A	LED Current	Current of the feedback LED **Unit**: 0.1 mA	UINT16	RO	0x0000 (0_{dec})
9008:1B	Supply voltage	Supply voltage of the feedback **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9008:1C	Life- time	Operating hour counter **Unit**: Minutes	UINT32	RO	0x00000000 (0_{dec})
9008:1D	Received Signal Strength Indicator	Received signal strength at the box **Unit**: %	UINT16	RO	0x0000 (0_{dec})
9008:1E	Slave Received Signal Strength Indicator	Received signal strength at the encoder **Unit**: %	UINT16	RO	0x0000 (0_{dec})
9008:1F	Line delay	Running time of the signal in the cable **Unit**: ns	UINT16	RO	0x0000 (0_{dec})

Index 9009 FB OCT Nameplate

The parameters described in this index are always read from the electronic type plate of the connected motor. These parameters automatically lead to the parameters marked with an asterisk (*) in this chapter, if automatic scanning of the electronic type plate is switched on (index 0x8008).

Index (hex)	Name	Meaning	Data type	Flags	Default
9009:0	FB OCT Nameplate	Maximum subindex	UINT8	RO	0x24 (36_{dec})
9009:01	Motor vendor	Motor vendor	STRING	RO	
9009:02	Electric motor type	Motor type	STRING	RO	
9009:03	Serial No	Serial number	STRING	RO	
9009:04	Order code	Order number (In case of Autoconfig a check is made on the basis of this index as to whether the motor is identical to the predecessor)	STRING	RO	
9009:05	Motor construction	Type of motor	STRING	RO	
9009:06	Pole pairs	Number of pole pairs	UINT32	RO	0x00000000 (0_{dec})
9009:07	Standstill current (rms)	Effective holding current **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
9009:08	Rated current (rms)	Effective rated current **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
9009:09	Peak current (rms)	Effective peak current **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
9009:0A	Nominal voltage (rms)	Effective nominal voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9009:0B	Max voltage (rms)	Maximum voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9009:0C	Max winding du/dt	Maximum permissible voltage rise on the winding **Unit**: kV/s	UINT32	RO	0x00000000 (0_{dec})
9009:0D	Max torque	Maximum torque **Unit**: mNm	UINT16	RO	0x0000 (0_{dec})
9009:0E	Torque constant	Torque constant **Unit**: mNm / A	UINT16	RO	0x0000 (0_{dec})
9009:0F	EMK (rms)	Reverse voltage **Unit**: mV / (rpm)	UINT32	RO	0x00000000 (0_{dec})
9009:10	Winding resistance Ph-Ph 20°C	Coil resistance **Unit**: mOhm	UINT16	RO	0x0000 (0_{dec})
9009:11	Ld Ph-Ph	Inductance in the direction of flow **Unit**: 0.1 mH	UINT16	RO	0x0000 (0_{dec})
9009:12	Lq Ph-Ph	Inductance in the torque-forming direction **Unit**: 0.1 mH	UINT16	RO	0x0000 (0_{dec})
9009:13	Max speed	Maximum speed **Unit**: rpm	UINT32	RO	0x00000000 (0_{dec})
9009:14	Moment of inertia	Mass moment of inertia **Unit**: g cm^2	UINT16	RO	0x0000 (0_{dec})
9009:15	T motor warn limit	Motor temperature warning threshold **Unit**: 0.1°C	UINT16	RO	0x0000 (0_{dec})
9009:16	T motor shut down	Motor temperature error threshold **Unit**: 0.1°C	UINT16	RO	0x0000 (0_{dec})
9009:17	Time constant i2t	Time constant I2T model **Unit**: s	UINT16	RO	0x0000 (0_{dec})
9009:18	Motor thermal constant	Thermal time constant of the motor **Unit**: s	UINT16	RO	0x0000 (0_{dec})
9009:1B	Brake type	Brake type • no Brake • holding Brake	STRING	RO	
9009:1C	Min brake voltage	Minimum brake voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9009:1D	Max brake voltage	Maximum brake voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9009:1E	Min brake monitor current	Minimum current for the monitoring of the brake **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
9009:1F	Brake holding torque	Brake holding torque **Unit**: mNm	UINT32	RO	0x00000000 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
9009:20	Brake T on	Time until the brake is applied **Unit**: ms	UINT16	RO	0x0000 (0_{dec})
9009:21	Brake T off	Time until the brake is released **Unit**: ms	UINT16	RO	0x0000 (0_{dec})
9009:22	Brake reduced holding voltage	Reduced brake voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9009:23	Brake time to red. holding volt.	Time from which the brake holds with reduced voltage **Unit**: ms	UINT16	RO	0x0000 (0_{dec})
9009:24	Motor temp sensor connection	Temperature sensor connection Feedback port (not changeable)	STRING	RO	

Index 9010 DRV Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
9010:0	DRV info data	Maximum subindex	UINT8	RO	0x14 (20_{dec})
9010:11	Amplifier temperature	Internal temperature of the box **Unit**: 0.1 °C	UINT16	RO	0x0000 (0_{dec})
9010:12	DC link voltage	DC link voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
9010:13	Supported drive modes	Information about supported drive modes. (DS402: Object 0x6502) Only modes *CSV*, *CST*, *CSTCA and CSP* are supported Bit 0: PP Bit 1: VL Bit 2: PV Bit 3: TQ Bit 4: R Bit 5: HM Bit 6: IP Bit 7: CSP Bit 8: CSV Bit 9: CST Bit 10: CSTCA Bit 11 - 15: reserved Bit 16-31: Manufacturer-specific	UINT32	RO	0x00000000 (0_{dec})
9010:14	Velocity encoder resolution	Display of configured encoder increments/s and motor revolutions/s. The velocity encoder resolution is calculated according to the following formula: Velocity Encoder Resolution = (encoder_increments / s) / (motor_revolutions / s)	UINT32	RO	0x00041893 (268435_{dec})

Index 9018 DRV Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
9018:0	DRV Info data	Maximum subindex	UINT8	RO	0x11 (17_{dec})
9018:11	Auxiliary voltage (10 V)	Auxiliary voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})

Index A010 DRV Amplifier Diag data

Index (hex)	Name	Meaning	Data type	Flags	Default
A010:0	DRV Amplifier Diag data	Maximum subindex	UINT8	RO	0x11 (17_{dec})
A010:11	Amplifier I2T temperature	I2T model load **Unit**: %	UINT8	RO	0x00 (0_{dec})

Index A011 DRV Motor Diag data

Index (hex)	Name	Meaning	Data type	Flags	Default
A011:0	DRV Motor Diag data	Maximum subindex	UINT8	RO	0x13 (19_{dec})
A011:11	Motor I2T temperature	I2T model load **Einheit**: %	UINT8	RO	0x00 (0_{dec})
A011:13	Motor temperature	Temperature utilization ratio **Unit**: °	INT16	RO	0x0000 (0_{dec})

5.8.8 Standard objects

Index 1000 Device type

Index (hex)	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT slave: the Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x00001389 (5001_{dec})

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EP7211-0034 / EP7211-0035

Index 1009 Hardware version

Index (hex)	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT slave	STRING	RO	

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x1C2B4052 (472596562_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the low word (bit 0-15) indicates the special terminal number, the high word (bit 16-31) refers to the device description	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10F0 Backup parameter handling

Index (hex)	Name	Meaning	Data type	Flags	Default
10F0:0	Backup parameter handling	Information for standardized loading and saving of backup entries	UINT8	RO	0x01 (1_{dec})
10F0:01	Checksum	Checksum across all backup entries of the EtherCAT slave	UINT32	RO	0x00000000 (0_{dec})

Index 1600 DRV RxPDO-Map Controlword

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	DRV RxPDO-Map Controlword	PDO Mapping RxPDO 1	UINT8	RO	0x01 (1_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x01 (Controlword))	UINT32	RO	0x7010:01, 16

Index 1601 DRV RxPDO-Map Target velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	DRV RxPDO-Map Target velocity	PDO Mapping RxPDO 2	UINT8	RO	0x01 (1_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x06 (Target velocity))	UINT32	RO	0x7010:06, 32

Index 1602 DRV RxPDO-Map Target torque

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	DRV RxPDO-Map Target torque	PDO Mapping RxPDO 3	UINT8	RO	0x01 (1_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x09 (Target torque))	UINT32	RO	0x7010:09, 16

Index 1603 DRV RxPDO-Map Commutation angle

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	DRV RxPDO-Map Commutation angle	PDO Mapping RxPDO 4	UINT8	RO	0x01 (1_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x0E (Commutation angle))	UINT32	RO	0x7010:0E, 16

Index 1604 DRV RxPDO-Map Torque limitation

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	DRV RxPDO-Map Torque limitation	PDO Mapping RxPDO 5	UINT8	RO	0x01 (1_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x0B (Torque limitation))	UINT32	RO	0x7010:0B, 16

Index 1605 DRV RxPDO-Map Torque offset

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	DRV RxPDO-Map Torque offset	PDO Mapping RxPDO 6	UINT8	RO	0x01 (1_{dec})
1605:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x0A (Torque offset))	UINT32	RO	0x7010:0A, 16

Index 1606 DRV RxPDO-Map Target position

Index (hex)	Name	Meaning	Data type	Flags	Default
1606:0	DRV RxPDO-Map Target position	PDO Mapping RxPDO 7	UINT8	RO	0x01 (1_{dec})
1606:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DRV Outputs), entry 0x05 (Target postion))	UINT32	RO	0x7010:05, 32

