Documentation for

EP7041-x00x

Stepper Motor Modules with interface for incremental encoder

Version: 2.2.0
Date: 2018-12-05

BECKHOFF

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

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Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, DE102004044764, DE102007017835 with corresponding applications or registrations in various other countries.

The TwinCAT Technology is covered, including but not limited to the following patent applications and patents: EP0851348, US6167425 with corresponding applications or registrations in various other countries.

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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	Modifications
2.2.0	• Update Safety instructions • Update chapter *Mounting* • Correction chapter *Power cables*
2.1.0	• EP7041-3102 added
2.0.0	• Migration
1.7.0	• Preface updated • Chapter on *Nut torques for connectors* updated • Chapter on *EtherCAT connection* updated • Chapter *Signal cable* updated • Chapter *Accessories* updated • Chapter *Line losses* updated
1.6.0	• Power connection updated
1.5.0	• Technical data updated
1.4.0	• Technical data updated
1.3.0	• Technical data updated • Object descriptions updated • Basics about Position Interface added • Chapter *Accessories* updated • Chapter on *Nut torque for connectors* updated • Chapter *Power Connection* updated
1.2.0	• Chapter *Configuration of the main parameters* updated • Chapter *Accessories* added
1.1.0	• Technical data updated • EP7041-2002 and EP7041-3002 added • Overview of EtherCAT cables extended • Overview of the signal cables updated • Description of the power connection updated • ATEX notes added • Extended temperature range for activated modules documented
1.0.0	• Chapter on commissioning and configuration revised
0.6	• EP7041-1002 added • Object description updated • Nut torque for connectors added • Overview of the signal cables added
0.5	• First preliminary version for EP7041-0002

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.

Documentation version	EP7041-0002		EP7041-1002		EP7041-2002		EP7041-3002		EP7041-3102	
	Firmware	Hardware	Firmware	Hardware	Firmware	Hardware	Firmware	Hardware	Firmware	Hardware
2.2.0	11	14	10	12	11	13	07	10	07	06
2.1.0	11	12	10	10	11	11	06	08	06	04
2.0.0	11	11	10	09	11	10	06	08	-	-
1.7.0	11	11	10	09	11	10	06	07		
1.6.0	09	10	09	08	10	10	06	07		
1.4.0	08	06	08	04	08	06	04	02		
1.3.0	08	06	08	04	08	06	04	02		
1.2.0	08	03	08	01	08	03	04	02		
1.1.0	07	03	07	01	07	03	02	01		
1.0.0	04	01	04	00	-	-	-	-		
0.6	04	01	04	00						
0.5	03	01	-	-						

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)

WW YY FF HH

WW - week of production (calendar week)
YY - year of production
FF - firmware version
HH - hardware version

Example with ser. no.: 12 09 03 00:

12 - week of production 12
09 - year of production 2009
03 - firmware version 03
00 - hardware version 00

2 Product overview

2.1 EtherCAT Box - Introduction

The EtherCAT system has been extended with EtherCAT Box modules with protection class IP 67. 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.

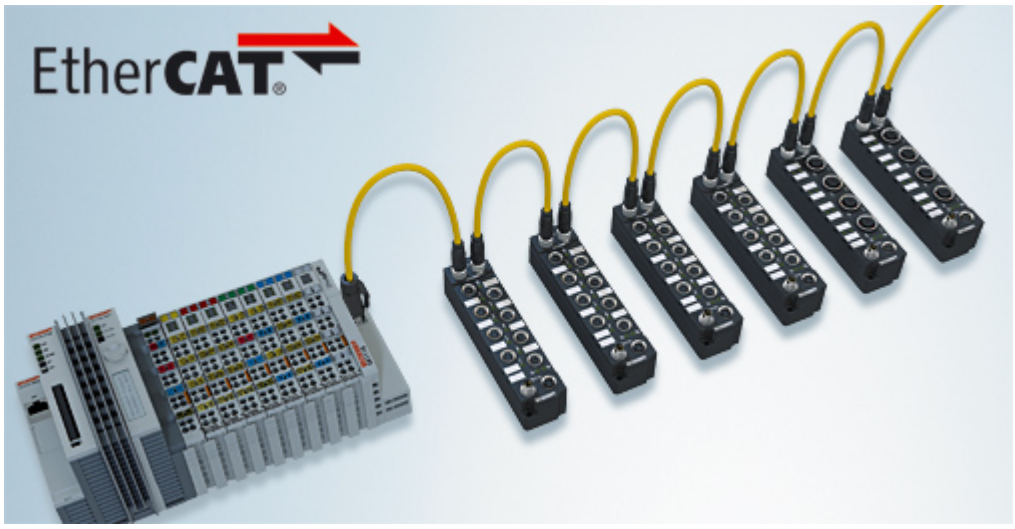


Fig. 1: EtherCAT Box Modules within an EtherCAT network

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.

EtherCAT XML Device Description

You will find XML files (XML Device Description Files) for Beckhoff EtherCAT modules on our website (www.beckhoff.com) under Downloads, in the Configuration Files area.

2.2 Module overview

Fig. 4: EP7041 with stepper motor

Module	Output current for stepper motor	Integrated connection for motor supply	Comment
EP7041-0002 [▶ 12]	2 x 3.5 A rated current, 2 x 5.0 A peak current	M12, female	• Designed for particularly quiet and precise motor operation.
EP7041-1002 [▶ 12]	2 x 1.0 A rated current, 2 x 1.5 A peak current	M12, female	• Designed for particularly quiet and precise motor operation. • Smaller output current for stepper motors with lower power consumption.
EP7041-2002 [▶ 13]	2 x 3.5 A rated current, 2 x 5.0 A peak current	M12, male	• Designed for particularly quiet and precise motor operation. • Integrated connector for feeding the motor supply build with pins (male).
EP7041-3002 [▶ 14]	2 x 3.5 A rated current, 2 x 5.0 A peak current	M12, male	• Designed for higher velocities. • Integrated connector for feeding the motor supply build with pins (male).
EP7041-3002 [▶ 14]	2 x 3.5 A rated current, 2 x 5.0 A peak current	M12, male	• Designed for higher velocities. • Integrated connector for feeding the motor supply build with pins (male). • 5 V_{DC} encoder supply

Also see about this

- EP7041-0002, EP7041-1002 - Introduction [▶ 12]
- EP7041-2002 - Introduction [▶ 13]
- EP7041-3002, EP7041-3102 - Introduction [▶ 14]

2.3 EP7041-0002, EP7041-1002 - Introduction

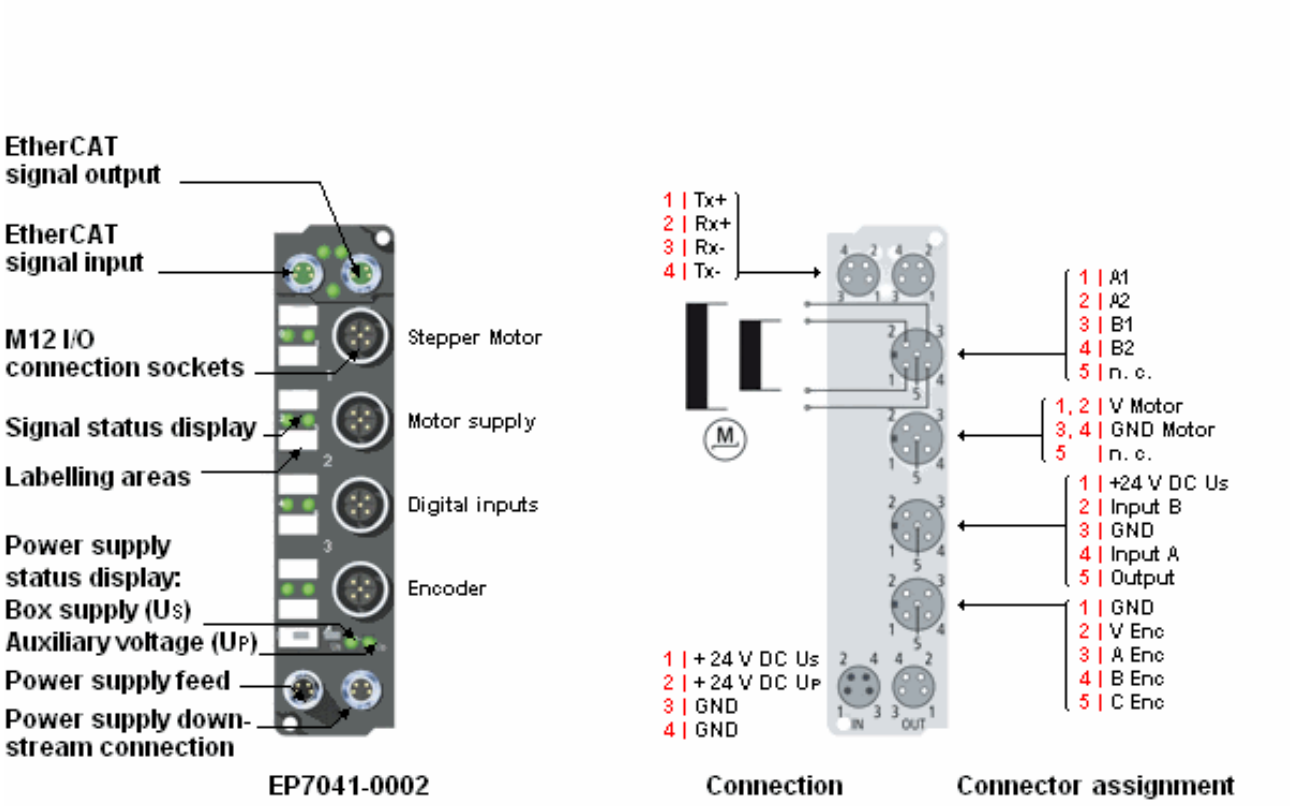


Fig. 5: EP7041-0002

Stepper Motor modules with interface for incremental encoder

The EP7041-0002 and EP7041-1002 EtherCAT Box Modules are intended for the direct connection of different stepper motors.

Two versions are available:

- EP7041-0002: 2 x 3.5 A rated current, (2 x 5.0 A peak current)
- EP7041-1002: 2 x 1.0 A rated current, (2 x 1.5 A peak current)

The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range.

A servo axis can easily be realized by connecting an incremental encoder.
Two digital inputs and a digital output (0.5 A) enable connection of limit switches and a motor brake.

The modules can be adjusted to the motor and the application by changing various parameters.
64-fold micro-stepping ensures particularly quiet and precise motor operation.

Quick links

- Installation [▶ 16]
- Configuration [▶ 40]
- ATEX - special conditions [▶ 34] for ATEX-approved modules

2.4 EP7041-2002 - Introduction

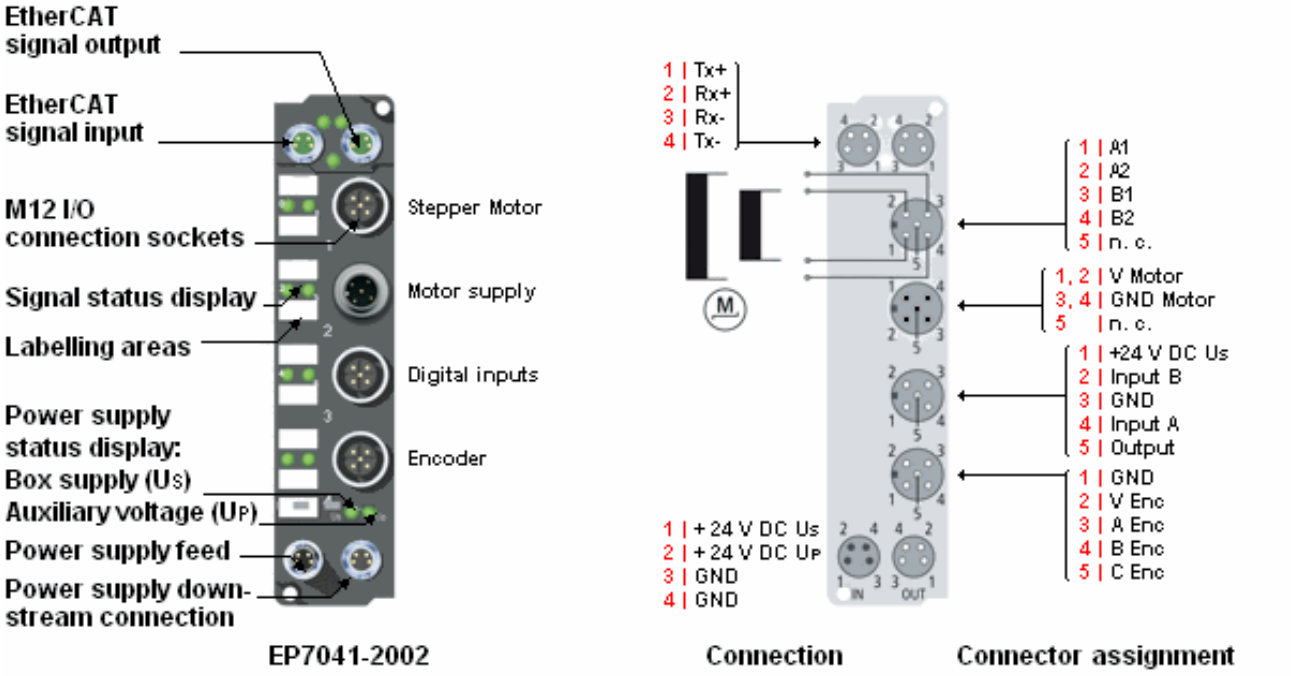


Fig. 6: EP7041-2002

Stepper Motor modules with interface for incremental encoder

The EP7041-2002 EtherCAT Box is designed for direct connection of different stepper motors.

The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range.

A servo axis can easily be realized by connecting an incremental encoder.
Two digital inputs and a digital output (0.5 A) enable connection of limit switches and a motor brake.

The external motor is fed via an integrated plug.

The EP7041-2002 can be adjusted to the motor and the application by changing various parameters.
64-fold micro-stepping ensures particularly quiet and precise motor operation.

Quick links

- Installation [▶ 16]
- Configuration [▶ 40]

2.5 EP7041-3002, EP7041-3102 - Introduction

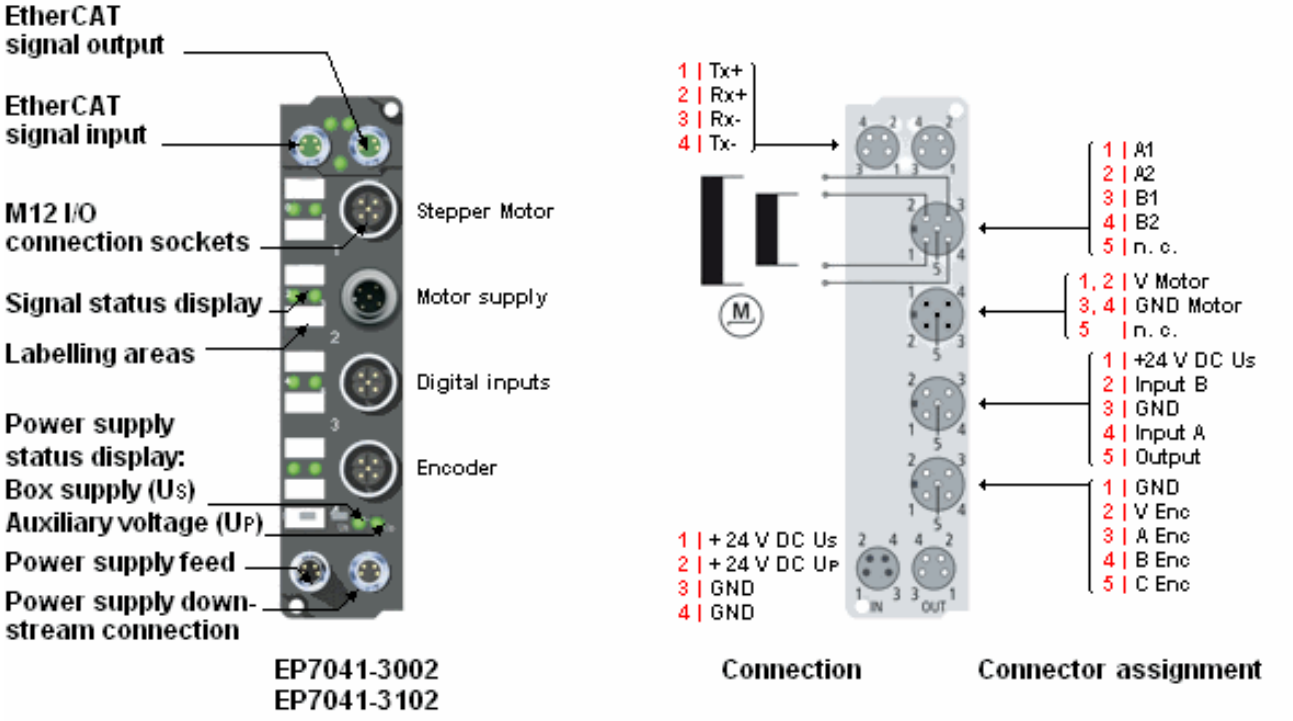


Fig. 7: EP7041-3002 and EP7041-3102

Stepper Motor modules with interface for incremental encoder

The EP7041-3002 and EP7041-3102 EtherCAT Box Modules are designed for direct connection of different stepper motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range.

A servo axis can easily be realized by connecting an incremental encoder. The modules supply the incremental encoder with:
EP7041-3002: 24 V_{DC}
EP7041-3102: 5 V_{DC}

Two digital inputs and a digital output (0.5 A) enable connection of limit switches and a motor brake.

The external motor is fed via an integrated plug.

EP7041-3002 and EP7041-3102 are designed for higher velocities and can be adjusted to the motor and the application by changing various parameters.