Index 1607 FB RxPDO-Map Touch probe control

Index (hex)	Name	Meaning	Data type	Flags	Default
1607:0	FB RxPDO-Map Touch probe control	PDO Mapping RxPDO 8	UINT8	RO	0x0C (12_{dec})
1607:01	SubIndex 001	1. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x01 (TP1 Enable))	UINT32	RO	0x7001:01, 1
1607:02	SubIndex 002	2. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x02 (TP1 Continous))	UINT32	RO	0x7001:02, 1
1607:03	SubIndex 003	3. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x03 (TP1 Trigger mode))	UINT32	RO	0x7001:03, 2
1607:04	SubIndex 004	4. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x05 (TP1 Enable pos edge))	UINT32	RO	0x7001:05, 1
1607:05	SubIndex 005	5. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x06 (TP1 Enable neg edge))	UINT32	RO	0x7001:06, 1
1607:06	SubIndex 006	6. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1607:07	SubIndex 007	7. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x09 (TP2 Enable))	UINT32	RO	0x7001:09, 1
1607:08	SubIndex 008	8. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x0A (TP2 Continous))	UINT32	RO	0x7001:0A, 1
1607:09	SubIndex 009	9. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x0B (TP2 Trigger mode))	UINT32	RO	0x7001:0B, 2
1607:0A	SubIndex 010	10. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x0D (TP2 Enable pos edge))	UINT32	RO	0x7001:0D, 1
1607:0B	SubIndex 011	11. PDO Mapping entry (object 0x7001 (FB Touch probe outputs), entry 0x0E (TP2 Enable neg edge))	UINT32	RO	0x7001:0E, 1
1607:0C	SubIndex 012	12. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2

Index 1A00 FB TxPDO-Map Position

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	FB TxPDO-Map Position	PDO Mapping TxPDO 1	UINT8	RO	0x01 (1_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (FB Inputs), entry 0x11 (Position))	UINT32	RO	0x6000:11, 32

Index 1A01 DRV TxPDO-Map Statusword

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	DRV TxPDO-Map Statusword	PDO Mapping TxPDO 2	UINT8	RO	0x01 (1_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DRV Inputs), entry 0x01 (Statusword))	UINT32	RO	0x6010:01, 16

Index 1A02 DRV TxPDO-Map Velocity actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	DRV TxPDO-Map Velocity actual value	PDO Mapping TxPDO 3	UINT8	RO	0x01 (1_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DRV Inputs), entry 0x07 (Velocity actual value))	UINT32	RO	0x6010:07, 32

Index 1A03 DRV TxPDO-Map Torque actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	DRV TxPDO-Map Torque actual value	PDO Mapping TxPDO 4	UINT8	RO	0x01 (1_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DRV Inputs), entry 0x08 (Torque actual value))	UINT32	RO	0x6010:08, 16

Index 1A04 DRV TxPDO-Map Info data 1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	DRV TxPDO-Map Info data 1	PDO Mapping TxPDO 5	UINT8	RO	0x01 (1_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DRV Inputs), entry 0x12 (Info data 1))	UINT32	RO	0x6010:12, 16

Index 1A05 DRV TxPDO-Map Info data 2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	DRV TxPDO-Map Info data 2	PDO Mapping TxPDO 6	UINT8	RO	0x01 (1_{dec})
1A05:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DRV Inputs), entry 0x13 (Info data 2))	UINT32	RO	0x6010:13, 16

Index 1A06 DRV TxPDO-Map Following error actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A06:0	DRV TxPDO-Map Following error actual value	PDO Mapping TxPDO 7	UINT8	RO	0x01 (1_{dec})
1A06:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DRV Inputs), entry 0x06 (Following error actual value))	UINT32	RO	0x6010:06, 32

Index 1A07 FB TxPDO-Map Touch probe status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A07:0	FB TxPDO-Map Touch probe status	PDO Mapping TxPDO 8	UINT8	RO	0x0A (10_{dec})
1A07:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x01 (TP1 Enable))	UINT32	RO	0x6001:01, 1
1A07:02	SubIndex 002	2. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x02 (TP1 pos value stored))	UINT32	RO	0x6001:02, 1
1A07:03	SubIndex 003	3. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x03 (TP1 Neg value stored))	UINT32	RO	0x6001:03, 1
1A07:04	SubIndex 004	4. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1A07:05	SubIndex 005	5. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x08 (TP1 Input))	UINT32	RO	0x6001:08, 1
1A07:06	SubIndex 006	6. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x09 (TP2 Enable))	UINT32	RO	0x6001:09, 1
1A07:07	SubIndex 007	7. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x0A (TP2 pos value stored))	UINT32	RO	0x6001:0A, 1
1A07:08	SubIndex 008	8. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x0B (TP2 neg value stored))	UINT32	RO	0x6001:0B, 1
1A07:09	SubIndex 009	9. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1A07:0A	SubIndex 010	10. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x10 (TP2 Input))	UINT32	RO	0x6001:10, 1

Index 1A08 FB TxPDO-Map Touch probe 1 pos position

Index (hex)	Name	Meaning	Data type	Flags	Default
1A08:0	FB TxPDO-Map Touch probe 1 pos position	PDO Mapping TxPDO 9	UINT8	RO	0x01 (1_{dec})
1A08:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (FP Touch probe inputs), entry 0x11 (TP1 Pos position))	UINT32	RO	0x6001:11, 32

Index 1A09 FB TxPDO-Map Touch probe 1 neg position

Index (hex)	Name	Meaning	Data type	Flags	Default
1A09:0	FB TxPDO-Map Touch probe 1 neg position	PDO Mapping TxPDO 10	UINT8	RO	0x01 (1_{dec})
1A09:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x12 (TP1 Neg position))	UINT32	RO	0x6001:12, 32

Index 1A0A FB TxPDO-Map Touch probe 2 pos position

Index (hex)	Name	Meaning	Data type	Flags	Default
1A0A:0	FB TxPDO-Map Touch probe 2 pos position	PDO Mapping TxPDO 11	UINT8	RO	0x01 (1_{dec})
1A0A:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x13 (TP2 Pos position))	UINT32	RO	0x6001:13, 32

Index 1A0B FB TxPDO-Map Touch probe 2 neg position

Index (hex)	Name	Meaning	Data type	Flags	Default
1A0B:0	FB TxPDO-Map Touch probe 2 neg position	PDO Mapping TxPDO 12	UINT8	RO	0x01 (1_{dec})
1A0B:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (FB Touch probe inputs), entry 0x14 (TP2 neg position))	UINT32	RO	0x6001:14, 32

Index 1C00 Sync manager type

Index (hex)	Name	Meaning	Data type	Flags	Default
1C00:0	Sync manager type	Using the sync managers	UINT8	RO	0x04 (4_{dec})
1C00:01	SubIndex 001	Sync-Manager Type Channel 1: Mailbox Write	UINT8	RO	0x01 (1_{dec})
1C00:02	SubIndex 002	Sync-Manager Type Channel 2: Mailbox Read	UINT8	RO	0x02 (2_{dec})
1C00:03	SubIndex 003	Sync-Manager Type Channel 3: Process Data Write (Outputs)	UINT8	RO	0x03 (3_{dec})
1C00:04	SubIndex 004	Sync-Manager Type Channel 4: Process Data Read (Inputs)	UINT8	RO	0x04 (4_{dec})

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x02 (2_{dec})
1C12:01	Subindex 001	1. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1601 (5633_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:04	Subindex 004	4. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:05	Subindex 005	5. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:06	Subindex 006	6. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:07	Subindex 007	7. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:08	Subindex 008	8. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x03 (3_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	Subindex 003	3. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A02 (6658_{dec})
1C13:04	Subindex 004	4. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:05	Subindex 005	5. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:06	Subindex 006	6. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:07	Subindex 007	7. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:08	Subindex 008	8. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:09	Subindex 009	9. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:0A	Subindex 010	10. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:0B	Subindex 011	11. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:0C	Subindex 012	12. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C32 SM output parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the outputs	UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	Current synchronization mode: • 3: DC-Mode - Synchron with SYNC1 Event	UINT16	RW	0x0000 (0_{dec})
1C32:02	Cycle time	Cycle time (in ns): • Free Run: Cycle time of the local timer • Synchronous with SM 2 event: Master cycle time • DC-Mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x0003D090 (250000_{dec})
1C32:03	Shift time	Time between SYNC0 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:04	Sync modes supported	Supported synchronization modes: • Bit 0 = 1: free run is supported • Bit 1 = 1: Synchronous with SM 2 event is supported • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 10: Output shift with SYNC1 event (only DC mode) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08)	UINT16	RO	0x4808 (18440_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x0001E848 (125000_{dec})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:07	Minimum delay time		UINT32	RO	0x00000000 (0_{dec})
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C32:03, 0x1C32:05, 0x1C32:06, 0x1C32:09, 0x1C33:03 [▶ 112], 0x1C33:06, and 0x1C33:09 [▶ 112] are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0_{dec})
1C32:09	Maximum delay time	Time between SYNC1 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)	UINT16	RO	0x0000 (0_{dec})
1C32:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	BOOLEAN	RO	0x00 (0_{dec})

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 3: DC - Synchron with SYNC1 Event	UINT16	RW	0x0000 (0_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 111]	UINT32	RW	0x0003D090 (250000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00001C52 (7250_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: synchronous with SM 2 event is supported (outputs available) • Bit 1: synchronous with SM 3 event is supported (no outputs available) • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 01: input shift through local event (outputs available) • Bit 4-5 = 10: input shift with SYNC1 event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08 [▶ 111] or 0x1C33:08)	UINT16	RO	0x4808 (18440_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 111]	UINT32	RO	0x0001E848 (125000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00001C52 (7250_{dec})
1C33:08	Command	as 0x1C32:08 [▶ 111]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00001C52 (7250_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11 [▶ 111]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12 [▶ 111]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13 [▶ 111]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32 [▶ 111]	BOOLEAN	RO	0x00 (0_{dec})

Index F000 Modular device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	General information for the modular device profile	UINT8	RO	0x02 (2_{dec})
F000:01	Module index distance	Index spacing of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0004 (4_{dec})

Index F008 Code word

Index (hex)	Name	Meaning	Data type	Flags	Default
F008:0	Code word	reserved	UINT32	RW	0x00000000 (0_{dec})

Index F010 Module list

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Maximum subindex	UINT8	RW	0x04 (4_{dec})
F010:01	SubIndex 001	Encoder profile number	UINT32	RW	0x00000201 (513_{dec})
F010:02	SubIndex 002	Servo drive profile number	UINT32	RW	0x000002E6 (742_{dec})
F010:03	SubIndex 003		UINT32	RW	0x00000000 (0_{dec})
F010:04	SubIndex 004	Profile number travel distance control	UINT32	RW	0x000002EE (750_{dec})

Index FB40 Memory interface

Index (hex)	Name	Meaning	Data type	Flags	Default
FB40:0	Memory interface	Maximum subindex	UINT8	RO	0x03 (3_{dec})
FB40:01	Address	reserved	UINT32	RW	0x00000000 (0_{dec})
FB40:02	Length	reserved	UINT16	RW	0x0000 (0_{dec})
FB40:03	Data	reserved	OCTET-STRING[8]	RW	{0}

5.9 Object description (DS402)

EtherCAT XML Device Description

The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area of the Beckhoff website and installing it according to installation instructions.

Parameterization via the CoE list (CAN over EtherCAT)

The box is parameterized via the CoE - Online tab (double-click on the respective object) or via the Process Data tab (allocation of PDOs). Please note the following general CoE information when using/manipulating the CoE parameters:
- Keep a startup list if components have to be replaced
- Differentiation between online/offline dictionary, existence of current XML description
- use “CoE reload” for resetting changes

NOTE

Risk of damage to the device!

We strongly advise not to change settings in the CoE objects while the axis is active, since this could impair the control.

5.9.1 Configuration data

Index 2002 Amplifier Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
2002:0	Amplifier Settings	Maximum subindex	UINT8	RO	0x49 (73_{dec})
2002:11	Device type	1: Servo drive (cannot be changed)	UINT32	RW	0x00000001 (1_{dec})
2002:12*	Current loop integral time	Integral component of current controller **Unit:** 0.1 ms This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x000A (10_{dec})
2002:13*	Current loop proportional gain	Proportional component of current controller **Unit:** 0.1 V/A This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0064 (100_{dec})
2002:14	Velocity loop integral time	Integral component of velocity controller **Unit:** 0.1 ms	UINT32	RW	0x00000032 (50_{dec})
2002:15	Velocity loop proportional gain	Proportional component of velocity controller **Unit:** mA / (rad/s)	UINT32	RW	0x00000096 (150_{dec})
2002:17	Position loop proportional gain	Proportional component position controller **Unit:** (rad/s) / rad	UINT32	RW	0x0000000A (10_{dec})
2002:19	Nominal DC link voltage	Nominal DC link voltage **Unit**: mV	UINT32	RW	0x0000BB80 (48000_{dec})
2002:1A	Min DC link voltage	Minimum DC link voltage **Unit**: mV	UINT32	RW	0x00001A90 (6800_{dec})
2002:1B	Max DC link voltage	Maximum DC link voltage **Unit**: mV	UINT32	RW	0x0000EA60 (60000_{dec})
2002:29	Amplifier I2T warn level	I²T model warning threshold **Unit**: %	UINT8	RW	0x50 (80_{dec})
2002:2A	Amplifier I2T error level	I²T model error threshold **Unit**: %	UINT8	RW	0x69 (105_{dec})
2002:2B	Amplifier temperature warn level	Overtemperature warning threshold **Unit**: 0.1 °C	UINT16	RW	0x0320 (800_{dec})
2002:2C	Amplifier temperature error level	Overtemperature error threshold **Unit**: 0.1 °C	UINT16	RW	0x03E8 (1000_{dec})
2002:31	Velocity limitation	Velocity limitation **Unit**: rpm	UINT32	RW	0x00040000 (262144_{dec})
2002:32	Short circuit brake duration max	Max. duration of armature short circuit brake **Unit**: ms	UINT16	RW	0x03E8 (1000_{dec})
2002:33	Stand still window	Standstill window **Unit**: rpm	UINT16	RW	0x0000 (0_{dec})
2002:41	Low-pass filter frequency	Low-pass filter frequency **Unit**: Hz The following values can be set: 0 Hz = off 160 Hz 320 Hz	UINT16	RW	0x0140 (320_{dec})
2002:49	Halt ramp deceleration	Halt ramp deceleration **Unit**: 0.1 rad / s²	UINT32	RW	0x0000F570 (62832_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
2002:53	Position loop proportional gain	Proportional component position controller **Unit:** mA / (rad/s)	UINT32	RW	0x00000000 (0_{dec})
2002:54	Feature bits	The adjustable motor current values can be interpreted as peak values or rms values. The feature bit (2002:54 [▶ 115]) enables the conversion. Peak value → Bit 0 = 0 (default) RMS value → Bit 0 = 1 normal output current → Bit 1 = 0 (default) increased output current → Bit 1 = 1 From these, the following combinations can be set: 0_{dec} → normal output current interpreted as peak value 1_{dec} → normal output current interpreted as rms value 2_{dec} → increased output current interpreted as peak value 3_{dec} → increased output current interpreted as rms value	UINT32	RW	0x00000000 (0_{dec})
2002:55	Select info data 1	Selection "Info data 1" Optional display of additional information in the cyclic process data. The following parameters are available.	UINT8	RW	0x00 (0_{dec})
		Torque current (filtered 1ms) [1000th of rated current]			
		DC link voltage [mV]			
		PCB temperature [0.1 °C]			
		Errors: Bit0: ADC Error Bit1: Overcurrent Bit2: Undervoltage Bit3: Overvoltage Bit4: Overtemperature Bit5: I2T Amplifier Bit6: I2T Motor Bit7: Encoder Bit8: Watchdog			
		Warnings: Bit2: Undervoltage Bit3: Overvoltage Bit4: Overtemperature Bit5: I2T Amplifier Bit6: I2T Motor Bit7: Encoder			
		I2T Motor [%]			
		I2T Amplifier [%]			
		Input Level: Bit0: Digital Input 1 Level Bit1: Digital Input 2 Level Bit8: HWE Level			
		Feature Bits: Bit0: Referenced (Parameter 2010:02 [▶ 120])			

Index (hex)	Name	Meaning	Data type	Flags	Default
2002:56	Select info data 2	Selection "Info data 2" Optional display of additional information in the cyclic process data. The following parameters are available.	UINT8	RW	0x00 (0 dec)
		Torque current (filtered 1ms) [1000th of rated current]			
		DC link voltage [mV]			
		PCB temperature [0.1 °C]			
		Errors: Bit0: ADC Error Bit1: Overcurrent Bit2: Undervoltage Bit3: Overvoltage Bit4: Overtemperature Bit5: I2T Amplifier Bit6: I2T Motor Bit7: Encoder Bit8: Watchdog			
		Warnings: Bit2: Undervoltage Bit3: Overvoltage Bit4: Overtemperature Bit5: I2T Amplifier Bit6: I2T Motor Bit7: Encoder			
		I2T Motor [%]			
		I2T Amplifier [%]			
		Input Level: Bit0: Digital Input 1 Level Bit1: Digital Input 2 Level Bit8: HWE Level			
		Feature Bits: Bit0: Referenced (Parameter 2010:02 [▶ 120])			

*) see index 2059 FB OCT Nameplate

Index 2003 Motor Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
2003:0	Motor Settings	Maximum subindex	UINT8	RO	0x2D (45_{dec})
2003:11*	Max current	Peak current **Unit**: mA The adjustable motor current values can be interpreted as peak values or rms values. The feature bit (2002:54 [▶ 115]) enables the conversion. Peak value → Bit 0 = 0 (default) RMS value → Bit 0 = 1 This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00001770 (6000_{dec})
2003:13*	Motor pole pairs	Number of pole pairs This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT8	RW	0x03 (3_{dec})
2003:15*	Commutation offset	Commutation offset (between electrical zero position and mechanical single-turn zero position) **Unit**: ° This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	INT16	RW	0x0000 (0_{dec})
2003:16*	Torque constant	Torque constant **Unit**: mNm / A This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00000000 (0_{dec})
2003:18*	Rotor moment of inertia	Mass moment of inertia of the motor **Unit**: g cm^2 This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT32	RW	0x00000000 (0_{dec})
2003:19*	Winding inductance	Inductance **Unit**: 0.1 mH This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x000E (14_{dec})
2003:29	Motor I2T warn level	I2T model warning threshold **Unit**: %	UINT8	RW	0x50 (80_{dec})
2003:2A	Motor I2T error level	I2T model error threshold **Unit**: %	UINT8	RW	0x69 (105_{dec})
2003:2B*	Motor Temperature warn level	Overtemperature warning threshold **Unit**: 0.1 °C This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0000 (0_{dec})
2003:2C*	Motor Temperature error level	Overtemperature error threshold **Unit**: 0.1 °C This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0000 (0_{dec})
2003:2D*	Motor thermal time constant	Thermal time constant **Unit**: 0.1 s This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0028 (40_{dec})

*) see index 2059 FB OCT Nameplate

Index 2004 brake settings

Index (hex)	Name	Meaning	Data type	Flags	Default
2004:0	Brake settings	Maximum subindex	UINT8	RO	0x14 (20_{dec})
2004:01	Manual override (release)	Manual release of the motor holding brake	BOOLEAN	RW	0x00 (0_{dec})
2004:11*	Release delay	Time required by the holding brake for opening (releasing) after the voltage was applied This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0000 (0_{dec})
2004:12*	Application delay	Time required by the holding brake for closing (holding) after the voltage was switched off This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0000 (0_{dec})
2004:13	Emergency application timeout	Time that the amplifier waits until the speed has reached the standstill window after the stop request (set speed 0 after halt ramp or *Torque off*). The holding brake is triggered irrespective of the speed if the set waiting time is exceeded. **Note:** With rotary axes and the *Torque off* setting for the error case, this parameter must be adjusted at least to the longest time of the "coasting down" of the axis. With suspended axes and the *Torque off* setting for the error case, this parameter must be set to a very short time in order to prevent further sagging of the axis/ load.	UINT16	RW	0x0000 (0_{dec})
2004:14*	Brake moment of inertia	Mass moment of inertia of the brake **Unit**: g cm^2 This value is affected by automatic scanning. (see Automatic scanning of the electronic identification plates [▶ 55])	UINT16	RW	0x0000 (0_{dec})