Quick links

- Installation [▶ 16]
- Configuration [▶ 40]

2.6 EP7041 - Technical data

Technische Daten	EP7041-0002	EP7041-1002	EP7041-2002	EP7041-3002	EP7041-3102
Technical data	EtherCAT				
Fieldbus connection	2 x M8 socket (green)				
Number of outputs	1 stepper motor (2 phases) 1 digital output (24 VDC)				
Number of inputs	2 end positions, 4 encoder systems (encoder)				
Encoder voltage	24 V_{DC}				5 V_{DC}
Connection of inputs and outputs [▶ 30]	M12 sockets		M12 sockets, M12 plug		
Output current stepper motor	2 x 3.5 A rated current, (2 x 5.0 A peak current) **at 50 °C**	2 x 1.0 A rated current, (2 x 1.5 A peak current)	2 x 3.5 A rated current, (2 x 5.0 A peak current) **at 50 °C**		
Motor voltage	max. 50 V_{DC}				
Maximum step frequency	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)				
Resolution	approx. 5,000 positions in typical applications (per revolution)				
Step pattern (automatic switching, velocity-dependent)	up to 64-fold micro-stepping			up to 256-fold micro-stepping	
Current controller frequency	approx. 30 kHz				
Encoder pulse frequency	maximum 400,000 increments/s (quadruple evaluation)				
Input signal voltage "0"	-3 V ... 2 V				
Input signal voltage "1"	2,5 V ... 28 V				
Input current	typically 5 mA				
Diagnostic LEDs	error segment A and B, loss of step/stagnation, power, enable				
Module electronic supply	derived from control voltage Us				
Module electronic current consumption	typically 120 mA				
Current consumption from UP					
Power supply connection	Power supply: 1 x M8 plug, 4-pin (black) Onward connection: 1 x M8 socket, 4-pin (black)				
Process image	Input: 2 x 16 bit data, 1 x 16 bit status Output: 2 x 16 bit data, 1 x 16 bit control				
Electrical isolation	Control voltage / fieldbus: yes				
Weight	approx. 165 g				
Permissible ambient temperature during operation	-25°C ... +60°C 0°C ... +55°C (according to ATEX, see special conditions [▶ 34])				
Permissible ambient temperature during storage	-40°C ... +85°C				
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27				
EMC immunity/emission	conforms to EN 61000-6-2 / EN 61000-6-4				
Protection class	IP65, IP66, IP67 (according to EN 60529)				
Installation position	up to 40 °C ambient temperature: variable over 40 °C ambient temperature: distance between two stepper motor modules at least 20 mm				
Approval	CE, ATEX [▶ 34]				

Also see about this

- Signal connection [▶ 30]
- ATEX - Special conditions [▶ 34]

3 Installation

3.1 Mounting

3.1.1 Dimensions

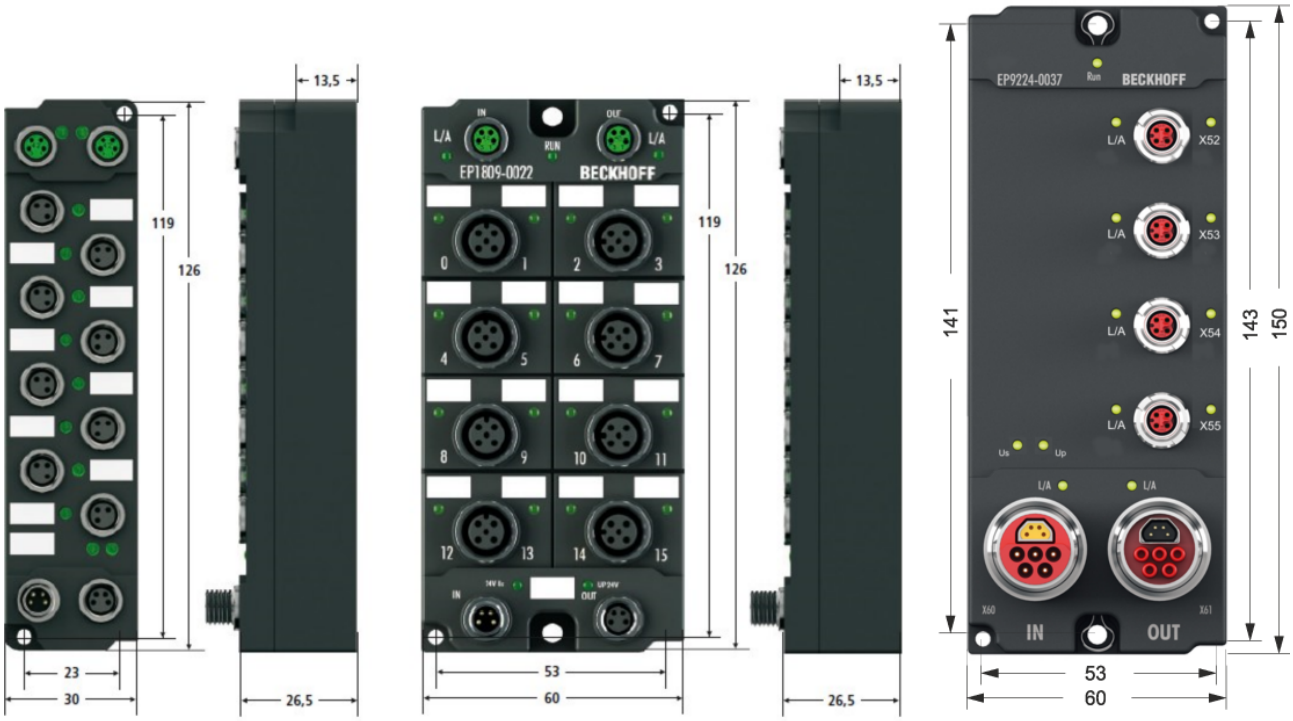


Fig. 8: Dimensions of the EtherCAT Box Modules

All dimensions are given in millimeters.

Housing properties

EtherCAT Box	lean body	wide bodies
Housing material	PA6 (polyamide)	
Casting compound	Polyurethane	
Mounting	two fastening holes Ø 3 mm for M3	two fastening holes Ø 3 mm for M3 two fastening holes Ø 4.5 mm for M4
Metal parts	Brass, nickel-plated	
Contacts	CuZn, gold-plated	
Power feed through	max. 4 A (M8) max. 16 A (7/8“) max. 15.5 A (B17 5G 1.5 mm^2)	
Installation position	variable	
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together	
Dimensions (H x W x D)	app. 126 x 30 x 26.5 mm	app. 126 x 60 x 26,5 mm app. 150 x 60 x 26.5 mm (without 7/8", B17)

3.1.2 Fixing

Note or pointer

While mounting the modules, protect all connectors, especially the IP-Link, against contamination! Only with connected cables or plugs the protection class IP67 is guaranteed! Unused connectors have to be protected with the right plugs! See for plug sets in the catalogue.

Modules with narrow housing are mounted with two M3 bolts.
Modules with wide housing are mounted with two M3 bolts to the fixing holes located at the corners or mounted with two M4 bolts to the fixing holes located centrally.

The bolts must be longer than 15 mm. The fixing holes of the modules are not threaded.

When assembling, remember that the fieldbus connectors increases the overall height. See chapter accessories.

Mounting Rail ZS5300-0001

The mounting rail ZS5300-0001 (500 mm x 129 mm) allows the time saving assembly of modules.

The rail is made of stainless steel, 1.5 mm thick, with already pre-made M3 threads for the modules. The rail has got 5.3 mm slots to mount it via M5 screws to the machine.

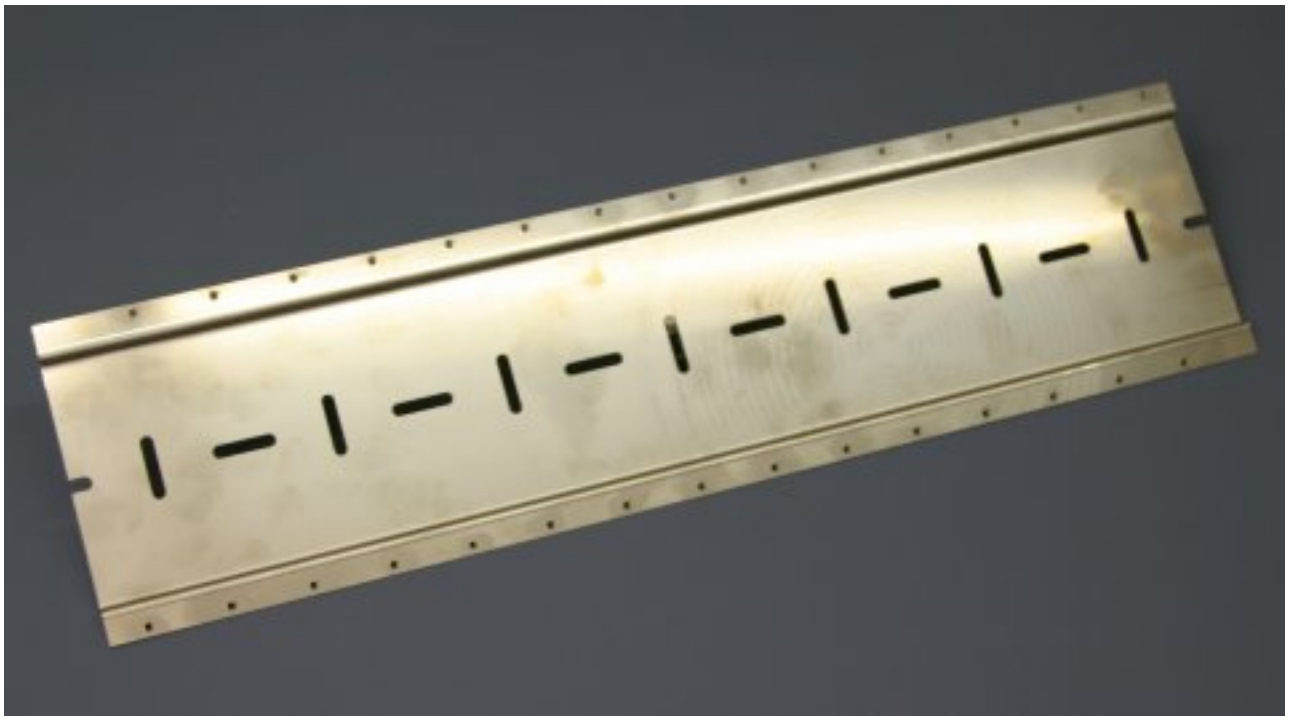


Fig. 9: Mounting Rail ZS5300-000

The mounting rail is 500 mm long, that way 15 narrow modules can be mounted with a distance of 2 mm between two modules. The rail can be cut to length for the application.

Mounting Rail ZS5300-0011

The mounting rail ZS5300-0011 (500 mm x 129 mm) has in addition to the M3 treads also pre-made M4 treads to fix 60 mm wide modules via their middle holes.

Up to 14 narrow or 7 wide modules may be mixed mounted.

3.1.3 Nut torque for connectors

M8 connectors

It is recommended to pull the M8 connectors tight with a nut torque of **0.4 Nm**. When using the torque control screwdriver ZB8800 is also a max. torque of **0.5 Nm** permissible.

Fig. 10: EtherCAT Box with M8 connectors

M12 connectors

It is recommended to pull the M12 connectors tight with a nut torque of **0.6 Nm**.

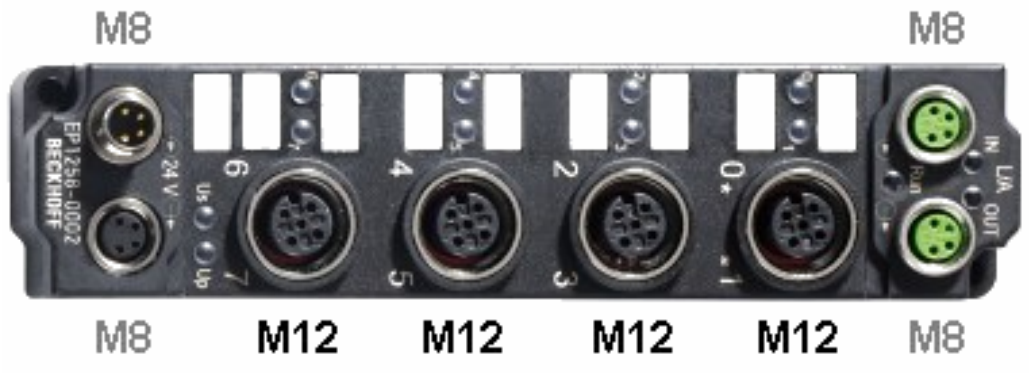


Fig. 11: EtherCAT Box with M8 and M12 connectors

7/8" plug connectors

We recommend fastening the 7/8" plug connectors with a torque of **1.5 Nm**.

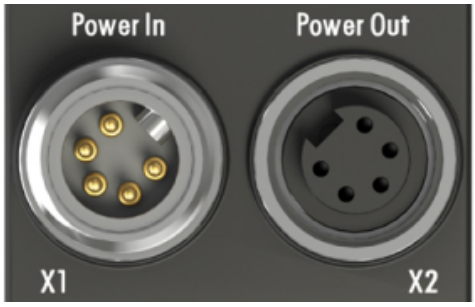


Fig. 12: 7/8" plug connectors

Torque socket wrenches

Fig. 13: ZB8801 torque socket wrench

Ensure the right torque

Use the torque socket wrenches available by Beckhoff to pull the connectors tight (ZB8800, ZB8801-0000)!

3.2 Connection

3.2.1 EtherCAT connection

For the incoming and ongoing EtherCAT connection,

- the EtherCAT Box (EPxxxx) has two M8 sockets, marked in **green**
- the Coupler Box (FBB-x110) has two M12 sockets

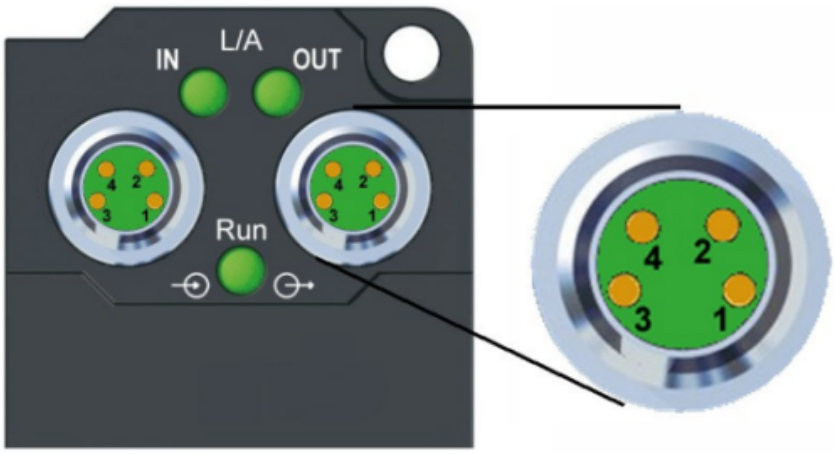


Fig. 14: EtherCAT Box: M8, 30 mm housing

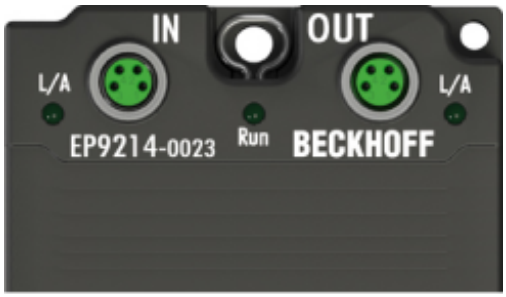


Fig. 15: EtherCAT Box: M860 mm housing (example: EP9214)

Fig. 16: Coupler Box: M12

Assignment

There are various different standards for the assignment and colors of connectors and cables for Ethernet/ EtherCAT.

Ethernet/EtherCAT		Plug connector			Cable		Standard
Signal	**Description**	**M8**	**M12**	**RJ45[1]**	**ZB9010, ZB9020, ZB9030, ZB9032, ZK1090-6292, ZK1090-3xxx-xxxx**	**ZB9031 and old versions of ZB9030, ZB9032, ZK1090-3xxx-xxxx**	**TIA-568B**
Tx +	Transmit Data+	Pin 1	Pin 1	Pin 1	yellow[2]	orange/white[3]	white/orange
Tx -	Transmit Data-	Pin 4	Pin 3	Pin 2	orange[2]	orange[3]	orange
Rx +	Receive Data+	Pin 2	Pin 2	Pin 3	white[2]	blue/white[3]	white/green
Rx -	Receive Data-	Pin 3	Pin 4	Pin 6	blue[2]	blue[3]	green
Shield	Shield	Housing		Shroud	Screen	Screen	Screen

[1]) colored markings according to EN 61918 in the four-pin RJ45 connector ZS1090-0003
[2]) wire colors according to EN 61918
[3]) wire colors

Assimilation of color coding for cable ZB9030, ZB9032 and ZK1090-3xxxx-xxxx (with M8 connectors)

For unification the prevalent cables ZB9030, ZB9032 and ZK1090-3xxx-xxxx this means the pre assembled cables with M8 connectors were changed to the colors of EN61918 (yellow, orange, white, blue).So different color coding exists. But the electrical properties are absolutely identical.

EtherCAT connector

The following connectors can be supplied for use in Beckhoff EtherCAT systems.

Name	Connector	Comment
ZS1090-0003	RJ45	four-pole, IP20, field-configurable
ZS1090-0004	M12, male	four-pin, IP67, for field assembly
ZS1090-0005	RJ45	eight-pole, IP20, field-configurable, suitable for gigabit Ethernet
ZS1090-0006	M8 plug connector	four-pole, IP67, field-configurable, for cable type ZB903x
ZS1090-0007	M8 socket	four-pole, IP67, field-configurable, for cable type ZB903x
ZS1090-1006	M8 plug connector	four-pole, IP67, field-configurable up to OD = 6.5 mm
ZS1090-1007	M8 socket	four-pole, IP67, field-configurable up to OD = 6.5 mm

3.2.2 EtherCAT - Fieldbus LEDs

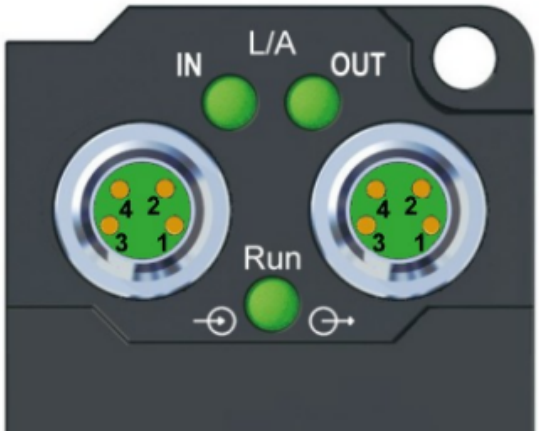


Fig. 17: EtherCAT-LEDs

LED display

LED	Display	Meaning
IN L/A	off	no connection to the preceding EtherCAT module
	Lit	LINK: connection to the preceding EtherCAT module
	flashing	ACT: Communication with the preceding EtherCAT module
OUT L/A	off	no connection to the following EtherCAT module
	Lit	LINK: connection to the following EtherCAT module
	flashing	ACT: Communication with the following EtherCAT module
Run	off	Status of the EtherCAT module is Init
	flashes quickly	Status of the EtherCAT module is pre-operational
	flashes slowly	Status of the EtherCAT module is safe-operational
	Lit	Status of the EtherCAT module is operational

EtherCAT statuses

The various statuses in which an EtherCAT module may be found are described in the Basic System Documentation for EtherCAT, which is available for download from our website (www.beckhoff.com) under Downloads.