*) see index 2059 FB OCT Nameplate

Index 2010 feedback settings

Index (hex)	Name	Meaning	Data type	Flags	Default
2010:0	Feedback settings	Maximum subindex	UINT8	RO	0x13 (19_{dec})
2010:01	Invert feedback direction	Inverting the count direction	BOOLEAN	RW	0x00 (0_{dec})
2010:02	Referenced	The box sets this parameter to FALSE in two cases: • If a motor with a different serial number was detected. • If a motor with single-turn encoder was connected. If you want to use this function, set the parameter to TRUE and monitor it. The value of this parameter is retained if the power supply is interrupted.	BOOLEAN	RW	0x00 (0_{dec})
2010:11	Device type	3: OCT (not changeable)	UINT32	RW	0x00000003 (3_{dec})
2010:12	Singleturn bits	Number of single-turn bits [▶ 44]	UINT8	RW	0x14 (20_{dec})
2010:13	Multi-turn bits	Number of multi-turn bits [▶ 44]	UINT8	RW	0x0C (12_{dec})
2010:14	Observer bandwidth	Bandwidth of the speed observer [Hz]	UINT16	RW	0x01F4 (500_{dec})
2010:15	Observer feed-forward	Load ratio [%] 100% = load-free 50% = mass moments of inertia of input and output are equal	UINT8	RW	0x01 (0_{dec})
2010:17	Position Offset		UINT32	RW	0x00000000 (0_{dec})

Index 2018 OCT Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
2018:0	OCT Settings	Maximum subindex	UINT8	RO	0x03 (3_{dec})
2018:01	Enable auto config	Configuration takes place automatically after the reading of the electronic identification plate (see Automatic scanning of the electronic identification plates [▶ 55])	BOOLEAN	RW	0x00 (0_{dec})
2018:02	Reconfig identical motor	When replacing identical motors, reconfiguration takes place automatically after reading the electronic identification plate. Enable autoconfig must be activated. (see Automatic scanning of the electronic identification plates [▶ 55])	BOOLEAN	RW	0x00 (0_{dec})
2018:03	Reconfig non-identical motor	When replacing non-identical motors, reconfiguration takes place automatically after reading the electronic identification plate. Enable autoconfig must be activated. (see Automatic scanning of the electronic identification plates [▶ 55])	BOOLEAN	RW	0x00 (0_{dec})

5.9.2 Configuration data (vendor-specific)

Index 2020 Vendor data

Index (hex)	Name	Meaning	Data type	Flags	Default
2020:0	Vendor data	Maximum subindex	UINT8	RO	0x15 (21_{dec})
2020:11	Amplifier peak current	Peak current of the amplifier (peak value) **Unit**: mA	UINT32	RW	0x00001F40 (8000_{dec})
2020:12	Amplifier rated current	Rated current of the amplifier (peak value) **Unit**: mA	UINT32	RW	0x00000FA0 (4000_{dec})
2020:13	Amplifier thermal time constant	Thermal time constant of the amplifier **Unit**: 0.1 ms	UINT16	RW	0x0023 (35_{dec})
2020:14	Amplifier overcurrent threshold	Threshold value for short-circuit detection **Unit**: mA	UINT32	RW	0x00002EE0 (12000_{dec})
2020:15	Max rotary field frequency	Max. rotary field frequency– **Unit:** Hz	UINT16	RW	0x0257 (599_{dec})

5.9.3 Command object

Index FB00 command

Index (hex)	Name	Meaning	Data type	Flags	Default
FB00:0	Command	Maximum subindex	UINT8	RO	0x03 (3_{dec})
FB00:01	Request	reserved	OCTET-STRING[2]	RW	{0}
FB00:02	Status	reserved	UINT8	RO	0x00 (0_{dec})
FB00:03	Response	reserved	OCTET-STRING[4]	RO	{0}

5.9.4 Input/output data

Index 2001 Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
2001:0	Outputs	Maximum subindex	UINT8	RO	0x11 (17_{dec})
2001:11	Torque offset	Torque value offset The value is specified in 1000th of the *rated current* . Equation for index 0x2002:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x2003:16) Equation for index 0x2002:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x2003:16)	INT16	RO	0x0000 (0_{dec})

Index 2008 Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
2008:0	Inputs	Maximum subindex	UINT8	RO	0x02 (2_{dec})
2008:01	Info data1	Synchronous information (selection via subindex 0x2002:55)	UINT16	RO	0x0000 (0_{dec})
2008:01	Info data2	Synchronous information (selection via subindex 0x2002:56)	UINT16	RO	0x0000 (0_{dec})

Index 603E TxPDO Data invalid

Index (hex)	Name	Meaning	Data type	Flags	Default
603E:0	TxPDO Data invalid	Max. subindex	UINT8	RO	0x02 (2_{dec})
603E:02	Position actual value	0: The current position is valid 1: The current position is invalid	BOOLEAN	RO P	0

Index 6040 Controlword

Index (hex)	Name	Meaning	Data type	Flags	Default
6040:0	Controlword	DS402 Controlword Bit 0: Switch on Bit 1: Enable voltage Bit 2: reserved Bit 3: Enable operation Bit 4 - 6: reserved Bit 7: Fault reset Bit 8 - 15: reserved	UINT16	RO	0x0000 (0_{dec})

Index 6041 Statusword

Index (hex)	Name	Meaning	Data type	Flags	Default
6041:0	Statusword	DS402 Statusword Bit 0: Ready to switch on Bit 1: Switched on Bit 2: Operation enabled Bit 3: Fault Bit 4: reserved Bit 5: reserved Bit 6: Switch on disabled Bit 7: Warning Bit 8 + 9: reserved Bit 10: TxPDOToggle (selection/deselection via 0x60DA [▶ 125]) Bit 11: Internal limit active Bit 12: (Target value ignored) Bit 13 - 15: reserved	UINT16	RO	0x0000 (0_{dec})

Index 605E Fault reaction option code

Index (hex)	Name	Meaning	Data type	Flags	Default
605E:0	Fault reaction option code	0: Disable drive function, motor is free to rotate 1: Slow down by slow down ramp	ENUM16BIT	RW	0

Index 6060 Modes of operation

Index (hex)	Name	Meaning	Data type	Flags	Default
6060:0	Modes of operation	permitted values: 0x08: Cyclic synchronous position mode (CSP) 0x09: Cyclic synchronous velocity mode (CSV) 0x0A: Cyclic synchronous torque mode (CST) 0x0B: Cyclic synchronous torque mode with commutation angle (CSTCA)	UINT8	RW	0x00 (0_{dec})

Index 6061 Modes of operation display

Index (hex)	Name	Meaning	Data type	Flags	Default
6061:0	Modes of operation display	permitted values: 8: Cyclic synchronous position mode (CSP) 9: Cyclic synchronous velocity mode (CSV) 10: Cyclic synchronous torque mode (CST) 11: Cyclic synchronous torque mode with commutation angle (CSTCA)	UINT8	RO	0x00 (0_{dec})

Index 6064 Position actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
6064:0	Position actual value	Position **Unit**: the given value must be multiplied by the corresponding scaling factor	UINT32	RO	0x00000000 (0_{dec})

Index 6065 Following error window

Index (hex)	Name	Meaning	Data type	Flags	Default
6065:0	Following error window	Following error monitor: Following error window **Unit**: the given value must be multiplied by the corresponding scaling factor 0xFFFFFFFF (-1_{dec}) = following error monitor off Any other value = following error monitor on	UINT32	RO	0xFFFFFFFF (-1_{dec})

Index 6066 Following error time out

Index (hex)	Name	Meaning	Data type	Flags	Default
6066:0	Following error time out	Following error monitor: Timeout **Unit:** ms If the following error is larger than the following error window for a time that exceeds the timeout, this leads to an error reaction	UINT16	RO	0x0000 (0_{dec})

Index 606C Velocity actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
606C:0	Velocity actual value	Display of the current velocity value	INT32	RO	0x00000000 (0_{dec})

Index 6071 Target torque

Index (hex)	Name	Meaning	Data type	Flags	Default
6071:0	Target torque	This object shall indicate the configured input value for the torque controller. The value is specified in 1000th of the *rated current*. Equation for index 0x2002:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x2003:16) Equation for index 0x2002:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x2003:16)	INT16	RO	0x0000 (0_{dec})

Index 6072 Max torque

Index (hex)	Name	Meaning	Data type	Flags	Default
6072:0	Max torque	This object limits the target torque for the torque controller (bipolar limit). The value is specified in 1000th of the *rated current*. Equation for index 0x2002:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x2003:16) Equation for index 0x2002:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x2003:16)	UINT16	RW	0x7FFF (32767_{dec})

Index 6075 Motor rated current

Index (hex)	Name	Meaning	Data type	Flags	Default
6075:0	Motor rated current	Motor rated current **Unit**: mA	UINT32	RW	0x000003E8 (1000_{dec})

Index 6077 Torque actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
6077:0	Torque actual value	This object shall provide the actual value of the torque. The value is specified in 1000th of the *rated current*. Equation for index 0x2002:54 = 0 : M = ((Torque actual value / 1000) x (rated current / √2)) x torque constant (0x2003:16) Equation for index 0x2002:54 = 1 : M = ((Torque actual value / 1000) x rated current)) x torque constant (0x2003:16)	INT16	RO	0x0000 (0_{dec})

Index 6079 DC link circuit voltage

Index (hex)	Name	Meaning	Data type	Flags	Default
6079:0	DC link circuit voltage	DC link voltage g **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})

Index 607A Target position

Index (hex)	Name	Meaning	Data type	Flags	Default
607A:0	Target position	This object shall provide the actual position. **Unit**: the given value must be multiplied by the corresponding scaling factor	UINT32	RO	0x00000000 (0_{dec})

Index 6080 Max motor speed

Index (hex)	Name	Meaning	Data type	Flags	Default
6080:0	Max motor speed	Velocity limitation **Unit**: rpm	UINT32	RW	0x00040000 (262144_{dec})

Index 608F Position encoder resolution

Index (hex)	Name	Meaning	Data type	Flags	Default
608F:0	Position encoder resolution	This object represents the configured encoder increments and the number of motor revolutions. The position encoder resolution is calculated according to the following equation: Position encoder resolution = (encoder increments / motor revolutions)	UINT8	RO	0x02 (2_{dec})
608F:01	SubIndex 001	Encoder increments	UINT32	RO	0x00000000 (0_{dec})
608F:02	SubIndex 002	Motor revolutions	UINT32	RO	0x00000000 (0_{dec})

Index 6090 Velocity Encoder Resolution

Index (hex)	Name	Meaning	Data type	Flags	Default
6090:0	Velocity Encoder Resolution	Display of configured encoder increments/s and motor revolutions/s. The velocity encoder resolution is calculated according to the following formula: Velocity Encoder Resolution = (encoder_increments / s) / (motor_revolutions / s)	UINT32	RO	0x00000000 (0_{dec})

Index 60B2 Torque offset

Index (hex)	Name	Meaning	Data type	Flags	Default
60B2:0	Torque offset	Torque value offset	UINT16	RO	0x0000 (0_{dec})

Index 60B8 Touch probe function

Index (hex)	Name	Meaning	Data type	Flags	Default
60B8:0	Touch probe function	Touch probe function byte	UINT16	RO	0x0000 (0_{dec})

Index 60B9 Touch probe status

Index (hex)	Name	Meaning	Data type	Flags	Default
60B9:0	Touch probe status	Touch probe status byte	UINT16	RO	0x0000 (0_{dec})

Index 60BA Touch probe 1 positive edge

Index (hex)	Name	Meaning	Data type	Flags	Default
60BA:0	Touch probe 1 positive edge	Positive position value of TP 1 **Unit**: the given value must be multiplied by the corresponding scaling factor	INT32	RO	0x00000000 (0_{dec})

Index 60BB Touch probe 1 negative edge

Index (hex)	Name	Meaning	Data type	Flags	Default
60BB:0	Touch probe 1 negative edge	Negative position value of TP 1 **Unit**: the given value must be multiplied by the corresponding scaling factor	INT32	RO	0x00000000 (0_{dec})

Index 60BC Touch probe 2 positive edge

Index (hex)	Name	Meaning	Data type	Flags	Default
60BC:0	Touch probe 2 positive edge	Positive position value of TP 2 **Unit**: the given value must be multiplied by the corresponding scaling factor	INT32	RO	0x00000000 (0_{dec})

Index 60BD Touch probe 2 negative edge

Index (hex)	Name	Meaning	Data type	Flags	Default
60BD:0	Touch probe 2 negative edge	Negative position value of TP 2 **Unit**: the given value must be multiplied by the corresponding scaling factor	INT32	RO	0x00000000 (0_{dec})

Index 60C2 Interpolation time period

Index (hex)	Name	Meaning	Data type	Flags	Default
60C2:0	Interpolation time period	Maximum subindex x	UINT8	RO	0x02 (2_{dec})
60C2:01	Interpolation time period value	This object shall indicate the configured interpolation cycle time. The interpolation time period (sub-index 0x01) value shall be given in $10^{(interpolation\ time\ index)}$ (second). The interpolation time index (sub-index 0x02) shall be dimensionless.	UINT8T8	RO	0x00 (0_{dec})
60C2:02	Interpolation time index		INT8	RO	0x00 (0_{dec})

Index 60D9 Supported functions

Index (hex)	Name	Meaning	Data type	Flags	Default
60D9:0	Supported functions	This object shall provide information on the supported functions in the device.	UINT3232	RO	0x00000000 (0_{dec})

Index 60DA Function settings

Index (hex)	Name	Meaning	Data type	Flags	Default
60DA:0	Function settings	This object shall enable/disable supported functions in the device. Bit 0: Enable TxPDOToggle-Bit in Statusword: Bit 10 Bit 1: Enable input cycle counter in Statusword: Bit 13 Bit 2-31: reserved	UINT32	RW	0x00000000 (0_{dec})

Index 60EA Commutation angle

Index (hex)	Name	Meaning	Data type	Flags	Default
60EA:0	Commutation angle	Electrical commutation angle (for the CSTCA mode) **Unit**: 5.49 * 10-3 °	UINT16	RO	0x0000 (0_{dec})

Index 60F4 Following error actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
60F4:0	Following error actual value	Following error **Unit**: the given value must be multiplied by the corresponding scaling factor	INT32	RO	0x00000000 (0_{dec})

Index 60FF Target velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
60FF:0	Target velocity	This object shall indicate the configured target velocity The velocity scaling can be found in object 0x6090 (Velocity encoder resolution)	INT32	RO	0x00000000 (0_{dec})

Index 6403 Motor catalogue number

Index (hex)	Name	Meaning	Data type	Flags	Default
6403:0	Motor catalogue number	This is the order code from the electronic type plate of the motor, e.g. AM8121-0F20-0000	STRING	RO	

Index 6502 Supported drive modes

Index (hex)	Name	Meaning	Data type	Flags	Default
6502:0	Supported drive modes	This object shall provide information on the supported drive modes. (DS402 Object 0x6502) Only modes *CSV*, *CST*, *CSTCA and CSP* are supported Bit 0: PP Bit 1: VL Bit 2: PV Bit 3: TQ Bit 4: R Bit 5: HM Bit 6: IP Bit 7: CSP Bit 8: CSV Bit 9: CST Bit 10: CSTCA Bit 11-15: reserved Bit 16-31: Manufacturer-specific	UINT32	RO	0x00000000 (0_{dec})

5.9.5 Information / diagnosis data

Index 10F3 Diagnosis History

Index (hex)	Name	Meaning	Data type	Flags	Default
10F3:0	Diagnosis History	Maximum subindex	UINT8	RO	0x37 (55_{dec})
10F3:01	Maximum Messages	Maximum number of stored messages. A maximum of 50 messages can be stored	UINT8	RO	0x00 (0_{dec})
10F3:02	Newest Message	Subindex of the latest message	UINT8	RO	0x00 (0_{dec})
10F3:03	Newest Acknowledged Message	Subindex of the last confirmed message	UINT8	RW	0x00 (0_{dec})
10F3:04	New Messages Available	Indicates that a new message is available	BOOLEAN	RO	0x00 (0_{dec})
10F3:05	Flags	not used	UINT16	RW	0x0000 (0_{dec})
10F3:06	Diagnosis Message 001	Message 1	OCTET-STRING[28]	RO	{0}
...	...	...	...	...	...
10F3:37	Diagnosis Message 050	Message 50	OCTET-STRING[28]	RO	{0}

Index 10F8 Actual Time Stamp

Index (hex)	Name	Meaning	Data type	Flags	Default
10F8:0	Actual Time Stamp	Time stamp	UINT64	RO	

Index 2030 Amplifier Diag data

Index (hex)	Name	Meaning	Data type	Flags	Default
2030:0	Amplifier Diag data	Maximum subindex	UINT8	RO	0x11 (17_{dec})
2030:11	Amplifier I2T temperature	I2T model load **Unit**: %	UINT8	RO	0x00 (0_{dec})

Index 2031 Motor Diag data

Index (hex)	Name	Meaning	Data type	Flags	Default
2031:0	Motor Diag data	Maximum subindex	UINT8	RO	0x13 (19_{dec})
2031:11	Motor I2T temperature	I2T model load **Unit**: %	UINT8	RO	0x00 (0_{dec})
2031:13	Motor temperature	Temperature utilization ratio **Unit**: °	UINT16	RO	0x0000 (0_{dec})

Index 2040 Amplifier Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
2040:0	Amplifier Info data	Maximum subindex	UINT8	RO	0x12 (18_{dec})
2040:11	Amplifier temperature	Internal temperature of the box **Unit**: 0.1 °C	UINT16	RO	0x0000 (0_{dec})
2040:12	DC link voltage	DC link voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})

Index 2041 Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
2041:0	Info data	Maximum subindex	UINT8	RO	0x11 (17_{dec})
2041:11	Auxiliary voltage (10 V)	Auxiliary voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})

Index 2058 OCT Info data

(these data are always read in automatically from the electronic type plate of the motor and serve purely informative purposes)

Index (hex)	Name	Meaning	Data type	Flags	Default
2058:0	OCT Info data	Maximum subindex	UINT8	RO	0x20 (32_{dec})
2058:11	Encoder Type	Feedback type 2: rotary encoder, unipolar counting	UINT16	RO	0x0000 (0_{dec})
2058:12	Resolution	Resolution of the feedback **Unit**: Steps per revolution	UINT32	RO	0x00000000 (0_{dec})
2058:13	Range	Working range of the feedback. On leaving this range there is an overflow of the position. **Unit**: Revolutions	UINT32	RO	0x00000000 (0_{dec})
2058:14	Type Code Name	Name of the feedback	STRING	RO	
2058:15	Serial No	Serial number of the feedback	STRING	RO	
2058:16	Firmware Revision No	Revision of the firmware	STRING	RO	
2058:17	Firmware Date	Date of the firmware	STRING	RO	
2058:18	EEPROM Size	EEPROM size	UINT16	RO	0x0000 (0_{dec})
2058:19	Temperature	Temperature **Unit**: 0.1°	INT16	RO	0x0000 (0_{dec})
2058:1A	LED Current	Current of the feedback LED **Unit**: 0.1 mA	UINT16	RO	0x0000 (0_{dec})
2058:1B	Supply voltage	Supply voltage of the feedback **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
2058:1C	Life- time	Operating hour counter **Unit**: Minutes	UINT32	RO	0x00000000 (0_{dec})
2058:1D	Received Signal Strength Indicator	Received signal strength at the terminal **Unit**: %	UINT16	RO	0x0000 (0_{dec})
2058:1E	Slave Received Signal Strength Indicator	Received signal strength at the encoder **Unit**: %	UINT16	RO	0x0000 (0_{dec})
2058:1F	Line delay	Running time of the signal in the cable **Unit**: ns	UINT16	RO	0x0000 (0_{dec})
2058:20	Encoder position offset	Position offset stored in the motor feedback	UINT16	RO	0x0000 (0_{dec})

Index 2059 OCT Nameplate

The parameters described in this index are always read from the electronic type plate of the connected motor. These parameters automatically lead to the parameters marked with an asterisk (*) in this chapter, if automatic scanning of the electronic type plate is switched on (index 0x2018).