3.2.3 Power Connection

The feeding and forwarding of supply voltages is done via two M8 connectors at the bottom end of the modules:

- IN: left M8 connector for feeding the supply voltages
- OUT: right M8 connector for forwarding the supply voltages

Fig. 18: EtherCAT Box, Connectors for power supply

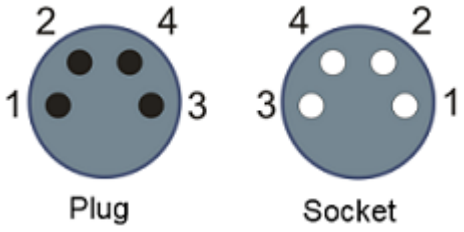


Fig. 19: Pin assignment M8, Power In and Power Out

Table 1: PIN assignment

Pin	Voltage	
1	Control voltage Us, +24 V_{DC}	
2	Auxiliary voltage Up, +24 V_{DC}	
3	GNDs*	*) may be connected internally to each other depending on the module: see specific module descriptions
4	GNDp*	

The pins M8 connectors carry a maximum current of 4 A.

Two LEDs display the status of the supply voltages.

NOTE

Don't confuse the power connectors with the EtherCAT connectors!

Never connect the power cables (M8, 24 V_{DC}) with the green marked EtherCAT sockets of the EtherCAT Box Modules! This can damage the modules!

Control voltage Us: 24 V_{DC}

Power is supplied to the fieldbus, the processor logic, the inputs and the sensors from the 24 V_{DC} control voltage Us. The control voltage is electrically isolated from the fieldbus circuitry.

Auxiliary voltage Up 24 V_{DC}

The Auxiliary voltage Up supplies the digital outputs; it can be brought in separately. If the load voltage is switched off, the fieldbus functions and the power supply and functionality of the inputs are retained.

Redirection of the supply voltages

The IN and OUT power connections are bridged in the module (not IP204x-Bxxx and IE204x). The supply voltages Us and Up can thus easily be transferred from EtherCAT Box to EtherCAT Box.

NOTE

Pay attention to the maximum permissible current!

Pay attention also for the redirection of the supply voltages Us and Up, the maximum permissible current for M8 connectors of 4 A must not be exceeded!

Supply via EP92x4-0023 PowerBox modules

If the machine requires higher current or if the EtherCAT Box Modules are installed far away from the control cabinet with included power supply, the usage of four cannel power distribution modules EP9214 or EP9224 (with integrated data logging, see www.beckhoff.com/EP9224) is recommended.

With these modules intelligent power distribution concepts with up to 2 x 16 A and a maximum of 2.5 mm² cable cross-section can be realized.

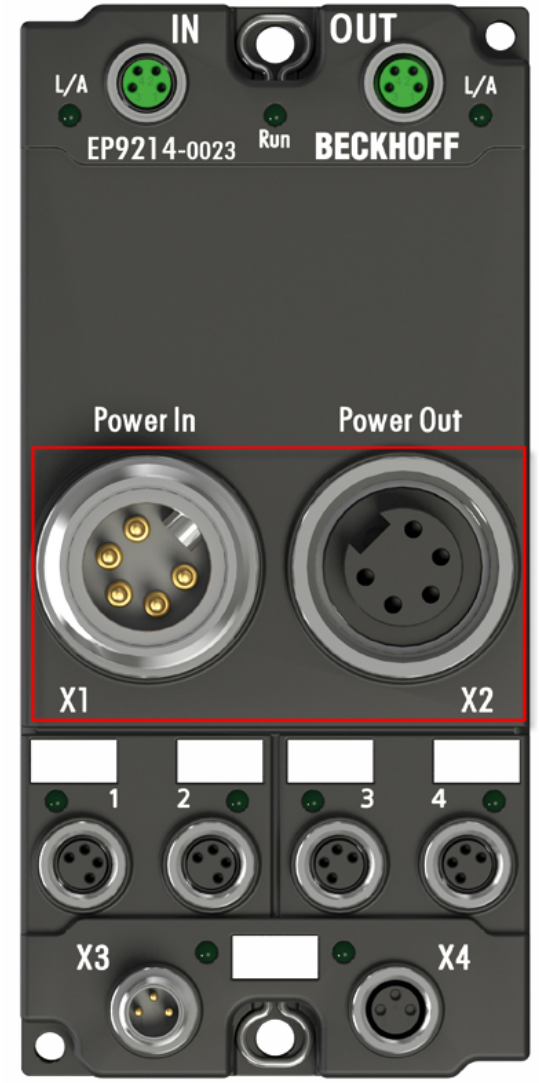


Fig. 20: EP92x4-0023, Connectors for Power In and Power Out

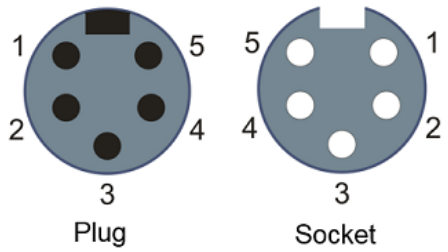


Fig. 21: Pin assignment 7/8”, Power In and Power Out

Electrical isolation

Digital modules

In the digital input/output modules, the grounds of the control voltage (GNDs) and the auxiliary voltage (GNDp) are connected to each other!

Check this at the documentation of each used EtherCAT Box.

Analog modules

In the analog input/output modules the grounds of the control voltage (GNDs) and the auxiliary voltage (GNDp) are separated from each other in order to ensure electrical isolation of the analog signals from the control voltage.

In some of the analog modules the sensors or actuators are supplied by Up - this means, for instance, that in the case of 0...10 V inputs, any reference voltage (0...30 V) may be connected to Up; this is then available to the sensors (e.g. smoothed 10 V for measuring potentiometers).

Details of the power supply may be taken from the specific module descriptions.

NOTE

Electrical isolation may be cancelled!

If digital and analog fieldbus boxes are connected directly via four-core power leads, the analog signals in the fieldbus boxes may be no longer electrically isolated from the control voltage!

3.2.4 Status LEDs for power supply

Fig. 22: Status LEDs for power supply

LED display

LED	Display	Meaning
Us (Control voltage)	off	The power supply voltage Us is not present
	green illuminated	The power supply voltage Us is present
	red illuminated	Because of overload (current > 0.5 A) the sensor supply generated from power supply voltage Us was switched off for all sensors fed from this.
Up (Auxiliary voltage)	off	The power supply voltage Up is not present
	green illuminated	The power supply voltage Up is present

3.2.5 Power cables

Ordering data

Order designation	Power cable	Screw-in connector	Contacts	Cross-section	Length
ZK2020-3200-0020	Straight socket, open end	M8	4-pin	0.34 mm²	2.00 m
ZK2020-3200-0050					5.00 m
ZK2020-3200-0100					10.00 m
ZK2020-3400-0020	Angled socket, open end				2.00 m
ZK2020-3400-0050					5.00 m
ZK2020-3400-0100					10.00 m
ZK2020-3132-0001	Straight socket, straight socket				0.15 m
ZK2020-3132-0005					0.50 m
ZK2020-3132-0010					1.00 m
ZK2020-3132-0020					2.00 m
ZK2020-3132-0050					5.00 m
ZK2020-3334-0001	Angled socket, angled socket				0.15 m
ZK2020-3334-0005					0.50 m
ZK2020-3334-0010					1.00 m
ZK2020-3334-0020					2.00 m
ZK2020-3334-0050					5.00 m

Further available power cables may be found in the Beckhoff catalog or on our internet pages (http://www.beckhoff.com).

Technical data

Technical data	
Rated voltage according to IEC61076-2-101	30 V_{DC}
Contamination level according to IEC 60 664-1	3/2
Insulation resistance IEC 60 512-2	>10^9Ω
Current carrying capacity according to IEC 60512-3	4 A
Volume resistance according to IEC 60512-2	< 5 mΩ
Protection class according to IEC 60529	IP65/66/67, when screwed together
Ambient temperature	-30°C to +80°C

3.2.6 Power cable conductor losses M8

The ZK2020-xxxx-yyyy power cables should not exceed the total length of 15 m at 4 A (with continuation). When planning the cabling, note that at 24 V nominal voltage, the functionality of the module can no longer be assured if the voltage drop reaches 6 V. Variations in the output voltage from the power supply unit must also be taken into account.

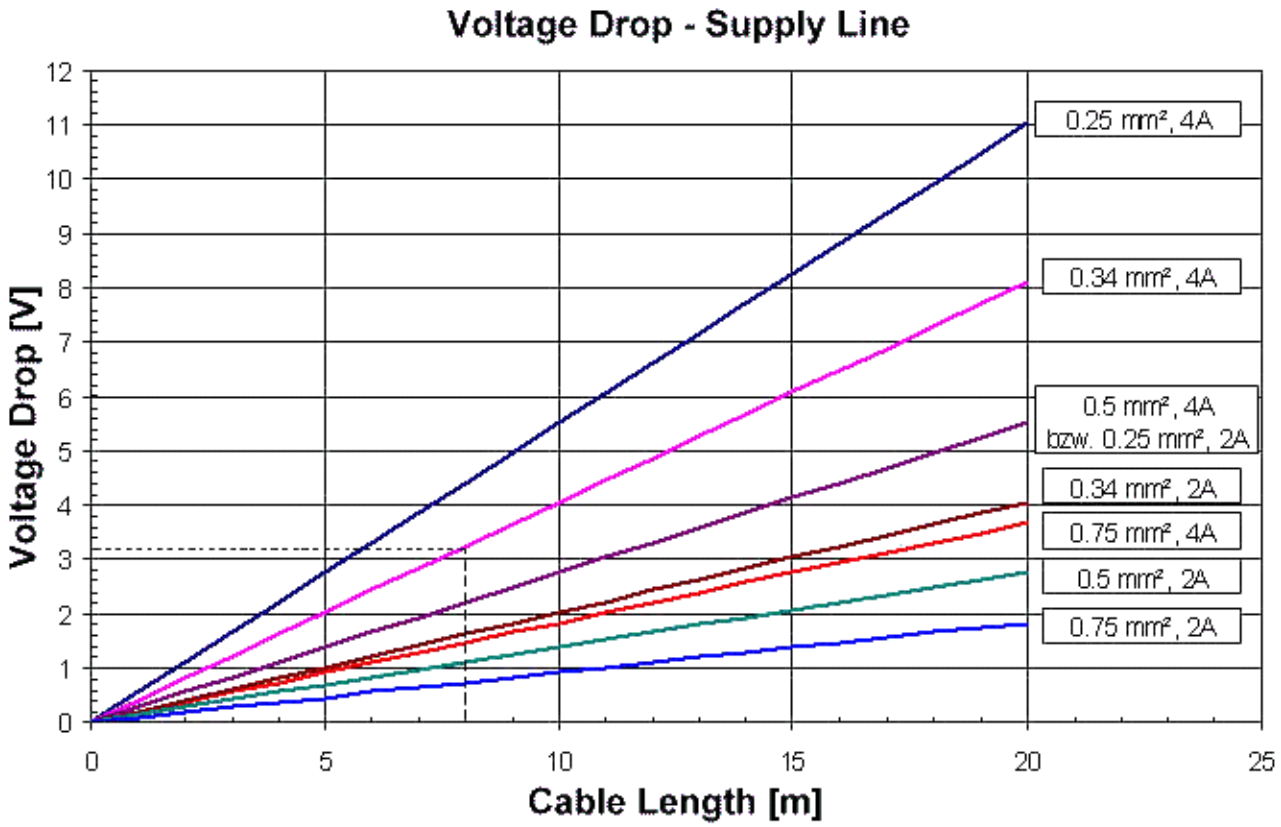


Fig. 23: Power cable conductor losses

Example

8 m power cable with 0.34 mm² cross-section has a voltage drop of 3.2 V at 4 A.

EP92x4 Power Distribution Modules

With EP9214 and EP9224 Power Distribution Modules intelligent concepts for voltage supply are available. Further information may be found under www.beckhoff.com/EP9224.

3.2.7 Signal connection

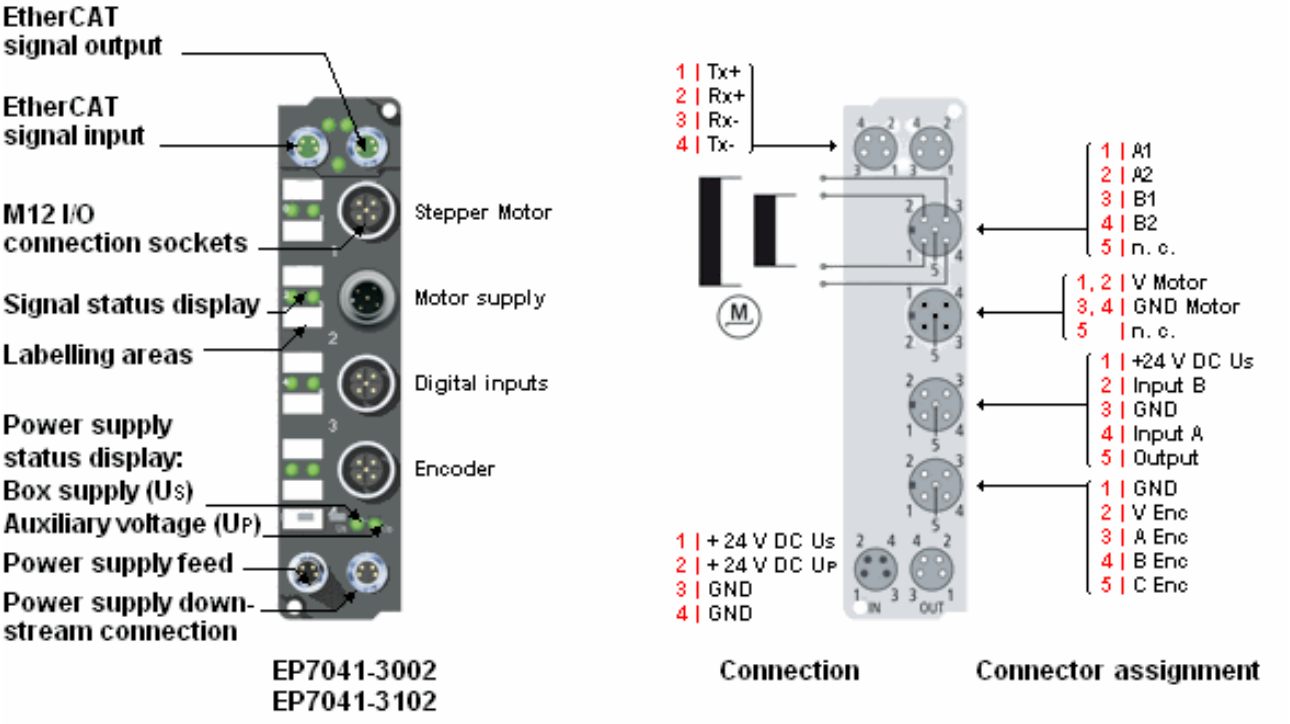


Fig. 24: Signal connection EP7041-3002

NOTE

Note the numbering of the M12 sockets

Mixing up the M12 connectors can damage the module.

M12 socket no. 1: Stepper motor connection

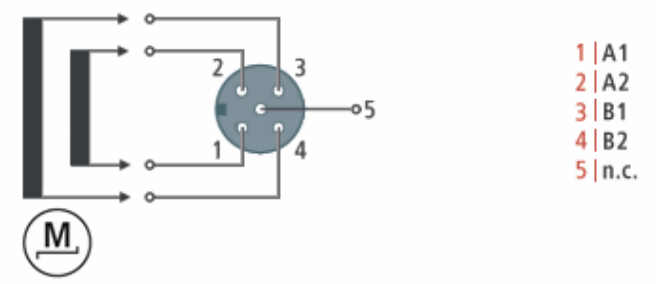


Fig. 25: Stepper motor connection

M12 socket no. 2: Connection for motor supply

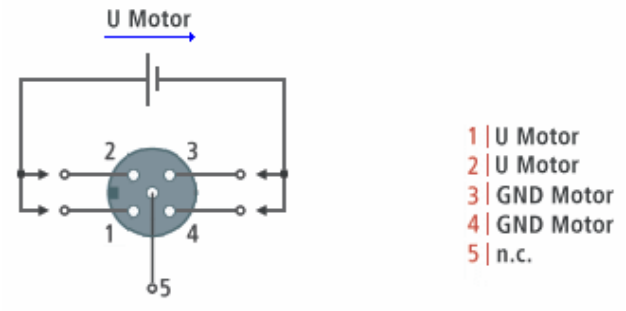


Fig. 26: Connection for motor supply with EP7041-0002 [▶ 12] and EP7041-1002 [▶ 12]

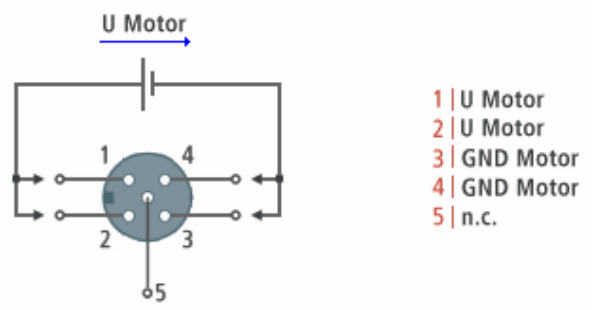


Fig. 27: Connection for motor supply with EP7041-2002 [▶ 13] and EP7041-3002 [▶ 14]

M12 socket no. 3: Connection for binary inputs and outputs

The module

- acquires the binary control signals from the process level and transmits them to the higher-level automation device.
- connects the binary control signals from the automation device on to the actuators at the process level.

The signal connection of the binary inputs and outputs is done via M12 connectors.

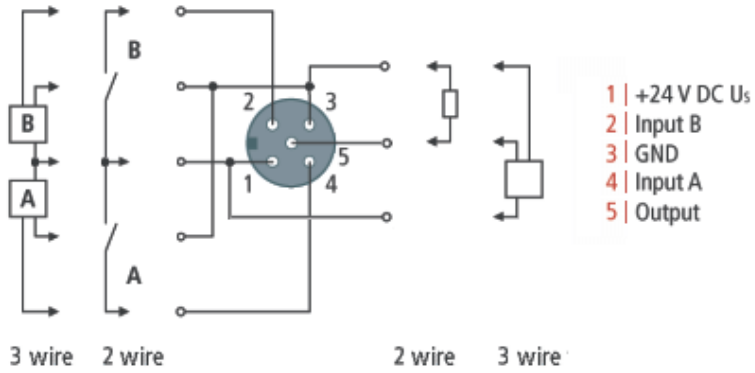


Fig. 28: Connection for binary inputs and outputs

The sensors are supplied with a common maximum current of 0.5 A from the control voltage Us.

The output is short-circuit-proof and is protected against polarity reversal.

LEDs indicate the signal state of the inputs and outputs.

M12 socket no. 4: Encoder connection

Encoder

Fig. 29: Encoder connection

3.2.8 EP7041 – Status LEDs

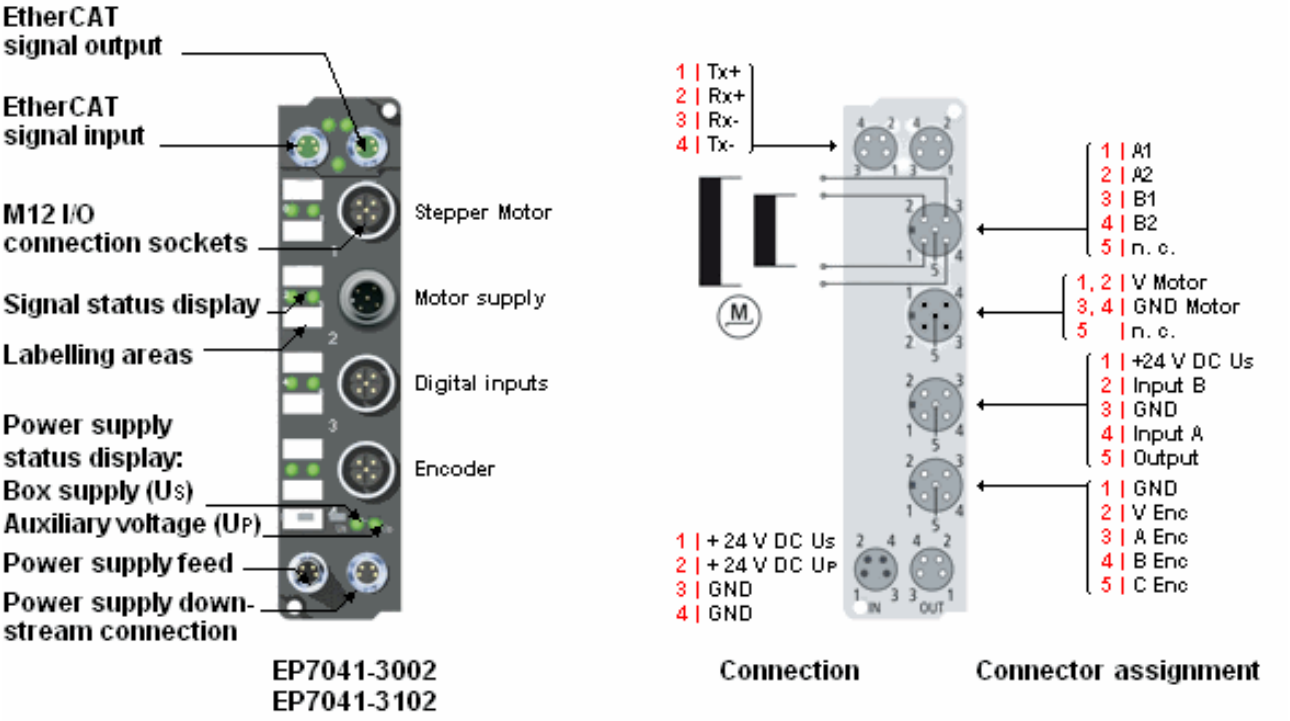


Fig. 30: LEDs EP7041-3002

Status LEDs at the M12 connections

Connection	LED	Display	Meaning
M12 socket no. 1: Stepper motor	R left	green	Motor control is enabled (Index 0x6010:02 [▶ 103] is set) and EP7041 is ready to operate
		yellow	If motor is disabled: motor control in standby
			If motor is enabled: warning, configuration error. Check the motor status.
		red	Error: Check DiagData (Index 0xA010 [▶ 104])
	L right	green	Motor is turning
		red	internal error
M12 socket no. 2: Motor supply	R left	off	Motor supply voltage is not present
		green	Motor supply voltage is present
	L right	off	Binary output (M12 socket no. 3, pin 5) switched off (0 V)
		green	Binary output (M12 socket no. 3, pin 5) switched on (24 V)
M12 socket no. 3: binary inputs binary output	R left	off	there is no signal (0 V) on binary input 1 (M12 socket no. 3, pin 4)
		green	there is no signal (24 V) on binary input 1 (M12 socket no. 3, pin 4)
	L right	off	there is no signal (0 V) on binary input 2 (M12 socket no. 3, pin 2)
		green	there is no signal (24 V) on binary input 2 (M12 socket no. 3, pin 2)
M12 socket no. 4: Encoder	R left	flashes	Encoder track C
	L right	flashes	Encoder track A

3.2.9 Signal cables

A selection of motor and encoder cables follows. Other cables with various lengths will be found in the Beckhoff main catalog, and under www.beckhoff.de.

Detailed information on the cables can be found in the associated data sheets.

Motor cables

ZK4000-6261-0xxx

4 x 0.5 mm², preassembled at both ends

Use:

- Motor cable for EP7041 with stepper motor AS1010, AS1020, AS1030, AS1050 or AS1060

ZK4000-6261-	0005	0010	0020	0100
Length	0.5 m	1.0 m	2.0 m	10.0 m

ZK4000-6100-2xxx

4 x 0.5 mm², M12 plug – open end

Use:

- Motor cable for EP7041 with other stepper motors
- Cable for feeding in the motor supply in EP7041-0002 [▶ 12] and EP7041-1002 [▶ 12]

ZK4000-6100-	2010	2020	2050	2100
Length	1.0 m	2.0 m	5.0 m	10.0 m

ZK4000-6200-2xxx

4 x 0.5 mm², M12 socket – open end

Use:

- Cable for feeding in the motor supply in EP7041-2002 [▶ 13] and EP7041-3002 [▶ 14]
- Motor cable for stepper motor AS1010, AS1020, AS1030, AS1050 or AS1060
  on stepper motor terminals from the series ELxxxx (E-bus) or KLxxxx (K-bus)

ZK4000-6200-	2010	2030	2050	2080	2100
Length	1.0 m	3.0 m	5.0 m	8.0 m	10.0 m

Encoder cables

ZK4000-5151-0xxx

4 x 0.35 mm², shielded, preassembled at both ends

Use:

- Encoder cable for stepper motor AS1020, AS1050 or AS1060

ZK4000-5151-	0005	0010	0020	0100
Length	0.5 m	1.0 m	2.0 m	10.0 m

ZK4000-5100-2xxx

4 x 0.35 mm², shielded, M12 socket – open end

Use:

- Encoder cable for other encoders

ZK4000-5100-	2010	2030	2050	2080	2100
Length	1.0 m	3.0 m	5.0 m	8.0 m	10.0 m

3.3 ATEX notes

3.3.1 ATEX - Special conditions

⚠ WARNING

Observe the special conditions for the intended use of EtherCAT Box modules in potentially explosive areas – directive 94/9/EU.

- The certified components are to be installed in the BG2000-0000 protection enclosure [▶ 35] that guarantees a protection against mechanical hazards!
- If the temperatures during rated operation are higher than 70°C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values!
- Observethe permissible ambient temperature range of 0 - 55°C for the use of EtherCAT Box modules in potentially explosive areas!
- Measures must be taken to protect against the rated operating voltage being exceeded by more than 40% due to short-term interference voltages!
- The connections of the certified components may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!

Standards

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

- EN 60079-0: 2006
- EN 60079-15: 2005

Marking

The EtherCAT Box modules certified for potentially explosive areas bear the following marking:

II 3 G Ex nA II T4 DEKRA 11ATEX0080 X Ta: 0 - 55°C

or

II 3 G Ex nA nC IIC T4 DEKRA 11ATEX0080 X Ta: 0 - 55°C

Batch number (D number)

The EtherCAT Box modules bear a batch number (D number) that is structured as follows:

D: WW YY FF HH

WW - week of production (calendar week)
YY - year of production
FF - firmware version
HH - hardware version

Beispiel mit Ser. Nr.: 29 10 02 01:

29 - week of production 29
10 - year of production 2010
02 - firmware version 02
01 - hardware version 01

3.3.2 BG2000-0000 - EtherCAT Box protection enclosure

⚠ WARNING

Risk of electric shock and damage of device!

Bring the EtherCAT system into a safe, powered down state before starting installation, disassembly or wiring of the modules!

ATEX

The BG2000-0000 protection enclosure has to be mounted over a single EtherCAT Box to fulfill the special conditions according to ATEX [▶ 34].

Installation

Put the cables for EtherCAT, power supply and sensors/actuators through the hole of the BG2000-0000 protection enclosure.

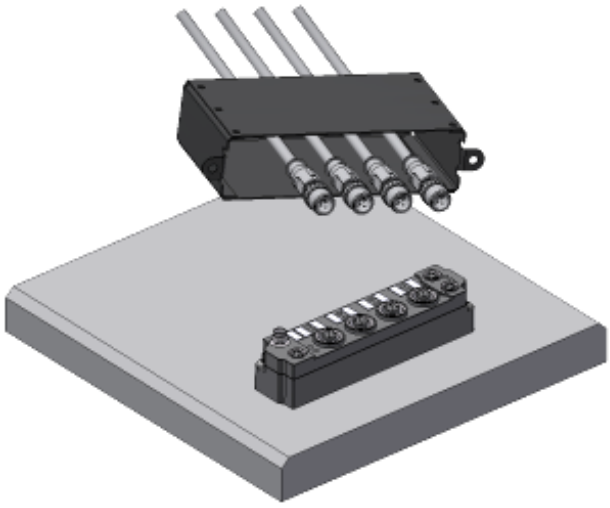


Fig. 31: BG2000-0000, putting the cables

Fix the wires for EtherCAT, power supply and sensors/actuators to the EtherCAT Box.

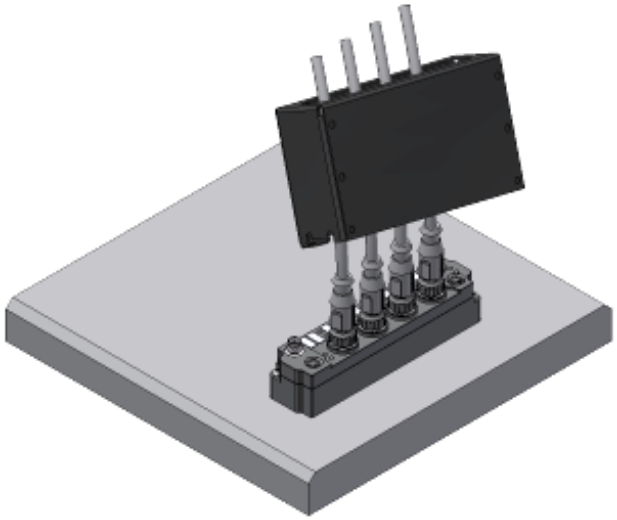


Fig. 32: BG2000-0000, fixing the cables

Mount the BG2000-0000 protection enclosure over the EtherCAT Box.

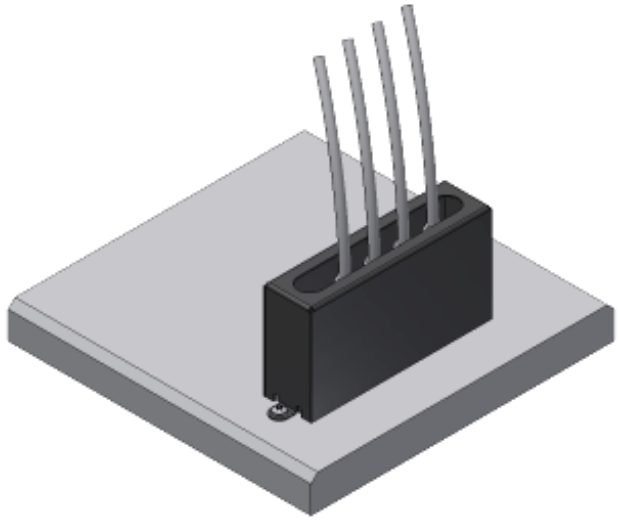


Fig. 33: BG2000-0000, mounting the protection enclosure

3.3.3 ATEX Documentation

Notes about operation of EtherCAT Box Modules (EPxxxx-xxxx) in potentially explosive areas (ATEX)

Pay also attention to the continuative documentationNotes about operation of EtherCAT Box Modules (EPxxxx-xxxx) in potentially explosive areas (ATEX) that is available in the download area of the Beckhoff homepage http:\\www.beckhoff.com!

4 Commissioning/Configuration

4.1 Integration in TwinCAT

4.1.1 Inserting into the EtherCAT network

Installation of the latest XML device description

Please ensure that you have installed the latest XML device description in TwinCAT. This can be downloaded from the Beckhoff website (http://www.beckhoff.de/english/download/elconfg.htm?id=1983920606140) and installed according to the installation instructions.

At the Beckhoff TwinCAT System Manager the configuration tree can be build in two different ways:

- by scanning [▶ 37] for existing hardware (called "online") and
- by manual inserting/appending [▶ 37] of fieldbus devices, couplers and slaves.

Automatic scanning in of the box

- The EtherCAT system must be in a safe, de-energized state before the EtherCAT modules are connected to the EtherCAT network!
- Switch on the operating voltage, open the TwinCAT System Manager [▶ 40] (Config mode), and scan in the devices (see Fig. 1). Acknowledge all dialogs with "*OK*", so that the configuration is in "FreeRun" mode.

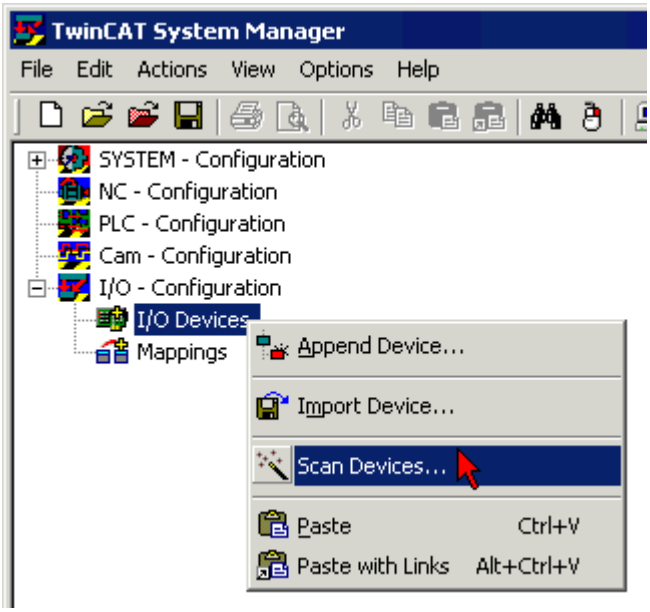


Fig. 34: Scanning in the configuration (I/O Devices -> right-click -> Scan Devices...)

Appending a module manually

- The EtherCAT system must be in a safe, de-energized state before the EtherCAT modules are connected to the EtherCAT network!
- Switch on the operating voltage, open the TwinCAT System Manager [▶ 40] (Config mode)
- Append a new I/O device. In the dialog that appears select the device *EtherCAT (Direct Mode),* and confirm with *OK*.

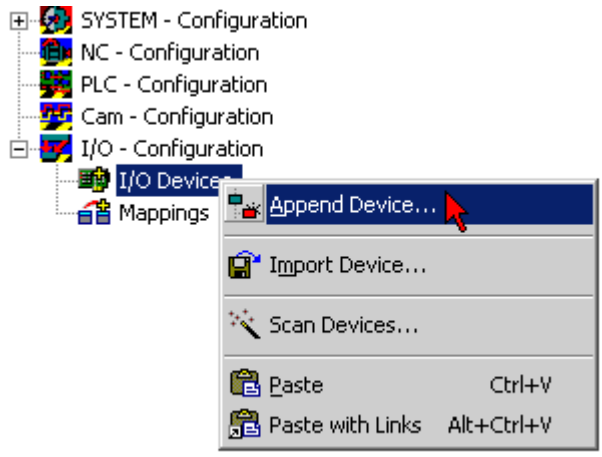


Fig. 35: Appending a new I/O device (I/O Devices -> right-click -> Append Device...)

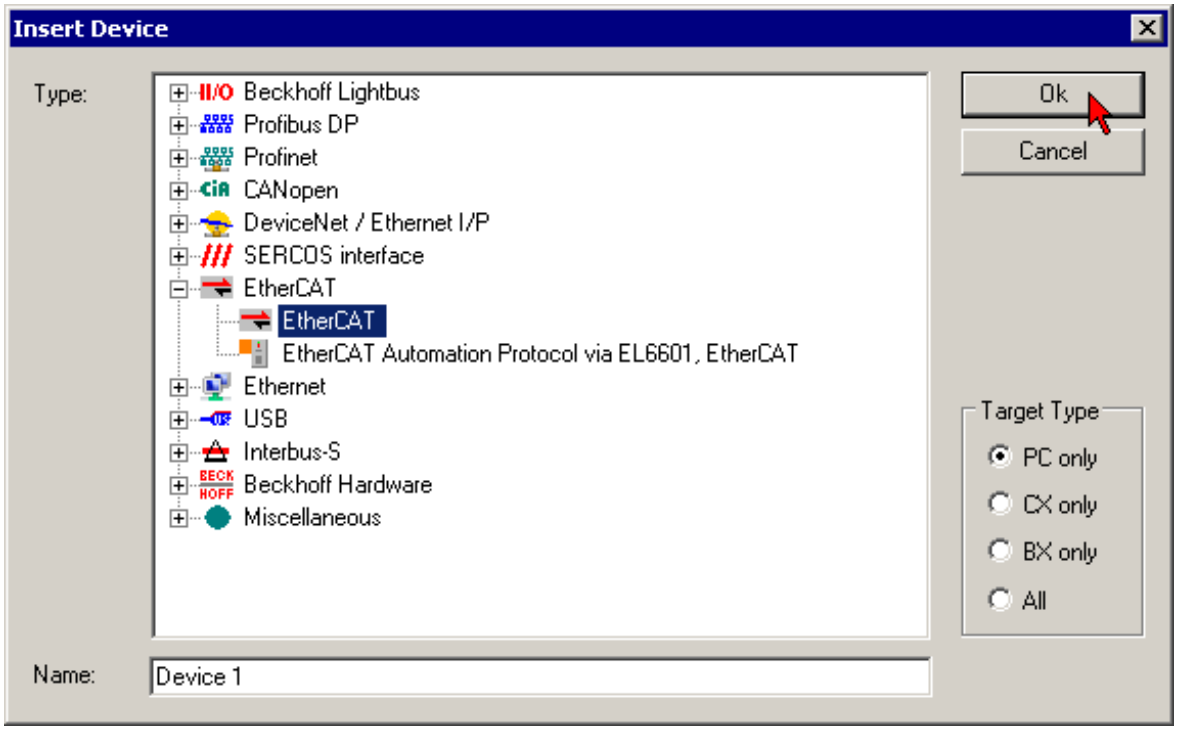


Fig. 36: Selecting the device EtherCAT

- Append a new box.