Index (hex)	Name	Meaning	Data type	Flags	Default
2059:0	OCT Nameplate	Maximum subindex	UINT8	RO	0x24 (36_{dec})
2059:01	Motor vendor	Motor vendor	STRING	RO	
2059:02	Electric motor type	Motor type	STRING	RO	
2059:03	Serial No	Serial number	STRING	RO	
2059:04	Order code	Order number (In case of Autoconfig a check is made on the basis of this index as to whether the motor is identical to the predecessor)	STRING	RO	
2059:05	Motor construction	Type of motor	STRING	RO	
2059:06	Pole pairs	Number of pole pairs	UINT32	RO	0x00000000 (0_{dec})
2059:07	Standstill current (rms)	Effective holding current **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
2059:08	Rated current (rms)	Effective rated current **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
2059:09	Peak current (rms)	Effective peak current **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
2059:0A	Nominal voltage (rms)	Effective nominal voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
2059:0B	Max voltage (rms)	Maximum voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
2059:0C	Max winding du/dt	Maximum permissible voltage rise on the winding **Unit**: kV/s	UINT32	RO	0x00000000 (0_{dec})
2059:0D	Max torque	Maximum torque **Unit**: mNm	UINT16	RO	0x0000 (0_{dec})
2059:0E	Torque constant	Torque constant **Unit**: mNm / A	UINT16	RO	0x0000 (0_{dec})
2059:0F	EMK (rms)	Reverse voltage **Unit**: mV / (rpm)	UINT32	RO	0x00000000 (0_{dec})
2059:10	Winding resistance Ph-Ph 20°C	Coil resistance **Unit**: mOhm	UINT16	RO	0x0000 (0_{dec})
2059:11	Ld Ph-Ph	Inductance in the direction of flow **Unit**: 0.1 mH	UINT16	RO	0x0000 (0_{dec})
2059:12	Lq Ph-Ph	Inductance in the torque-forming direction **Unit**: 0.1 mH	UINT16	RO	0x0000 (0_{dec})
2059:13	Max speed	Maximum speed **Unit**: rpm	UINT32	RO	0x00000000 (0_{dec})
2059:14	Moment of inertia	Mass moment of inertia **Unit**: g cm^2	UINT16	RO	0x0000 (0_{dec})
2059:15	T motor warn limit	Motor temperature warning threshold **Unit**: 0.1 °C	UINT16	RO	0x0000 (0_{dec})
2059:16	T motor shut down	Motor temperature error threshold **Unit**: 0.1°C	UINT16	RO	0x0000 (0_{dec})
2059:17	Time constant i2t	Time constant I2T model **Unit**: s	UINT16	RO	0x0000 (0_{dec})
2059:18	Motor thermal constant	Thermal time constant of the motor **Unit**: s	UINT16	RO	0x0000 (0_{dec})
2059:1B	Brake type	Brake type • no Brake • holding Brake	STRING	RO	
2059:1C	Min brake voltage	Minimum brake voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
2059:1D	Max brake voltage	Maximum brake voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
2059:1E	Min brake monitor current	Minimum current for the monitoring of the brake **Unit**: mA	UINT32	RO	0x00000000 (0_{dec})
2059:1F	Brake holding torque	Brake holding torque **Unit**: mNm	UINT32	RO	0x00000000 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
2059:20	Brake T on	Time until the brake is applied **Unit**: ms	UINT16	RO	0x0000 (0_{dec})
2059:21	Brake T off	Time until the brake is released **Unit**: ms	UINT16	RO	0x0000 (0_{dec})
2059:22	Brake reduced holding voltage	Reduced brake voltage **Unit**: mV	UINT32	RO	0x00000000 (0_{dec})
2059:23	Brake time to red. holding volt.	Time from which the brake holds with reduced voltage **Unit**: ms	UINT16	RO	0x0000 (0_{dec})
2059:24	Motor temp sensor connection	Temperature sensor connection feedback port (not changeable)	STRING	RO	

5.9.6 Standard objects

Index 1000 Device type

Index (hex)	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT slave: the Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x00000192 (402_{dec})

Index 1001 Error register

Index (hex)	Name	Meaning	Data type	Flags	Default
1001:0	Error register		UINT8	RO	0x00 (0_{dec})

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EP7211-0034 / EP7211-0035

Index 1009 Hardware version

Index (hex)	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT slave	STRING	RO	

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x1C2B4052 (472596562_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 1600 DS402 RxPDO-Map Controlword

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	DS402 RxPDO-Map Controlword	PDO Mapping RxPDO 1	UINT8	RO	0x01 (1_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x6040:00, 16

Index 1601 DS402 RxPDO-Map Target velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	DS402 RxPDO-Map Target velocity	PDO Mapping RxPDO 2	UINT8	RO	0x01 (1_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60FF:00, 32

Index 1602 DS402 RxPDO-Map Target torque

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	DS402 RxPDO-Map Target torque	PDO Mapping RxPDO 3	UINT8	RO	0x01 (1_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x6071:00, 16

Index 1603 DS402 RxPDO-Map Commutation angle

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	DS402 RxPDO-Map Commutation angle	PDO Mapping RxPDO 4	UINT8	RO	0x01 (1_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60EA:00, 16

Index 1604 DS402 RxPDO-Map Torque limitation

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	DS402 RxPDO-Map Torque limitation	PDO Mapping RxPDO 5	UINT8	RO	0x01 (1_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x6072:00, 16

Index 1605 DS402 RxPDO-Map Torque offset

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	DS402 RxPDO-Map Torque offset	PDO Mapping RxPDO 6	UINT8	RO	0x01 (1_{dec})
1605:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x2001:11, 16

Index 1606 DS402 RxPDO-Map Target position

Index (hex)	Name	Meaning	Data type	Flags	Default
1606:0	DS402 RxPDO-Map Target position	PDO Mapping RxPDO 7	UINT8	RO	0x01 (1_{dec})
1606:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x607A:00, 32

Index 1607 DS402 RxPDO-Map Touch probe function

Index (hex)	Name	Meaning	Data type	Flags	Default
1607:0	DS402 RxPDO-Map Touch probe function	PDO Mapping RxPDO 8	UINT8	RO	0x01 (1_{dec})
1607:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60B8:00, 16

Index 1A00 DS402 TxPDO-Map Statusword

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	DS402 TxPDO-Map Statusword	PDO Mapping TxPDO 1	UINT8	RO	0x01 (1_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x6041:00, 16

Index 1A01 DS402 TxPDO-Map Position actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	DS402 TxPDO-Map Position actual value	PDO Mapping TxPDO 2	UINT8	RO	0x01 (1_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x6064:00, 32

Index 1A02 DS402 TxPDO-Map Velocity actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	DS402 TxPDO-Map Velocity actual value	PDO Mapping TxPDO 3	UINT8	RO	0x01 (1_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x606C:00, 32

Index 1A03 DS402 TxPDO-Map Torque actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	DS402 TxPDO-Map Torque actual value	PDO Mapping TxPDO 4	UINT8	RO	0x01 (1_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x6077:00, 16

Index 1A04 DS402 TxPDO-Map Following error actual value

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	DS402 TxPDO-Map Following error actual value	PDO Mapping TxPDO 5	UINT8	RO	0x01 (1_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60F4:00, 32

Index 1A05 DS402 TxPDO-Map Touch probe status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	DS402 TxPDO-Map Touch probe status	PDO Mapping TxPDO 6	UINT8	RO	0x01 (1_{dec})
1A05:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60B9:00, 16

Index 1A06 DS402 TxPDO-Map Touch probe 1 positive edge

Index (hex)	Name	Meaning	Data type	Flags	Default
1A06:0	DS402 TxPDO-Map Touch probe 1 positive edge	PDO Mapping TxPDO 7	UINT8	RO	0x01 (1_{dec})
1A06:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60BA:00, 32

Index 1A07 DS402 TxPDO-Map Touch probe 1 negative edge

Index (hex)	Name	Meaning	Data type	Flags	Default
1A07:0	DS402 TxPDO-Map Touch probe 1 negative edge	PDO Mapping TxPDO 8	UINT8	RO	0x01 (1_{dec})
1A07:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60BB:00, 32

Index 1A08 DS402 TxPDO-Map Touch probe 2 positive edge

Index (hex)	Name	Meaning	Data type	Flags	Default
1A08:0	DS402 TxPDO-Map Touch probe 2 positive edge	PDO Mapping TxPDO 9	UINT8	RO	0x01 (1_{dec})
1A08:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60BC:00, 32

Index 1A09 DS402 TxPDO-Map Touch probe 2 negative edge

Index (hex)	Name	Meaning	Data type	Flags	Default
1A09:0	DS402 TxPDO-Map Touch probe 2 negative edge	PDO Mapping TxPDO 10	UINT8	RO	0x01 (1_{dec})
1A09:01	SubIndex 001	1. PDO Mapping entry	UINT32	RO	0x60BD:00, 32

Index 1A0B DS402 TxPDO-Map Info data 1

Index	Name	Meaning	Data type	Flags	Default
1A0B:0	DS402 TxPDO-Map Info data 1	PDO Mapping TxPDO 12	UINT8	RO	0x01 (1_{dec})
1A0B:01	SubIndex 001	1st PDO Mapping entry (object 0x2008 (inputs), entry 0x01 (Info data 1))	UINT32	RO	0x2008:01, 16