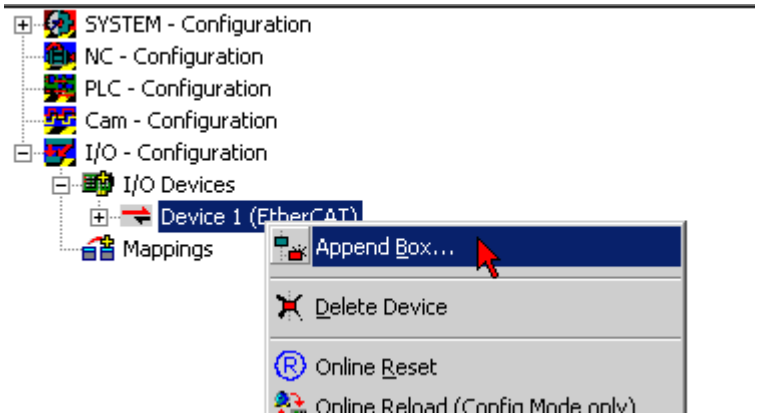


Fig. 37: Appending a new box (Device -> right-click -> Append Box...)

- In the dialog that appears select the desired box (e.g. EP2816-0008), and confirm with *OK*.

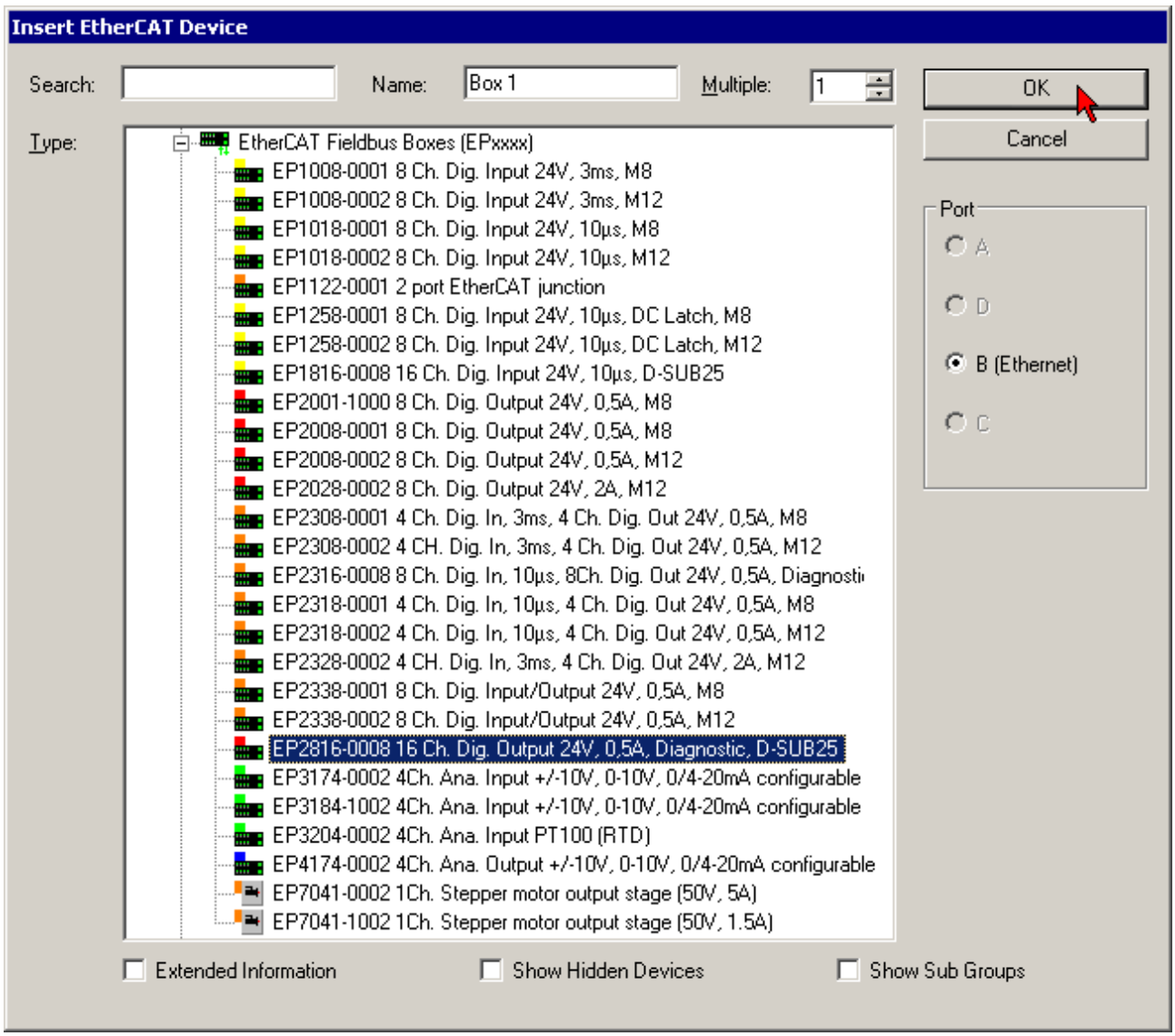


Fig. 38: Selecting a Box (e.g. EP2816-0008)

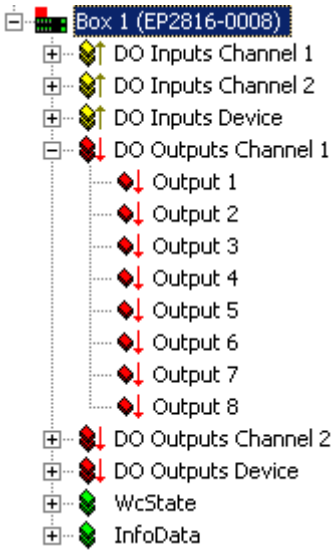


Fig. 39: Appended Box in the TwinCAT tree

4.1.2 Configuration via TwinCAT

In the left-hand window of the TwinCAT System Manager, click on the branch of the EtherCAT Box you wish to configure (EP2816-0008 in this example).

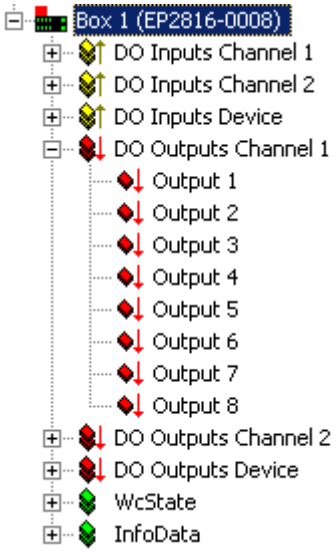


Fig. 40: Branch of the EtherCAT box to be configured

In the right-hand window of the TwinCAT System manager, various tabs are now available for configuring the EtherCAT Box.

General tab

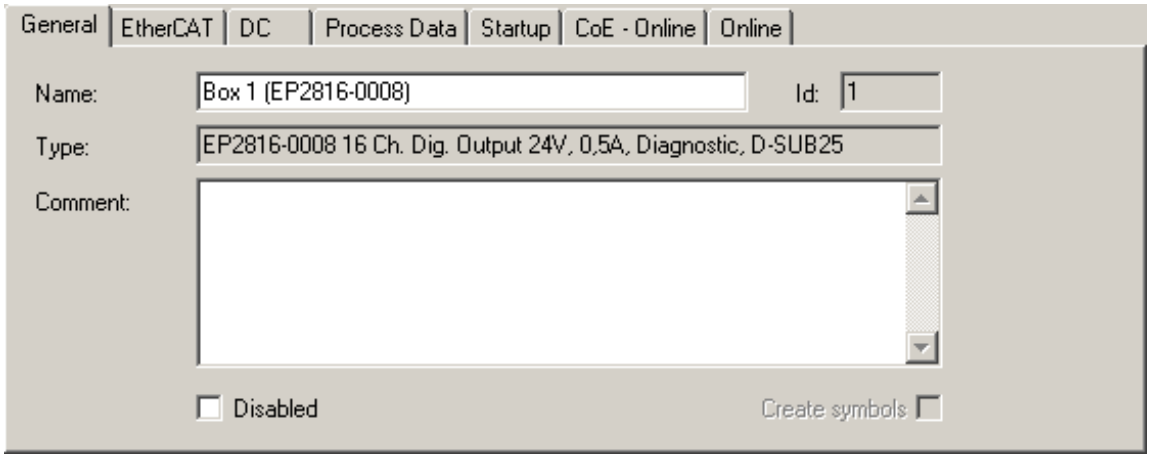


Fig. 41: General tab

Name	Name of the EtherCAT device
Id	Number of the EtherCAT device
Type	EtherCAT device type
Comment	Here you can add a comment (e.g. regarding the system).
Disabled	Here you can deactivate the EtherCAT device.
Create symbols	Access to this EtherCAT slave via ADS is only available if this checkbox is activated.

EtherCAT tab

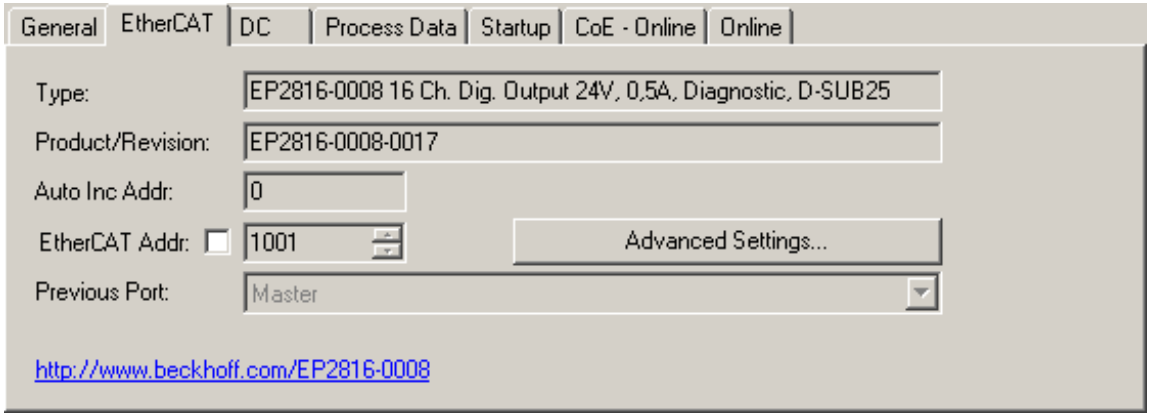


Fig. 42: EtherCAT tab

Type	EtherCAT device type
Product/Revision	Product and revision number of the EtherCAT device
Auto Inc Addr.	Auto increment address of the EtherCAT device. The auto increment address can be used for addressing each EtherCAT device in the communication ring through its physical position. Auto increment addressing is used during the start-up phase when the EtherCAT master allocates addresses to the EtherCAT devices. With auto increment addressing the first EtherCAT slave in the ring has the address 0000_{hex}. For each further slave the address is decremented by 1 ($FFFF_{hex}$, $FFFE_{hex}$ etc.).
EtherCAT Addr.	Fixed address of an EtherCAT slave. This address is allocated by the EtherCAT master during the start-up phase. Tick the checkbox to the left of the input field in order to modify the default value.
Previous Port	Name and port of the EtherCAT device to which this device is connected. If it is possible to connect this device with another one without changing the order of the EtherCAT devices in the communication ring, then this combobox is activated and the EtherCAT device to which this device is to be connected can be selected.
Advanced Settings	This button opens the dialogs for advanced settings.

The link at the bottom of the tab points to the product page for this EtherCAT device on the web.

Process Data tab

Indicates the configuration of the process data. The input and output data of the EtherCAT slave are represented as CANopen process data objects (PDO). The user can select a PDO via PDO assignment and modify the content of the individual PDO via this dialog, if the EtherCAT slave supports this function.

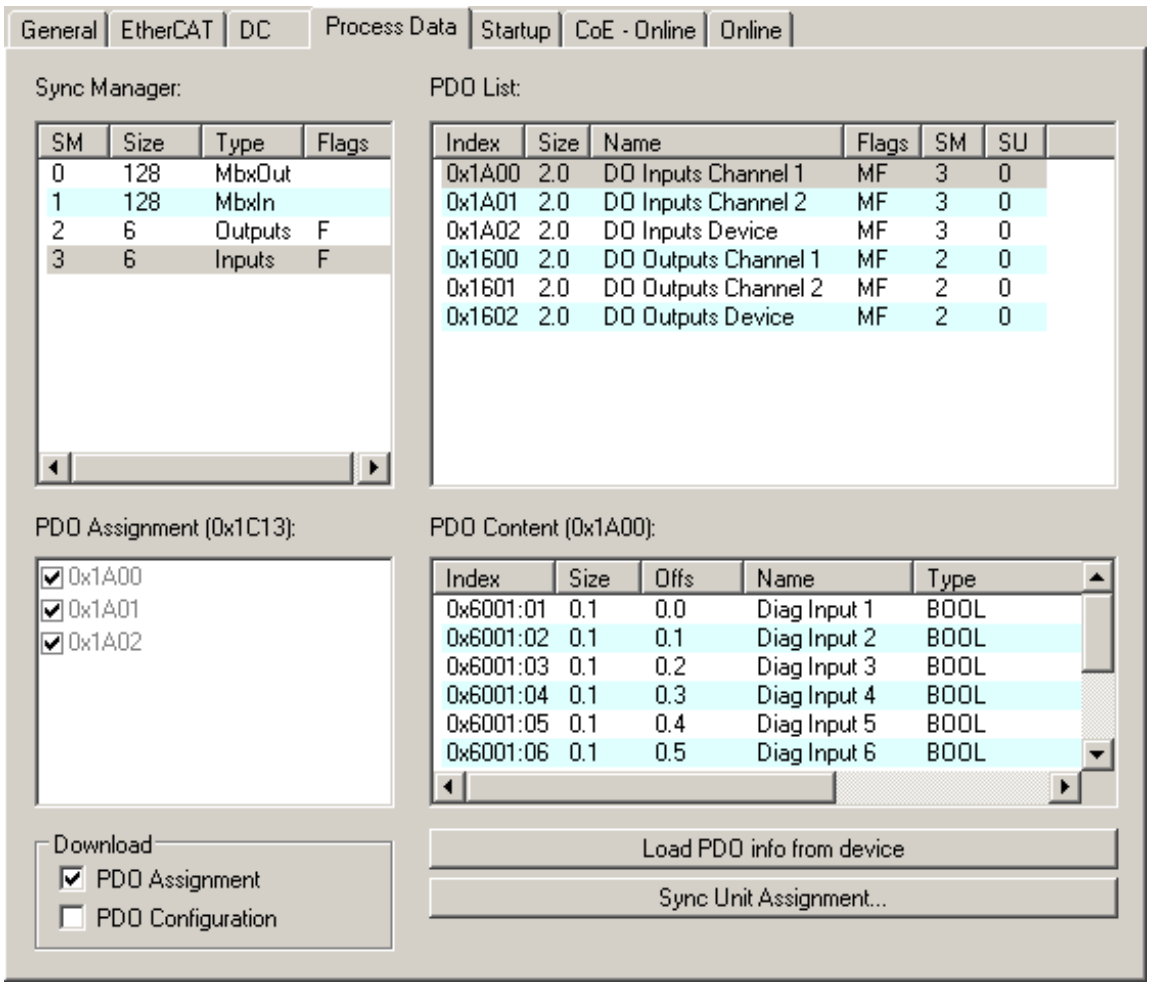


Fig. 43: Process Data tab

Sync Manager

Lists the configuration of the Sync Manager (SM).
If the EtherCAT device has a mailbox, SM0 is used for the mailbox output (MbxOut) and SM1 for the mailbox input (MbxIn).
SM2 is used for the output process data (outputs) and SM3 (inputs) for the input process data.

If an input is selected, the corresponding PDO assignment is displayed in the *PDO Assignment* list below.

PDO Assignment

PDO assignment of the selected Sync Manager. All PDOs defined for this Sync Manager type are listed here:

- If the output Sync Manager (outputs) is selected in the Sync Manager list, all RxPDOs are displayed.
- If the input Sync Manager (inputs) is selected in the Sync Manager list, all TxPDOs are displayed.

The selected entries are the PDOs involved in the process data transfer. In the tree diagram of the System Manager these PDOs are displayed as variables of the EtherCAT device. The name of the variable is identical to the *Name* parameter of the PDO, as displayed in the PDO list. If an entry in the PDO assignment list is deactivated (not selected and greyed out), this indicates that the input is excluded from the PDO assignment. In order to be able do select a greyed out PDO, the currently selected PDO has to be deselected first.

Activation of PDO assignment

- the EtherCAT slave has to run through the PS status transition cycle (from pre-operational to safe-operational) once (see Online tab [▶ 46]),
- and the System Manager has to reload the EtherCAT slaves ( button)

PDO list

List of all PDOs supported by this EtherCAT device. The content of the selected PDOs is displayed in the *PDO Content* list. The PDO configuration can be modified by double-clicking on an entry.

Column	Description	
Index	PDO index.	
Size	Size of the PDO in bytes.	
Name	Name of the PDO. If this PDO is assigned to a Sync Manager, it appears as a variable of the slave with this parameter as the name.	
Flags	F	Fixed content: The content of this PDO is fixed and cannot be changed by the System Manager.
	M	Mandatory PDO. This PDO is mandatory and must therefore be assigned to a Sync Manager! Consequently, this PDO cannot be deleted from the *PDO Assignment* list
SM	Sync Manager to which this PDO is assigned. If this entry is empty, this PDO does not take part in the process data traffic.	
SU	Sync unit to which this PDO is assigned.	

PDO Content

Indicates the content of the PDO. If flag F (fixed content) of the PDO is not set the content can be modified.

Download

If the device is intelligent and has a mailbox, the configuration of the PDO and the PDO assignments can be downloaded to the device. This is an optional feature that is not supported by all EtherCAT slaves.

PDO Assignment

If this check box is selected, the PDO assignment that is configured in the PDO Assignment list is downloaded to the device on startup. The required commands to be sent to the device can be viewed in the Startup [▶ 43] tab.

PDO Configuration

If this check box is selected, the configuration of the respective PDOs (as shown in the PDO list and the PDO Content display) is downloaded to the EtherCAT slave.

Startup tab

The *Startup* tab is displayed if the EtherCAT slave has a mailbox and supports the *CANopen over EtherCAT* (CoE) or *Servo drive over EtherCAT* protocol. This tab indicates which download requests are sent to the mailbox during startup. It is also possible to add new mailbox requests to the list display. The download requests are sent to the slave in the same order as they are shown in the list.

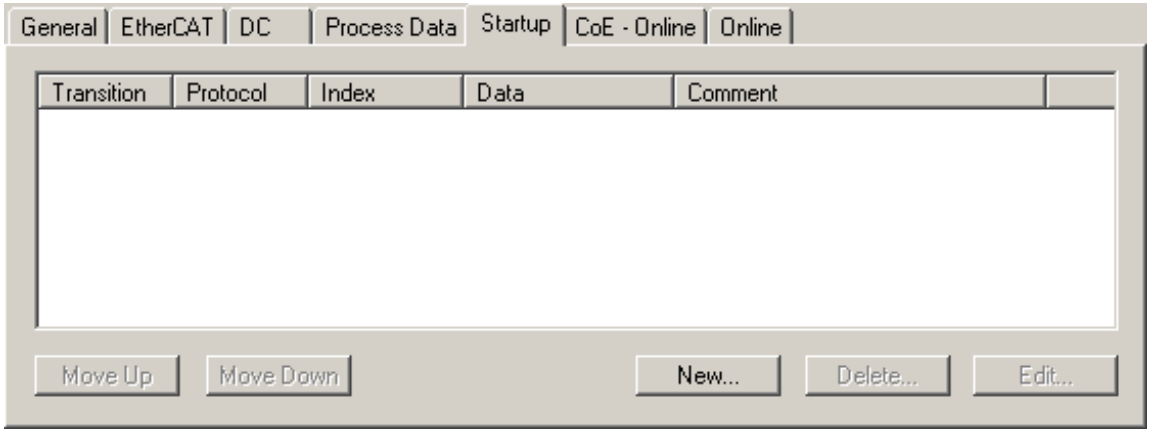


Fig. 44: Startup tab

Column	Description
Transition	Transition to which the request is sent. This can either be • the transition from pre-operational to safe-operational (PS), or • the transition from safe-operational to operational (SO). If the transition is enclosed in "<>" (e.g. <PS>), the mailbox request is fixed and cannot be modified or deleted by the user.
Protocol	Type of mailbox protocol
Index	Index of the object
Data	Date on which this object is to be downloaded.
Comment	Description of the request to be sent to the mailbox

Move Up	This button moves the selected request up by one position in the list.
Move Down	This button moves the selected request down by one position in the list.
New	This button adds a new mailbox download request to be sent during startup.
Delete	This button deletes the selected entry.
Edit	This button edits an existing request.

CoE - Online tab

The additional *CoE - Online* tab is displayed if the EtherCAT slave supports the *CANopen over EtherCAT* (CoE) protocol. This dialog lists the content of the object directory of the slave (SDO upload) and enables the user to modify the content of an object from this list. Details for the objects of the individual EtherCAT devices can be found in the device-specific object descriptions.

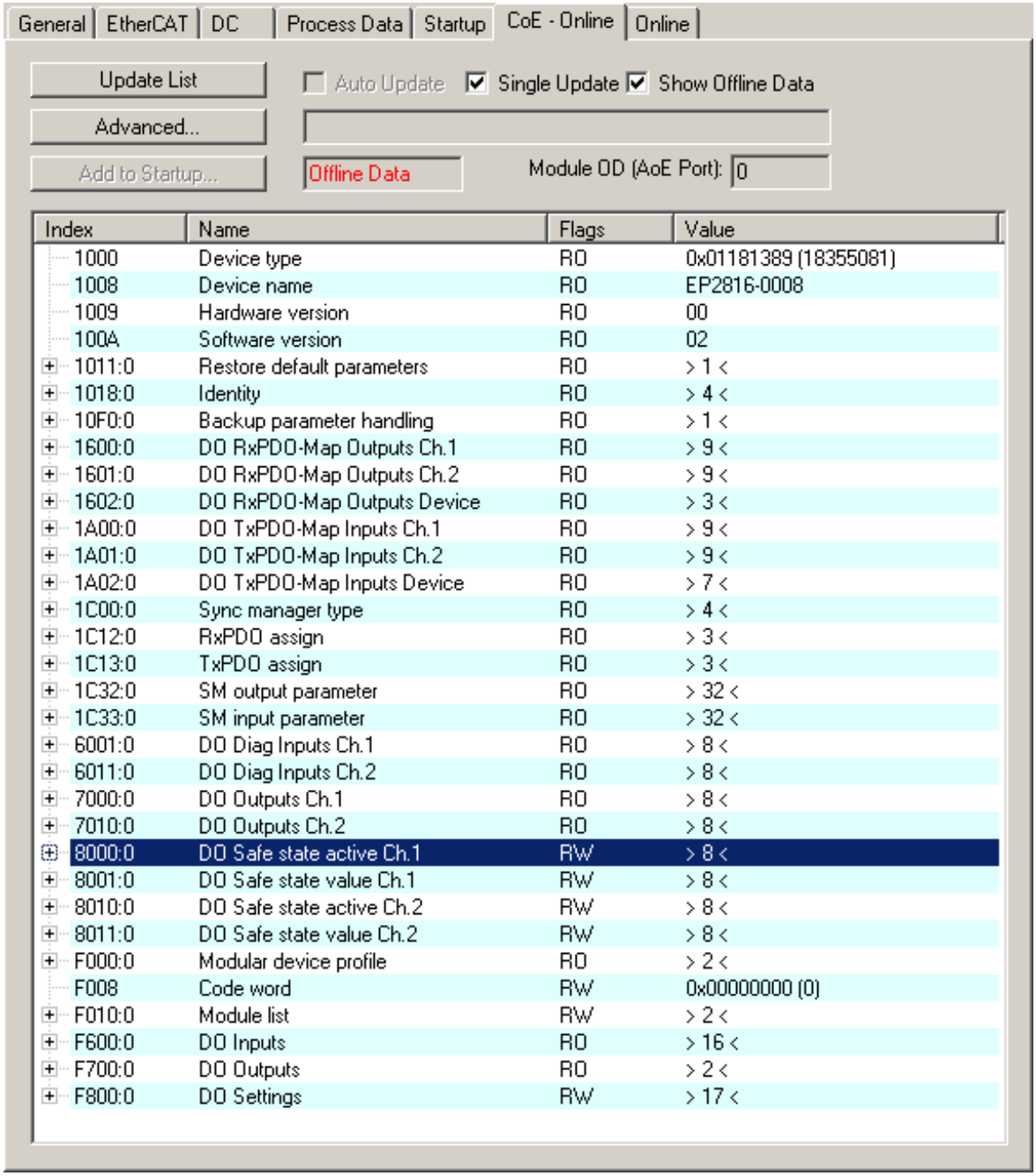


Fig. 45: CoE - Online tab

Object list display

Column	Description	
Index	Index and subindex of the object	
Name	Name of the object	
Flags	RW	The object can be read, and data can be written to the object (read/write)
	RO	The object can be read, but no data can be written to the object (read only)
	P	An additional P identifies the object as a process data object.
Value	Value of the object	

Update List The *Update list* button updates all objects in the displayed list

Auto Update If this check box is selected, the content of the objects is updated automatically.

Advanced The *Advanced* button opens the *Advanced Settings* dialog. Here you can specify which objects are displayed in the list.

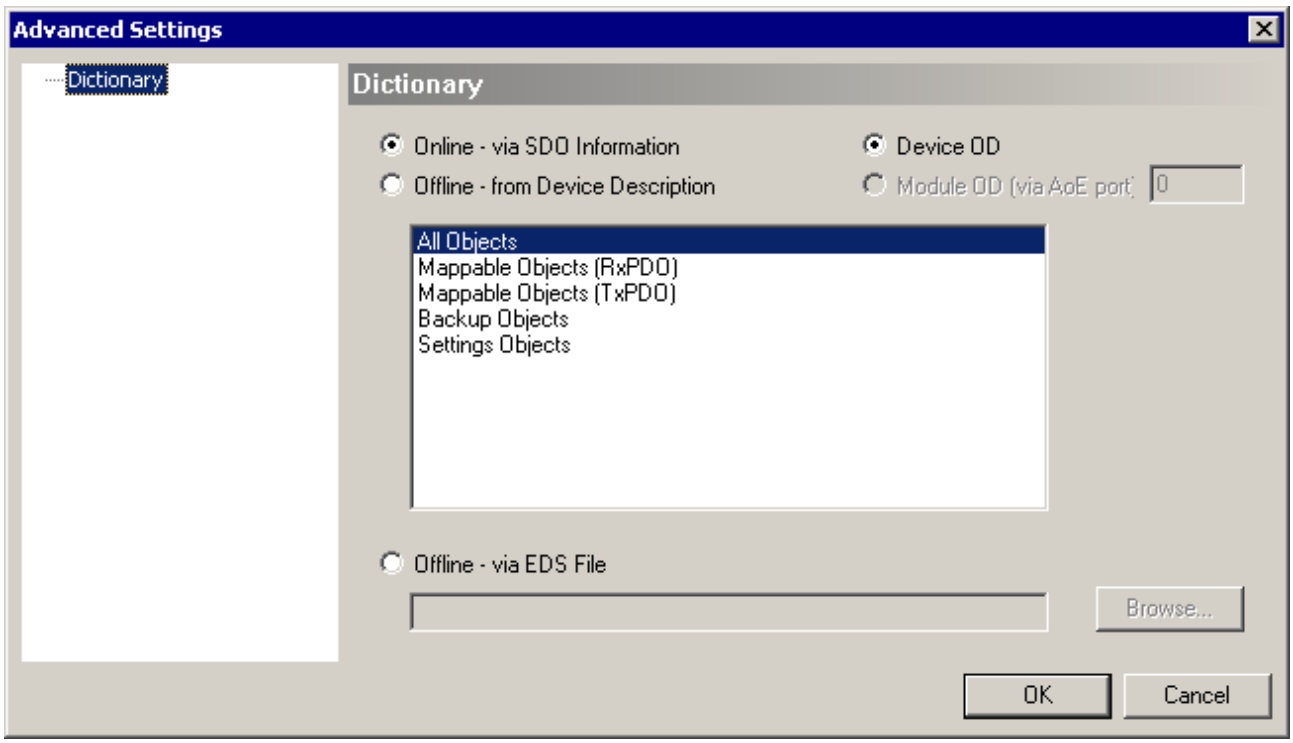


Fig. 46: Advanced settings

Online - via SDO information — If this option button is selected, the list of the objects included in the object directory of the slave is uploaded from the slave via SDO information. The list below can be used to specify which object types are to be uploaded.

Offline - via EDS file — If this option button is selected, the list of the objects included in the object directory is read from an EDS file provided by the user.

Online tab

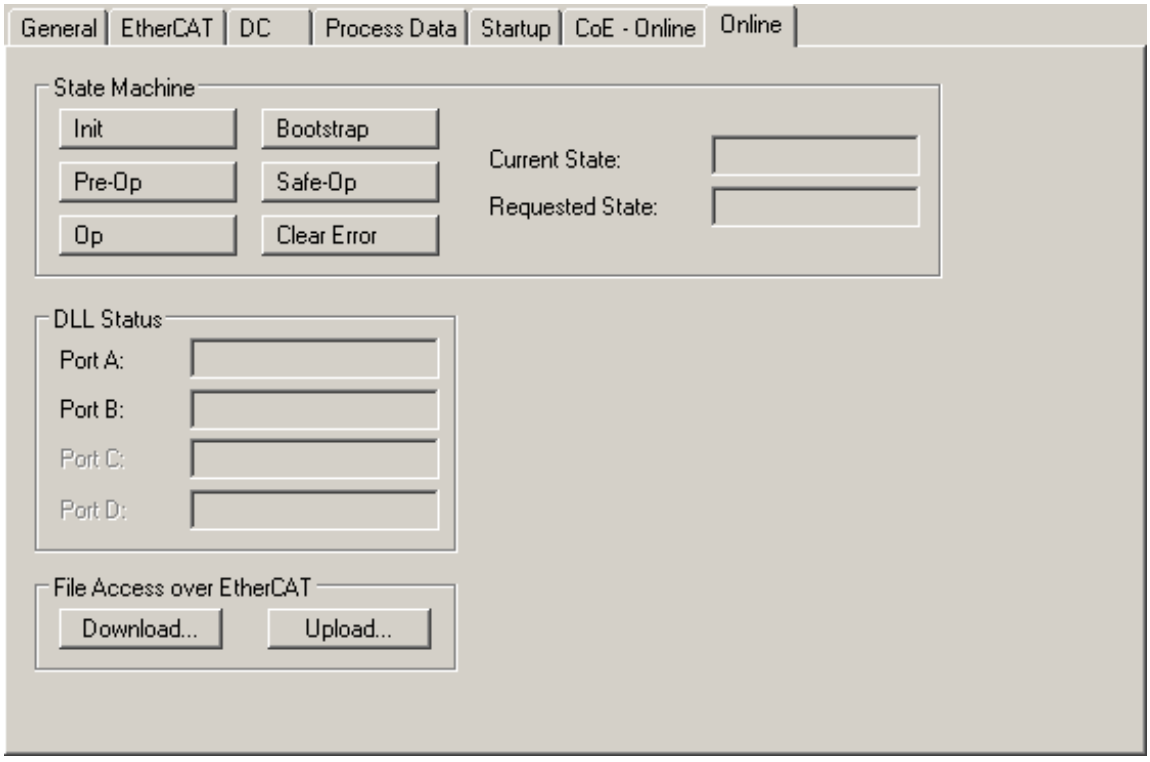


Fig. 47: Online tab

State Machine

Init	This button attempts to set the EtherCAT device to the *Init* state.
Pre-Op	This button attempts to set the EtherCAT device to the *pre-operational* state.
Op	This button attempts to set the EtherCAT device to the *operational* state.
Bootstrap	This button attempts to set the EtherCAT device to the *Bootstrap* state.
Safe-Op	This button attempts to set the EtherCAT device to the *safe-operational* state.
Clear Error	This button attempts to delete the fault display. If an EtherCAT slave fails during change of state it sets an error flag. Example: An EtherCAT slave is in PREOP state (pre-operational). The master now requests the SAFEOP state (safe-operational). If the slave fails during change of state it sets the error flag. The current state is now displayed as ERR PREOP. When the *Clear Error* button is pressed the error flag is cleared, and the current state is displayed as PREOP again.
Current State	Indicates the current state of the EtherCAT device.
Requested State	Indicates the state requested for the EtherCAT device.

DLL Status

Indicates the DLL status (data link layer status) of the individual ports of the EtherCAT slave. The DLL status can have four different states:

Status	Description
No Carrier / Open	No carrier signal is available at the port, but the port is open.
No Carrier / Closed	No carrier signal is available at the port, and the port is closed.
Carrier / Open	A carrier signal is available at the port, and the port is open.
Carrier / Closed	A carrier signal is available at the port, but the port is closed.

File Access over EtherCAT

Download	With this button a file can be written to the EtherCAT device.
Upload	With this button a file can be read from the EtherCAT device.

4.1.3 Integration into the NC configuration

(Master: TwinCAT 2.11)

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 (http://www.beckhoff.de/german/default.htm?download/elconfg.htm) and installed according to the installation instructions.

Integration into the NC can be accomplished as follows:

- The terminal must already have been inserted manually under I/O devices or have been scanned in by the system (see section "Inserting the terminal in the EtherCAT Terminal network").
- 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.

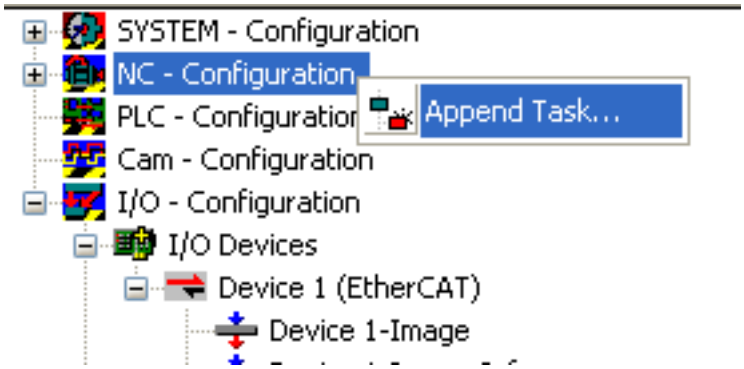


Fig. 48: Adding a new task

- Right-click on *Axes*, then add a new axis (see Fig. *Linking the axis with the terminal*).

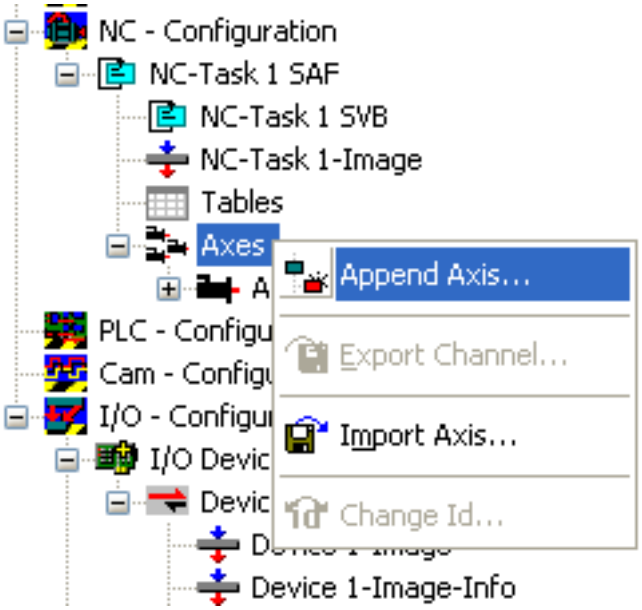


Fig. 49: Adding a new axis

- Select Continuous Axis type and confirm with OK (see Fig. 3).

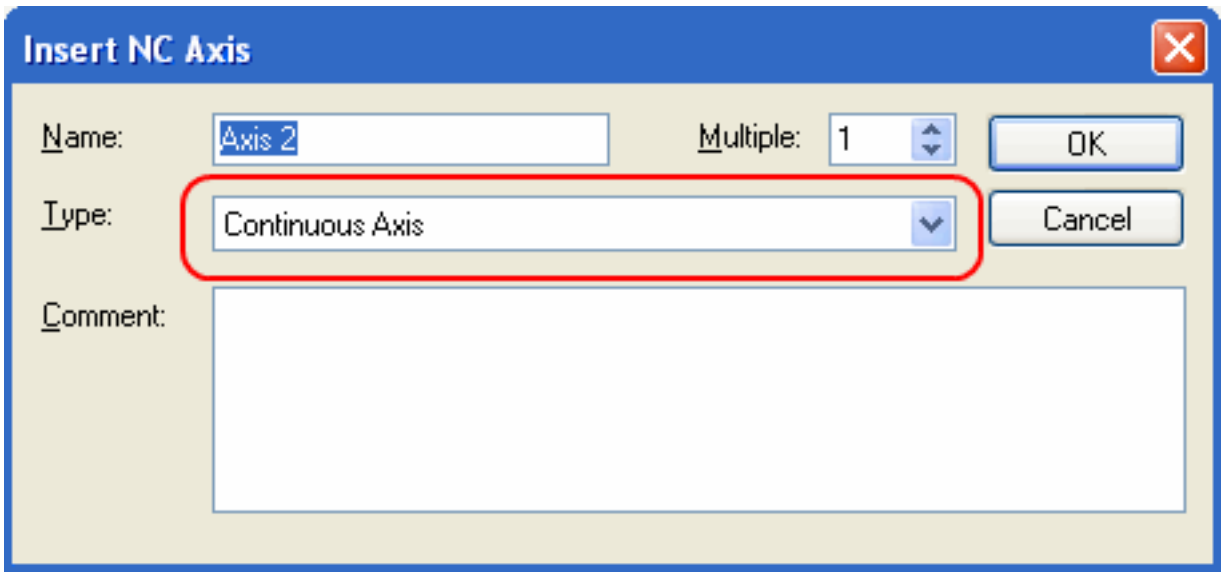


Fig. 50: Selecting and confirming the axis type

- Left-click your axis to select it. Under the S*ettings* tab select "Link To..." (see Fig. *Linking the axis with the terminal*).