Index 1A0C DS402 TxPDO-Map Info data 2

Index	Name	Meaning	Data type	Flags	Default
1A0C:0	DS402 TxPDO-Map Info data 2	PDO Mapping TxPDO 13	UINT8	RO	0x01 (1_{dec})
1A0C:01	SubIndex 001	1st PDO Mapping entry (object 0x2008 (inputs), entry 0x02 (Info data 2))	UINT32	RO	0x2008:02, 16

Index 1C00 Sync manager type

Index (hex)	Name	Meaning	Data type	Flags	Default
1C00:0	Sync manager type	Using the sync managers	UINT8	RO	0x04 (4_{dec})
1C00:01	SubIndex 001	Sync-Manager Type Channel 1: Mailbox Write	UINT8	RO	0x01 (1_{dec})
1C00:02	SubIndex 002	Sync-Manager Type Channel 2: Mailbox Read	UINT8	RO	0x02 (2_{dec})
1C00:03	SubIndex 003	Sync-Manager Type Channel 3: Process Data Write (Outputs)	UINT8	RO	0x03 (3_{dec})
1C00:04	SubIndex 004	Sync-Manager Type Channel 4: Process Data Read (Inputs)	UINT8	RO	0x04 (4_{dec})

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x02 (2_{dec})
1C12:01	Subindex 001	1. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1601 (5633_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:04	Subindex 004	4. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:05	Subindex 005	5. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:06	Subindex 006	6. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:07	Subindex 007	7. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:08	Subindex 008	8. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C13 TxPDO assign

Index	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x02 (2_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	Subindex 003	3. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:04	Subindex 004	4. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:05	Subindex 005	5. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:06	Subindex 006	6. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:07	Subindex 007	7. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:08	Subindex 008	8. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:09	Subindex 009	9. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:0A	Subindex 010	10. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C32 SM output parameter

Index (Hex)	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the outputs	UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	Current synchronization mode: • 3: DC-Mode - Synchronous with SYNC1 event	UINT16	RW	0x0000 (0_{dec})
1C32:02	Cycle time	Cycle time (in ns): • Free Run: Cycle time of the local timer • Synchronous with SM 2 event: Master cycle time • DC mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x0003D090 (250000_{dec})
1C32:03	Shift time	Time between SYNC0 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:04	Sync modes supported	Supported synchronization modes: • Bit 0 = 1: free run is supported • Bit 1 = 1: Synchronous with SM 2 event is supported • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 10: Output shift with SYNC1 event (only DC mode) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08)	UINT16	RO	0x4808 (18440_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x0001E848 (125000_{dec})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:07	Minimum delay time		UINT32	RO	0x00000000 (0_{dec})
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C32:03, 0x1C32:05, 0x1C32:06, 0x1C32:09, 0x1C33:03 [▶ 135], 0x1C33:06, and 0x1C33:09 [▶ 135] are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0_{dec})
1C32:09	Maximum delay time	Time between SYNC1 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)	UINT16	RO	0x0000 (0_{dec})
1C32:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	BOOLEAN	RO	0x00 (0_{dec})

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 3: DC - Synchronous with SYNC1 Event	UINT16	RW	0x0000 (0_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 134]	UINT32	RW	0x0003D090 (250000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00001C52 (7250_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: synchronous with SM 2 event is supported (outputs available) • Bit 1: synchronous with SM 3 event is supported (no outputs available) • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 01: input shift through local event (outputs available) • Bit 4-5 = 10: input shift with SYNC1 event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08 [▶ 134] or 0x1C33:08)	UINT16	RO	0x4808 (18440_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 134]	UINT32	RO	0x0001E848 (125000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00001C52 (7250_{dec})
1C33:08	Command	as 0x1C32:08 [▶ 134]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00001C52 (7250_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11 [▶ 134]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12 [▶ 134]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13 [▶ 134]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32 [▶ 134]	BOOLEAN	RO	0x00 (0_{dec})

Index F008 Code word

Index (hex)	Name	Meaning	Data type	Flags	Default
F008:0	Code word	see note!	UINT32	RW	0x00000000 (0_{dec})

6 Appendix

6.1 General operating conditions

Protection degrees (IP-Code)

The standard IEC 60529 (DIN EN 60529) defines the degrees of protection in different classes.

1. Number: dust protection and touch guard	Definition
0	Non-protected
1	Protected against access to hazardous parts with the back of a hand. Protected against solid foreign objects of Ø 50 mm
2	Protected against access to hazardous parts with a finger. Protected against solid foreign objects of Ø 12.5 mm.
3	Protected against access to hazardous parts with a tool. Protected against solid foreign objects Ø 2.5 mm.
4	Protected against access to hazardous parts with a wire. Protected against solid foreign objects Ø 1 mm.
5	Protected against access to hazardous parts with a wire. Dust-protected. Intrusion of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the device or to impair safety.
6	Protected against access to hazardous parts with a wire. Dust-tight. No intrusion of dust.
2. Number: water* protection	Definition
0	Non-protected
1	Protected against water drops
2	Protected against water drops when enclosure tilted up to 15°.
3	Protected against spraying water. Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.
4	Protected against splashing water. Water splashed against the disclosure from any direction shall have no harmful effects
5	Protected against water jets
6	Protected against powerful water jets
7	Protected against the effects of temporary immersion in water. Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water for 30 min. in 1 m depth.

*) These protection classes define only protection against water.

Chemical Resistance

The Resistance relates to the Housing of the IP67 modules and the used metal parts. In the table below you will find some typical resistance.

Character	Resistance
Steam	at temperatures >100°C: not resistant
Sodium base liquor (ph-Value > 12)	at room temperature: resistant > 40°C: not resistant
Acetic acid	not resistant
Argon (technical clean)	resistant

Key

- resistant: Lifetime several months
- non inherently resistant: Lifetime several weeks
- not resistant: Lifetime several hours resp. early decomposition

6.2 Accessories

Cables

A complete overview of pre-assembled cables for fieldbus components can be found here.

Ordering information	Description	Link
ZK1090-3xxx-xxxx	EtherCAT cable M8, green	Website
ZK1093-3xxx-xxxx	EtherCAT cable M8, yellow	Website
ZK2000-5xxx-xxxx	Sensor cable M12, 5-pin	Website
ZK470x-04xx-xxxx	Motor cable with itec connector	Website
ZK203x-xxxx-xxxx	Power cable 7/8 ", 5-pin	Website

Labeling material, protective caps

Ordering information	Description
ZS5000-0010	Protective cap for M8 sockets, IP67 (50 pieces)
ZS5000-0020	Protective cap for M12 sockets, IP67 (50 pcs.)
ZS5100-0000	Inscription labels, unprinted, 4 strips of 10
ZS5000-xxxx	Printed inscription labels on enquiry

Tools

Ordering information	Description
ZB8801-0000	Torque wrench for plugs, 0.4…1.0 Nm
ZB8801-0001	Torque cable key for M8 / wrench size 9 for ZB8801-0000
ZB8801-0002	Torque cable key for M12 / wrench size 13 for ZB8801-0000
ZB8801-0003	Torque cable key for M12 field assembly / wrench size 18 for ZB8801-0000

Further accessories

Further accessories can be found in the price list for fieldbus components from Beckhoff and online at https://www.beckhoff.com.

6.3 Version identification of EtherCAT devices

6.3.1 General notes on marking

Designation

A Beckhoff EtherCAT device has a 14-digit designation, made up of

- family key
- type
- version
- revision

Example	Family	Type	Version	Revision
EL3314-0000-0016	EL terminal (12 mm, non-pluggable connection level)	3314 (4-channel thermocouple terminal)	0000 (basic type)	0016
ES3602-0010-0017	ES terminal (12 mm, pluggable connection level)	3602 (2-channel voltage measurement)	0010 (high-precision version)	0017
CU2008-0000-0000	CU device	2008 (8-port fast ethernet switch)	0000 (basic type)	0000

Notes

- The elements mentioned above result in the **technical designation**. EL3314-0000-0016 is used in the example below.
- EL3314-0000 is the order identifier, in the case of “-0000” usually abbreviated to EL3314. “-0016” is the EtherCAT revision.
- The **order identifier** is made up of
  - family key (EL, EP, CU, ES, KL, CX, etc.)
  - type (3314)
  - version (-0000)
- The **revision** -0016 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.
  In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.
  Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff web site.
  From 2014/01 the revision is shown on the outside of the IP20 terminals, see Fig. *“EL5021 EL terminal, standard IP20 IO device with batch number and revision ID (since 2014/01)”*.
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

6.3.2 Version identification of EP/EPI/EPP/ER/ERI boxes

The serial number/ data code for Beckhoff IO devices is usually the 8-digit number printed on the device or on a sticker. The serial number indicates the configuration in delivery state and therefore refers to a whole production batch, without distinguishing the individual modules of a batch.

Structure of the serial number: **KK YY FF HH**	Example with serial number 12 06 3A 02:
KK - week of production (CW, calendar week)	12 - production week 12
YY - year of production	06 - production year 2006
FF - firmware version	3A - firmware version 3A
HH - hardware version	02 - hardware version 02

Exceptions can occur in the **IP67 area**, where the following syntax can be used (see respective device documentation):

Syntax: D ww yy x y z u

D - prefix designation
ww - calendar week
yy - year
x - firmware version of the bus PCB
y - hardware version of the bus PCB
z - firmware version of the I/O PCB
u - hardware version of the I/O PCB

Example: D.22081501 calendar week 22 of the year 2008 firmware version of bus PCB: 1 hardware version of bus PCB: 5 firmware version of I/O PCB: 0 (no firmware necessary for this PCB) hardware version of I/O PCB: 1

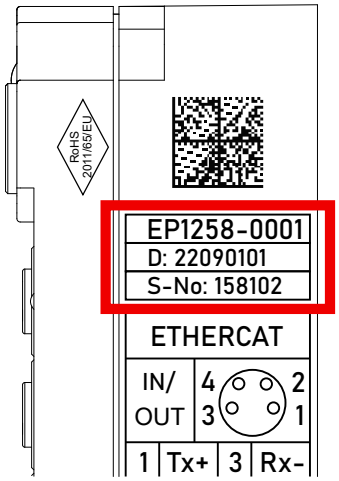


Fig. 81: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

6.3.3 Beckhoff Identification Code (BIC)

The Beckhoff Identification Code (BIC) is increasingly being applied to Beckhoff products to uniquely identify the product. The BIC is represented as a Data Matrix Code (DMC, code scheme ECC200), the content is based on the ANSI standard MH10.8.2-2016.