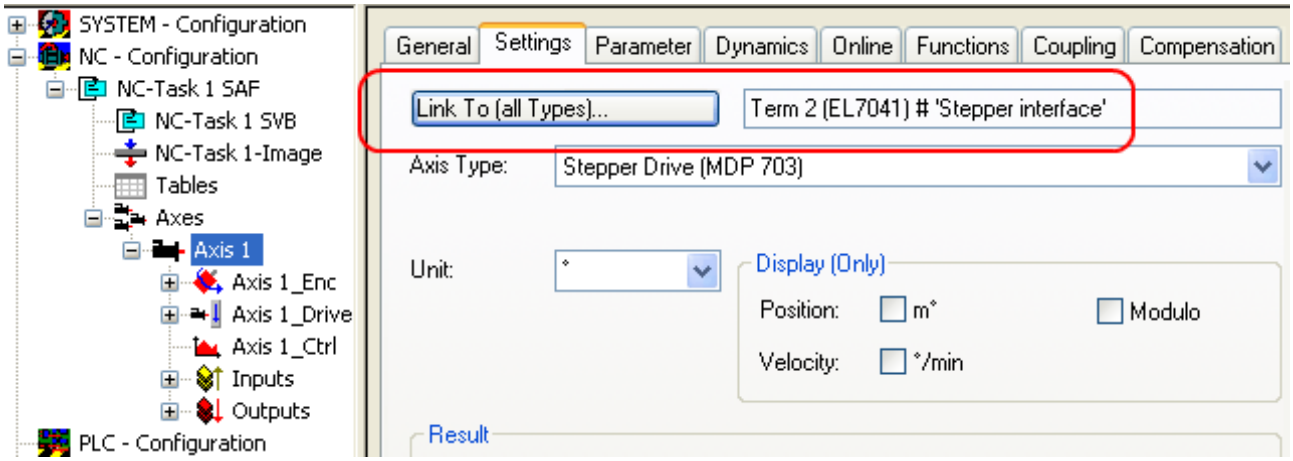


Fig. 51: Linking the axis with the terminal

- Select the right terminal (Stepper Drive (MDP 703)) and confirm with OK.

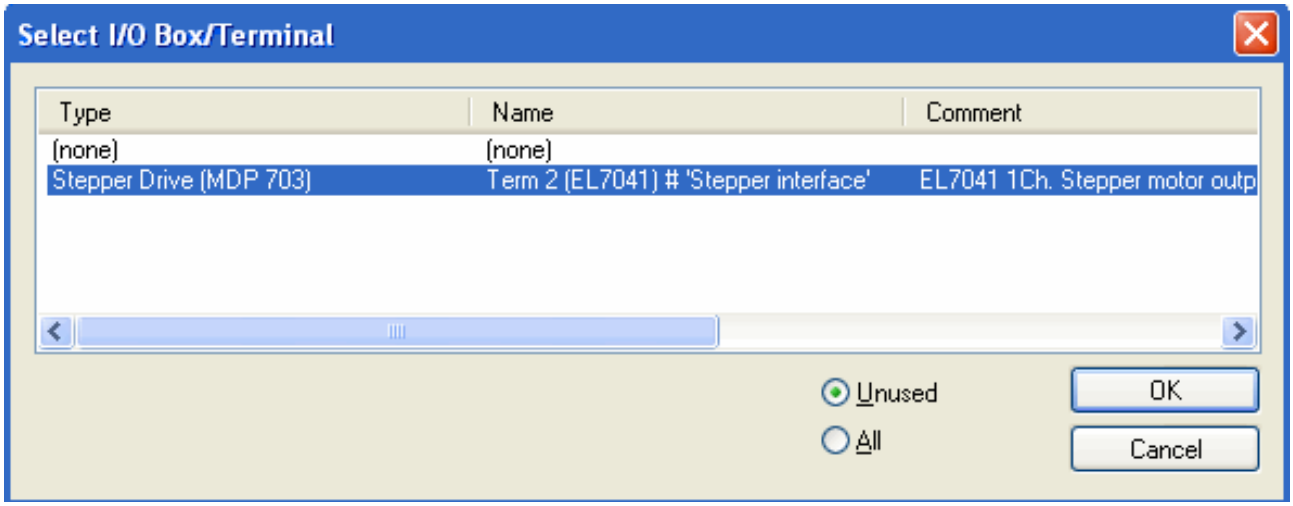


Fig. 52: Selecting the right terminal

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

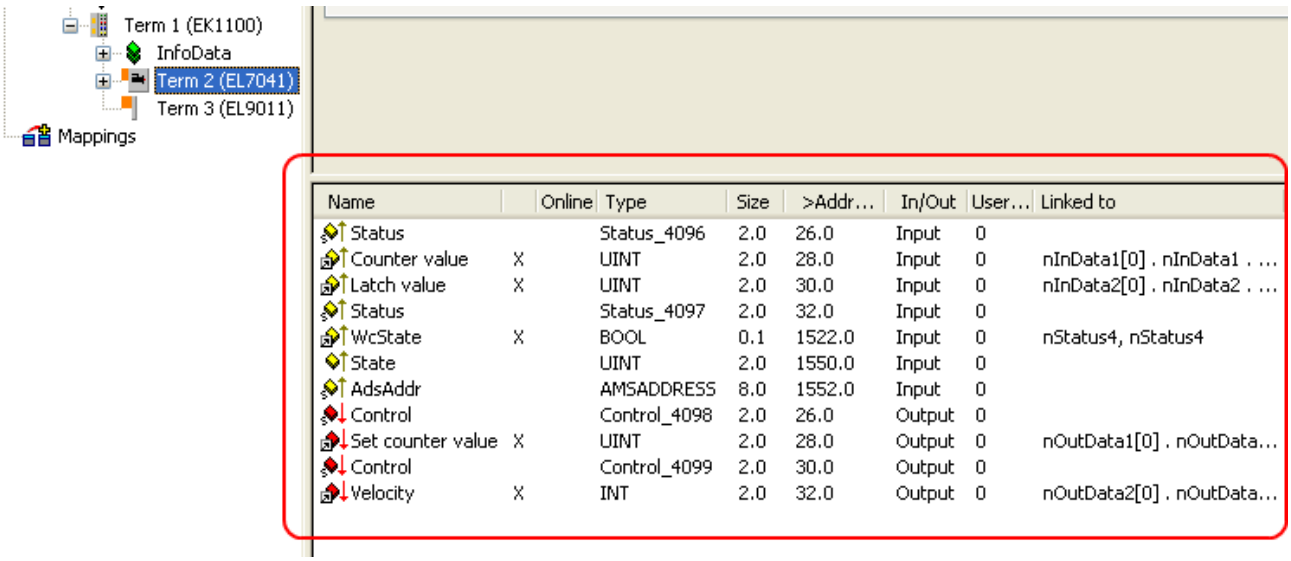


Fig. 53: Automatic linking of all main variables

- Several parameters have to be set before the motor can be started up. The values can be found in section "Configuration of the main parameters [▶ 52]". Please set these parameters before continuing with the motor commissioning procedure.

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 check marks and set *Override* to 100 (see Fig. 7). The axis can then be moved.

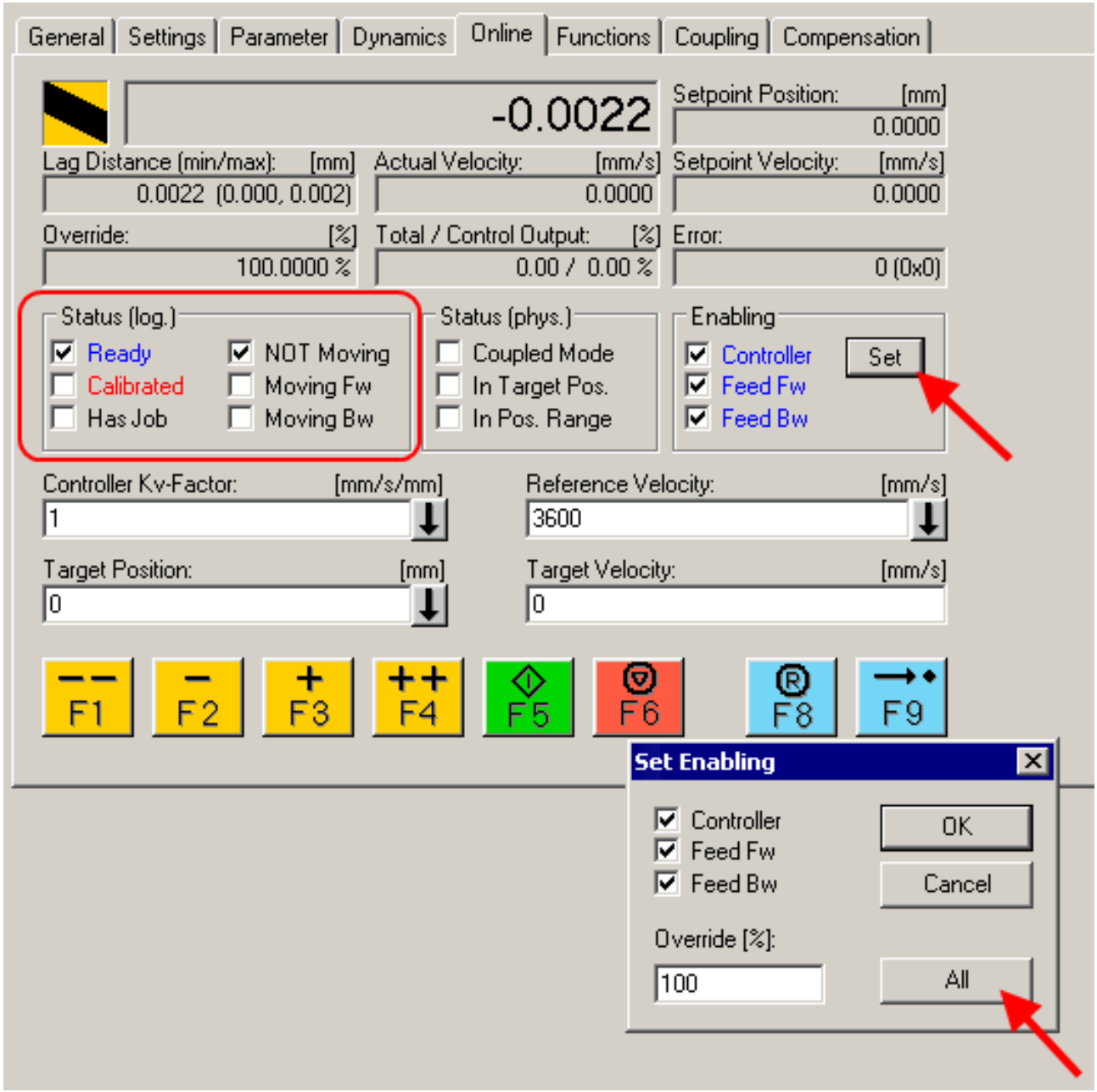


Fig. 54: Enabling an axis

You can now move the axis with the function keys F1, F2 (Backward) or F3, F4 (Forward).

Alternatively you can control the axis via the *Functions* tab.

Example

- Select as *Reversing Sequence* as the start mode.
- Enter the required *Target Position1*, e.g. 5000°.
- Enter the required *Target Velocity*, e.g. 1200°/s.
- Enter the required *Target Position2*, e.g. 0°.
- Enter the required *Idle Time*, e.g. 1 s.
- Select *Start*.

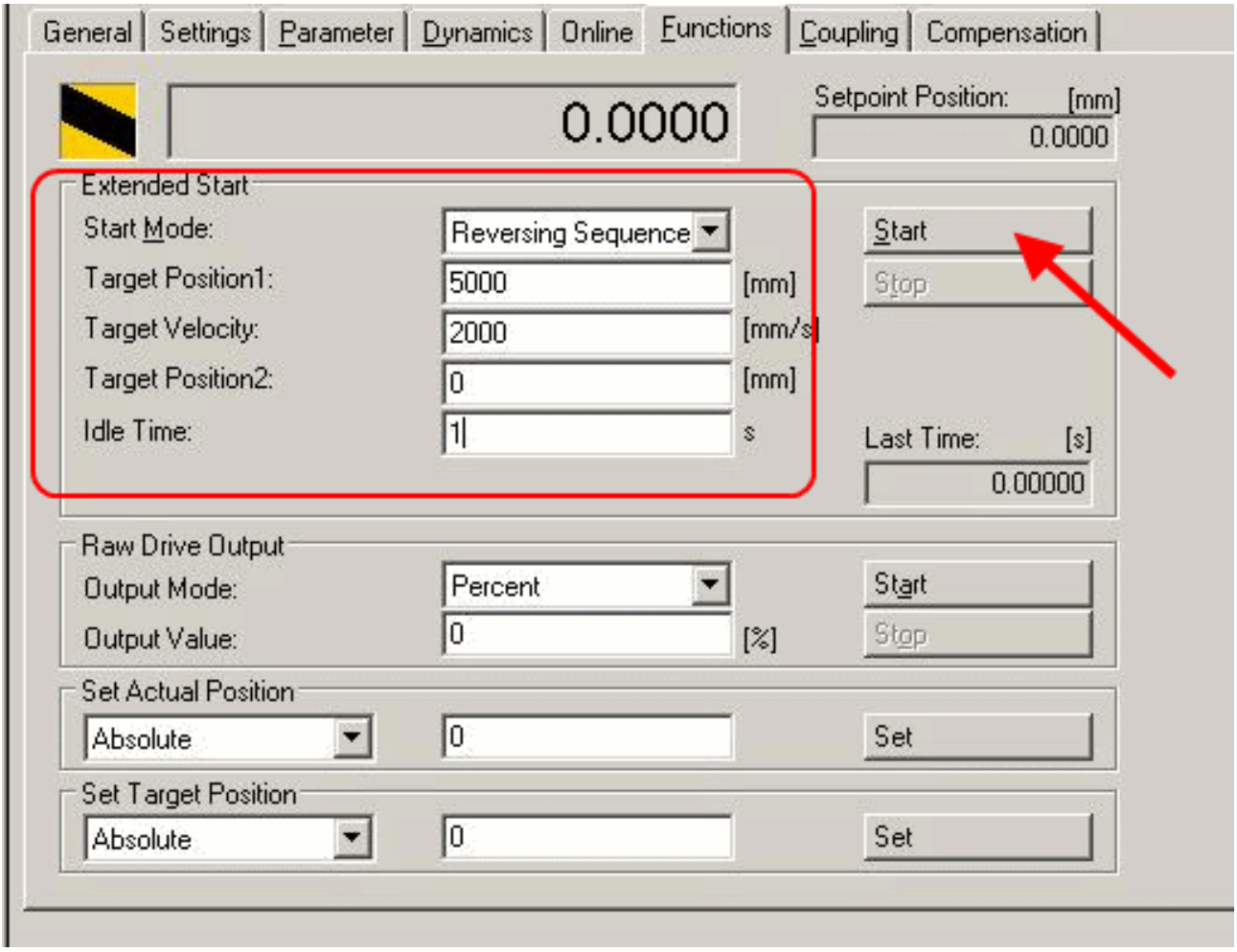


Fig. 55: Axis control, "Functions" tab

The motor now travels to Position 1, remains there for 1 s and then returns to Position 2. This is repeated until you click Stop.

4.1.4 Configuration of the main parameters

The data specified here apply to an AS 1050-0120 stepper motor and are intended as an example. For other motors the values may vary, depending on the application.

Setting the CoE objects

Execution of changes

Changes to CoE objects are only executed after the module has been placed in the Init state. Changes are only active after that.

Adaptation of current and voltage

NOTE

The motor may overheat!

In order to prevent overheating of the connected motor it is important to adapt the current and voltage output from the stepper interface to the motor.

To do this, set the indices 0x8010:01 [▶ 92] *Maximal current* and 0x8010:03 [▶ 92]*Nominal voltage* in the CoE register to suitable values (see Fig. *Adaptation of current and voltage*).

Reduced current can be set in index 0x8010:02 [▶ 92]. This reduces the coil current when at a standstill (and therefore the power dissipation). Please note that the torque is also reduced.

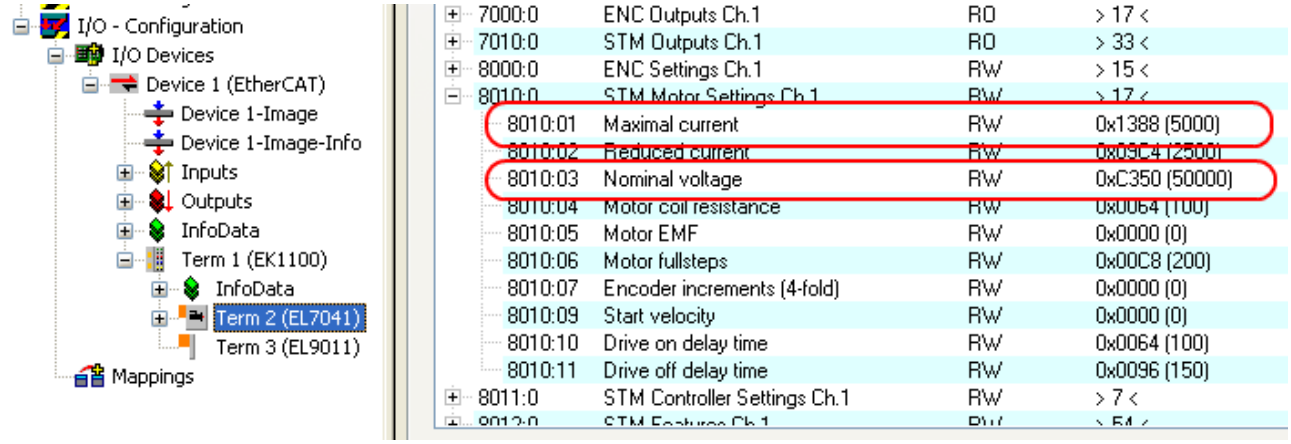


Fig. 56: Adaptation of current and voltage

Base frequency selection

Microstepping is set to 1/64 and cannot be changed. However, the base frequency can be changed (default: 2000). To do this, mark the module and select the *CoE Online* tab. Change the base frequency by double-clicking on the index 0x8012:05 [▶ 93] *Speed range* (Fig. *Setting the base frequency*).