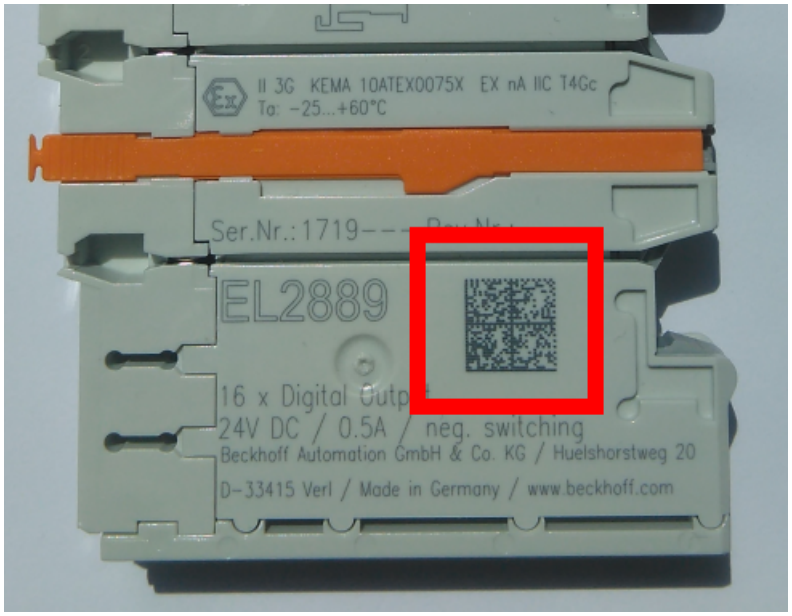


Fig. 82: BIC as data matrix code (DMC, code scheme ECC200)

The BIC will be introduced step by step across all product groups.

Depending on the product, it can be found in the following places:

- on the packaging unit
- directly on the product (if space suffices)
- on the packaging unit and the product

The BIC is machine-readable and contains information that can also be used by the customer for handling and product management.

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, spaces are added to it.

Following information is possible, positions 1 to 4 are always present, the other according to need of production:

Position	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	**Beckhoff order number**	1P	8	1P072222
2	Beckhoff Traceability Number (BTN)	**Unique serial number, see note below**	SBTN	12	SBTNk4p562d7
3	Article description	**Beckhoff article description, e.g. EL1008**	1K	32	1KEL1809
4	Quantity	**Quantity in packaging unit, e.g. 1, 10, etc.**	Q	6	Q1
5	Batch number	Optional: Year and week of production	2P	14	2P401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	51S678294
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	30PF971, 2*K183
...					

Further types of information and data identifiers are used by Beckhoff and serve internal processes.

Structure of the BIC

Example of composite information from positions 1 to 4 and with the above given example value on position 6. The data identifiers are highlighted in bold font:

1P072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

Accordingly as DMC:

Fig. 83: Example DMC **1P**072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, position 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTE

This information has been carefully prepared. However, the procedure described is constantly being further developed. We reserve the right to revise and change procedures and documentation at any time and without prior notice. No claims for changes can be made from the information, illustrations and descriptions in this information.

6.3.4 Electronic access to the BIC (eBIC)

Electronic BIC (eBIC)

The Beckhoff Identification Code (BIC) is applied to the outside of Beckhoff products in a visible place. If possible, it should also be electronically readable.

Decisive for the electronic readout is the interface via which the product can be electronically addressed.

K-bus devices (IP20, IP67)

Currently, no electronic storage and readout is planned for these devices.

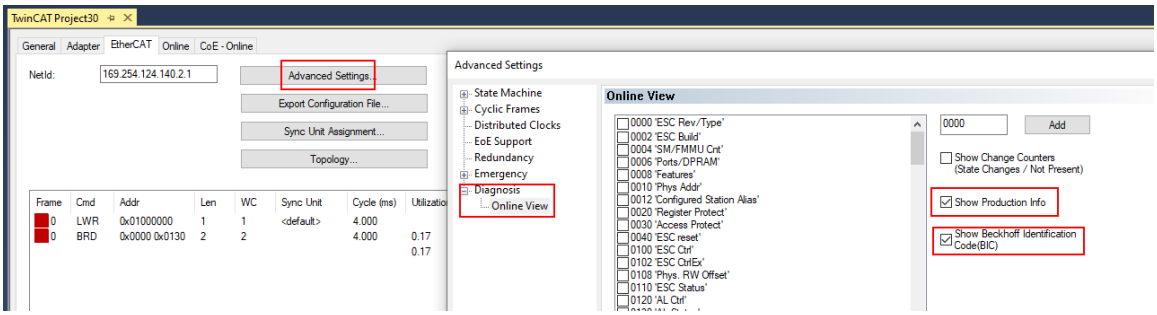
EtherCAT devices (IP20, IP67)

All Beckhoff EtherCAT devices have a so-called ESI-EEPROM, which contains the EtherCAT identity with the revision number. Stored in it is the EtherCAT slave information, also colloquially known as ESI/XML configuration file for the EtherCAT master. See the corresponding chapter in the EtherCAT system manual (Link) for the relationships.

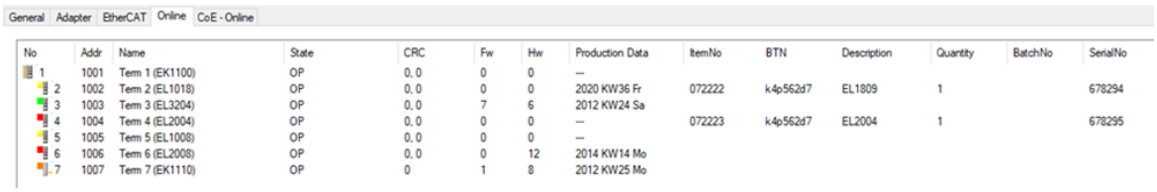
The eBIC is also stored in the ESI-EEPROM. The eBIC was introduced into the Beckhoff I/O production (terminals, box modules) from 2020; widespread implementation is expected in 2021.

The user can electronically access the eBIC (if existent) as follows:

- With all EtherCAT devices, the EtherCAT master (TwinCAT) can read the eBIC from the ESI-EEPROM
  - From TwinCAT 3.1 build 4024.11, the eBIC can be displayed in the online view.
  - To do this,
    check the checkbox "Show Beckhoff Identification Code (BIC)" under
    EtherCAT → Advanced Settings → Diagnostics:



  - The BTN and its contents are then displayed:



  - Note: as can be seen in the illustration, the production data HW version, FW version and production date, which have been programmed since 2012, can also be displayed with "Show Production Info".
  - From TwinCAT 3.1. build 4024.24 the functions *FB_EcReadBIC* and *FB_EcReadBTN* for reading into the PLC and further eBIC auxiliary functions are available in the Tc2_EtherCAT Library from v3.3.19.0.
- In the case of EtherCAT devices with CoE directory, the object 0x10E2:01 can additionally by used to display the device's own eBIC; the PLC can also simply access the information here:

- The device must be in PREOP/SAFEOP/OP for access:

Index	Name	Flags	Value
1000	Device type	RO	0x015E1389 (22942601)
1008	Device name	RO	ELM3704-0000
1009	Hardware version	RO	00
100A	Software version	RO	01
100B	Bootloader version	RO	J0.1.27.0
1011:0	Restore default parameters	RO	> 1 <
1018:0	Identity	RO	> 4 <
10E2:0	Manufacturer-specific Identification C...	RO	> 1 <
10E2:01	SubIndex 001	RO	1P158442SBTN0008jekp1KELM3704 Q1 2P482001000016
10F0:0	Backup parameter handling	RO	> 1 <
10F3:0	Diagnosis History	RO	> 21 <
10F8	Actual Time Stamp	RO	0x170bfb277e

- the object 0x10E2 will be introduced into stock products in the course of a necessary firmware revision.
- From TwinCAT 3.1. build 4024.24 the functions *FB_EcCoEReadBIC* and *FB_EcCoEReadBTN* for reading into the PLC and further eBIC auxiliary functions are available in the Tc2_EtherCAT Library from v3.3.19.0.

- Note: in the case of electronic further processing, the BTN is to be handled as a string(8); the identifier "SBTN" is not part of the BTN.
- Technical background
  The new BIC information is additionally written as a category in the ESI-EEPROM during the device production. The structure of the ESI content is largely dictated by the ETG specifications, therefore the additional vendor-specific content is stored with the help of a category according to ETG.2010. ID 03 indicates to all EtherCAT masters that they must not overwrite these data in case of an update or restore the data after an ESI update.
  The structure follows the content of the BIC, see there. This results in a memory requirement of approx. 50..200 bytes in the EEPROM.
- Special cases
  - If multiple, hierarchically arranged ESCs are installed in a device, only the top-level ESC carries the eBIC Information.
  - If multiple, non-hierarchically arranged ESCs are installed in a device, all ESCs carry the eBIC Information.
  - If the device consists of several sub-devices with their own identity, but only the top-level device is accessible via EtherCAT, the eBIC of the top-level device is located in the CoE object directory 0x10E2:01 and the eBICs of the sub-devices follow in 0x10E2:nn.

Profibus/Profinet/DeviceNet... Devices

Currently, no electronic storage and readout is planned for these devices.

6.4 Support and Service

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