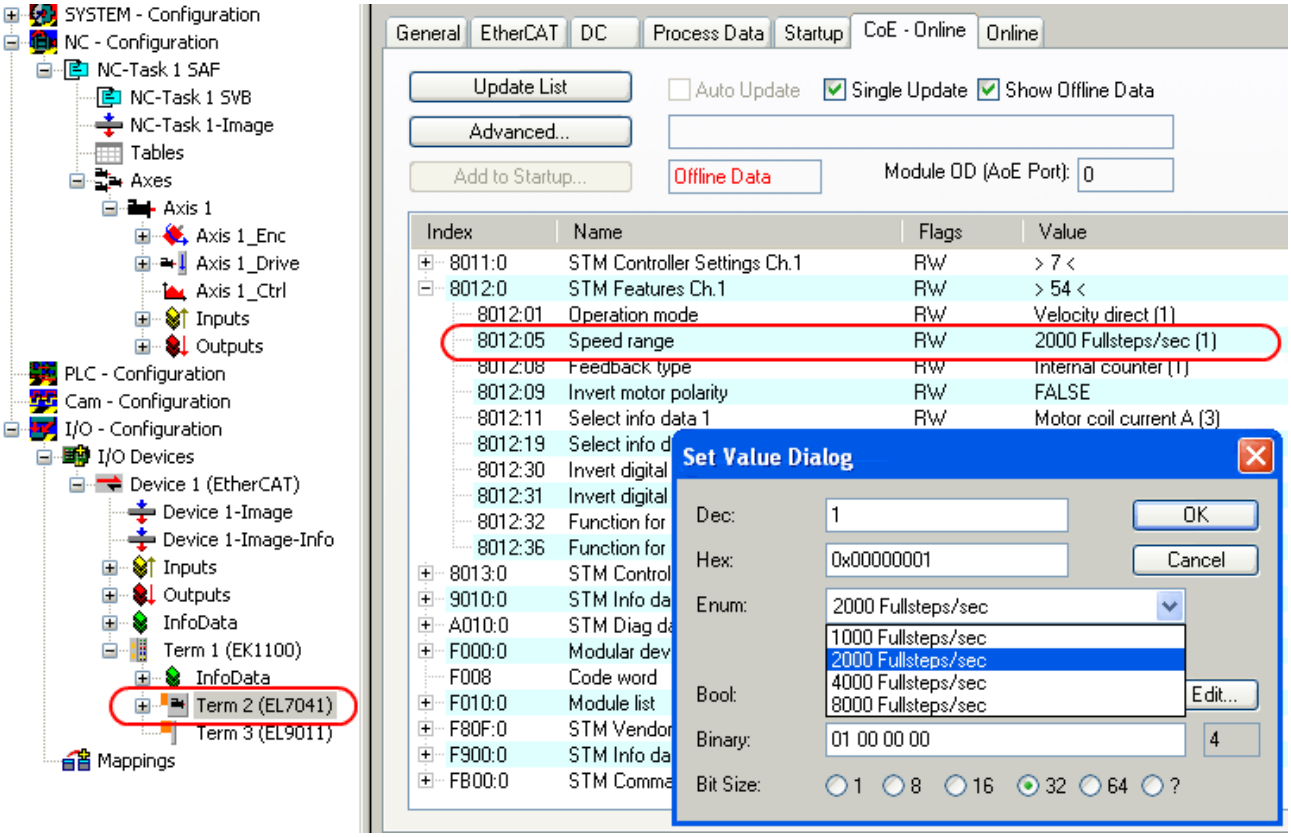


Fig. 57: Setting the base frequency

Selecting the feedback system

The module with encoder connections provides a choice of two possibilities for the feedback system:

- Internal Counter **(default)**: Use internal counter for position feedback
- Encoder: Use external encoder for position feedback

Setting the feedback type

By default, the stepper module is set to internal counter. If an external encoder is used, the setting must be changed by double-clicking on the index 0x8012:08 [▶ 93] Feedback type in the Enum menu (Fig. *Selecting the feedback system*).

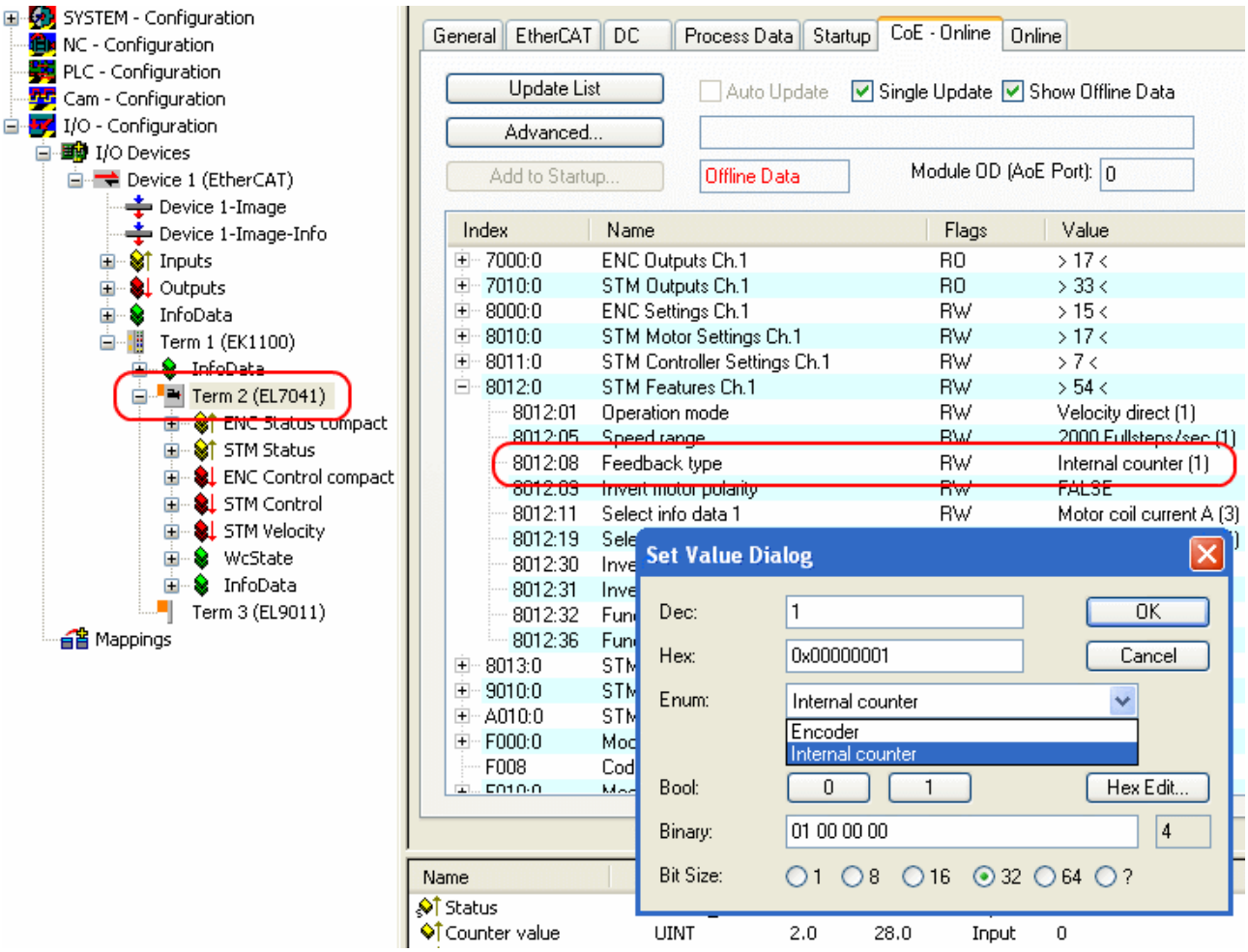


Fig. 58: Selecting the feedback system

K_A factor (EP7041-0002 [▶ 12] and EP7041-1002 [▶ 12]only)

The K_A factor can be used to adapt the current during the acceleration phases. The current increase is calculated as follows.

Current increase in mA = speed difference x K_A / 1000

The steeper the speed ramp, the higher the current increase.

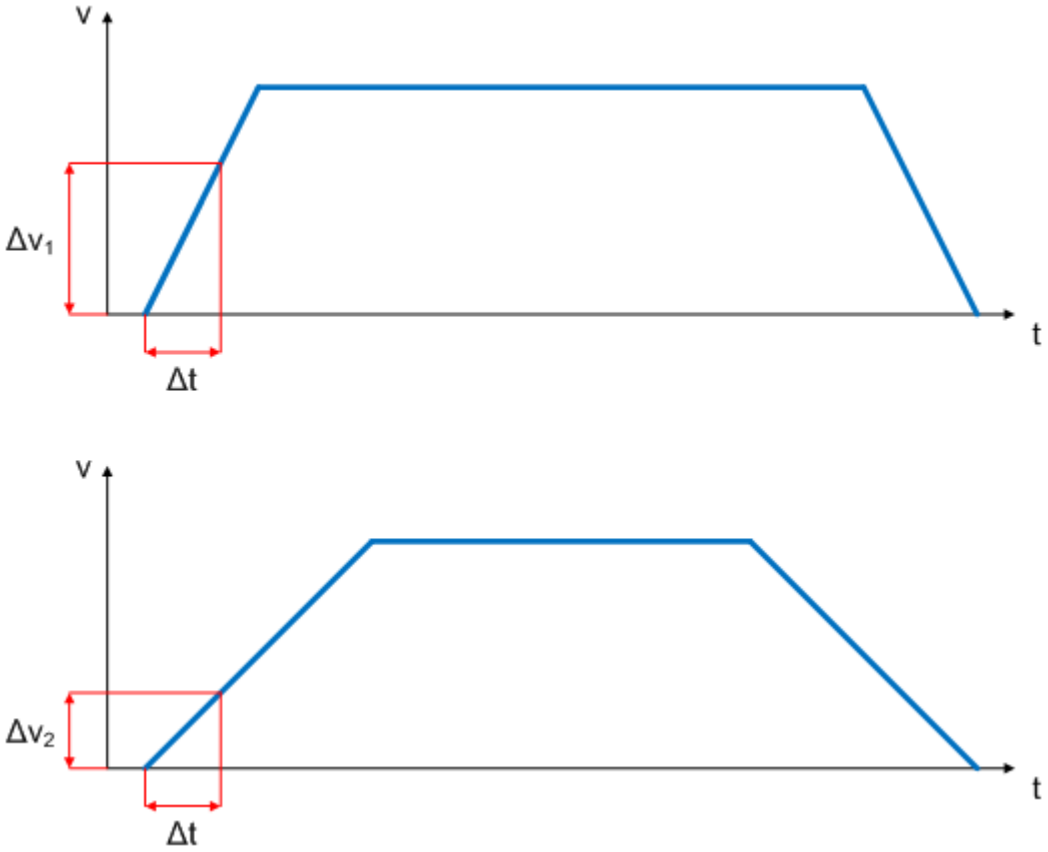


Fig. 59: Speed ramps

This value can be set in index 0x8011:07 [▶ 92] *Ka factor (curr.)* (see fig. *Setting the K_A factor*).

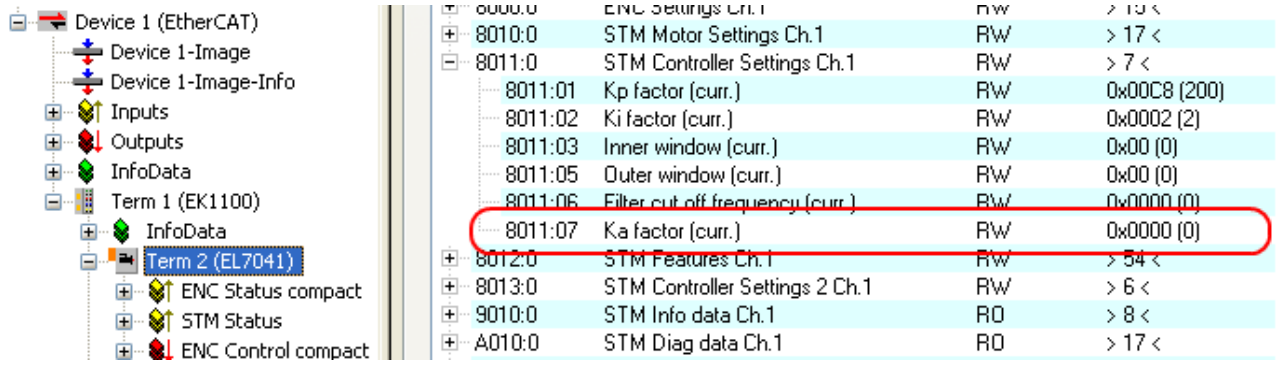


Fig. 60: Setting the K_A factor

NC settings

Reference speed selection

The maximum speed can be calculated from the base frequency and the motor frequency.

v_{max} = base frequency / motor frequency = (2000 full steps / s) / (200 full steps / rev) = 10 revolutions / s

The reference speed can be calculated by multiplying the maximum speed with the distance per revolution.

v_{ref} = 10 revolutions / s x 360° = 3600 °/ s

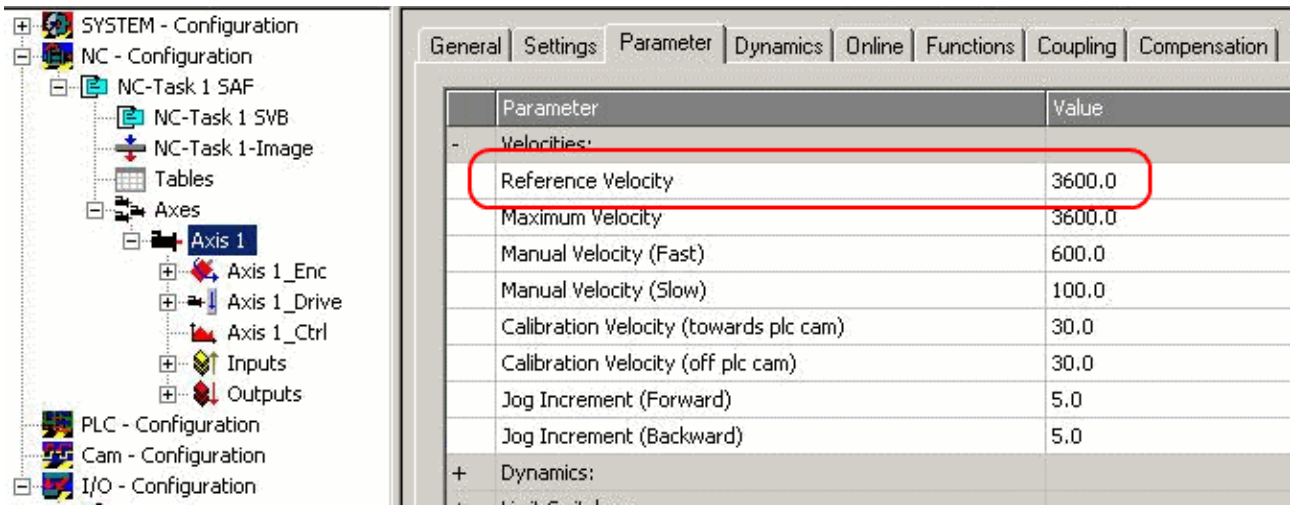


Fig. 61: Reference speed parameter

Dead time compensation

The *dead time compensation* should theoretically be 3 cycles of the NC cycle time, although in practice 4 cycles are preferable. At a cycle time of 2 ms it should therefore be 0.008 s. The *dead time compensation* can be found under *Advanced Settings* in the encoder parameters.

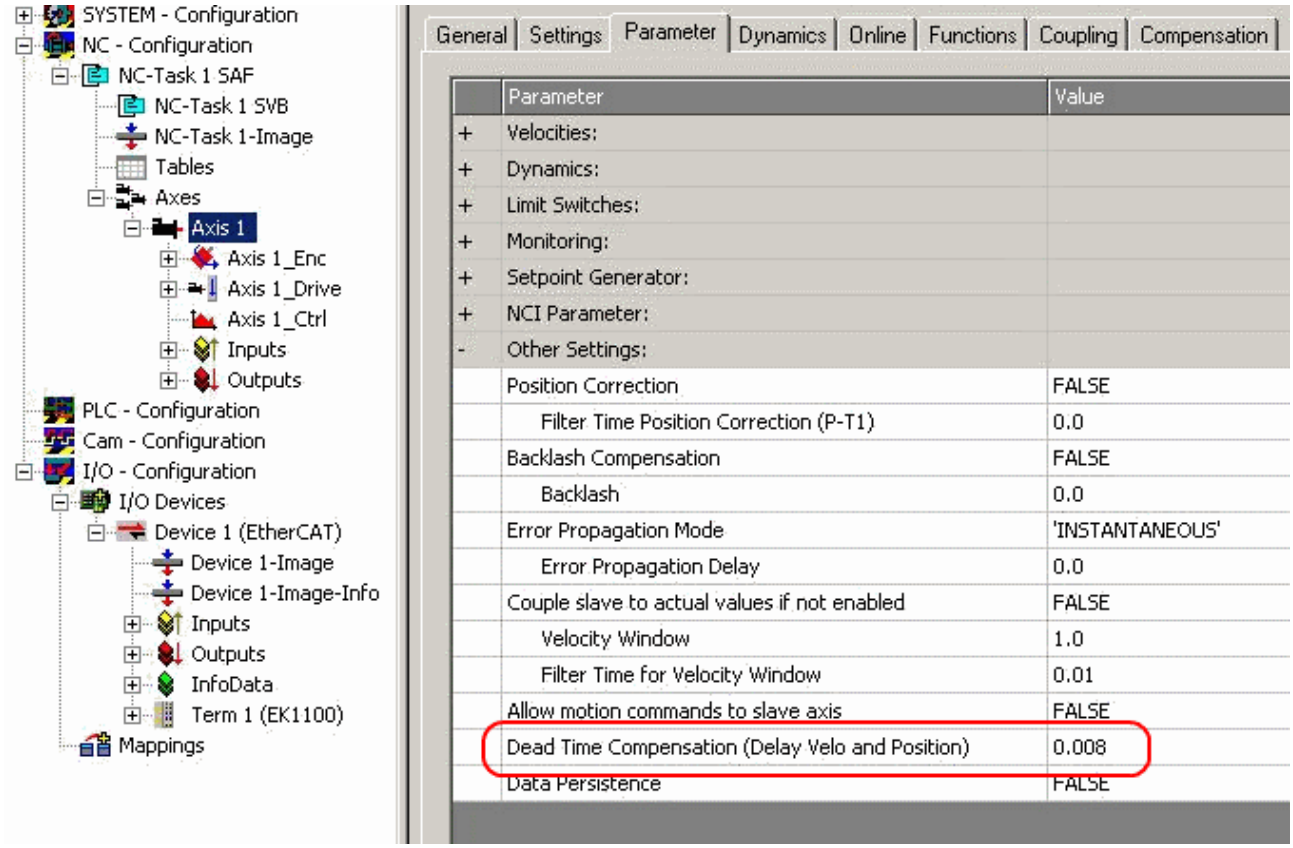


Fig. 62: Dead time compensation parameter

Scaling factor

The scaling factor can be changed by selecting *NC Axis 1_Enc* and the *Parameter* tab in the NC (see fig. *Setting the scaling factor (example with encoder)*). The value can be calculated with the formulas specified below.

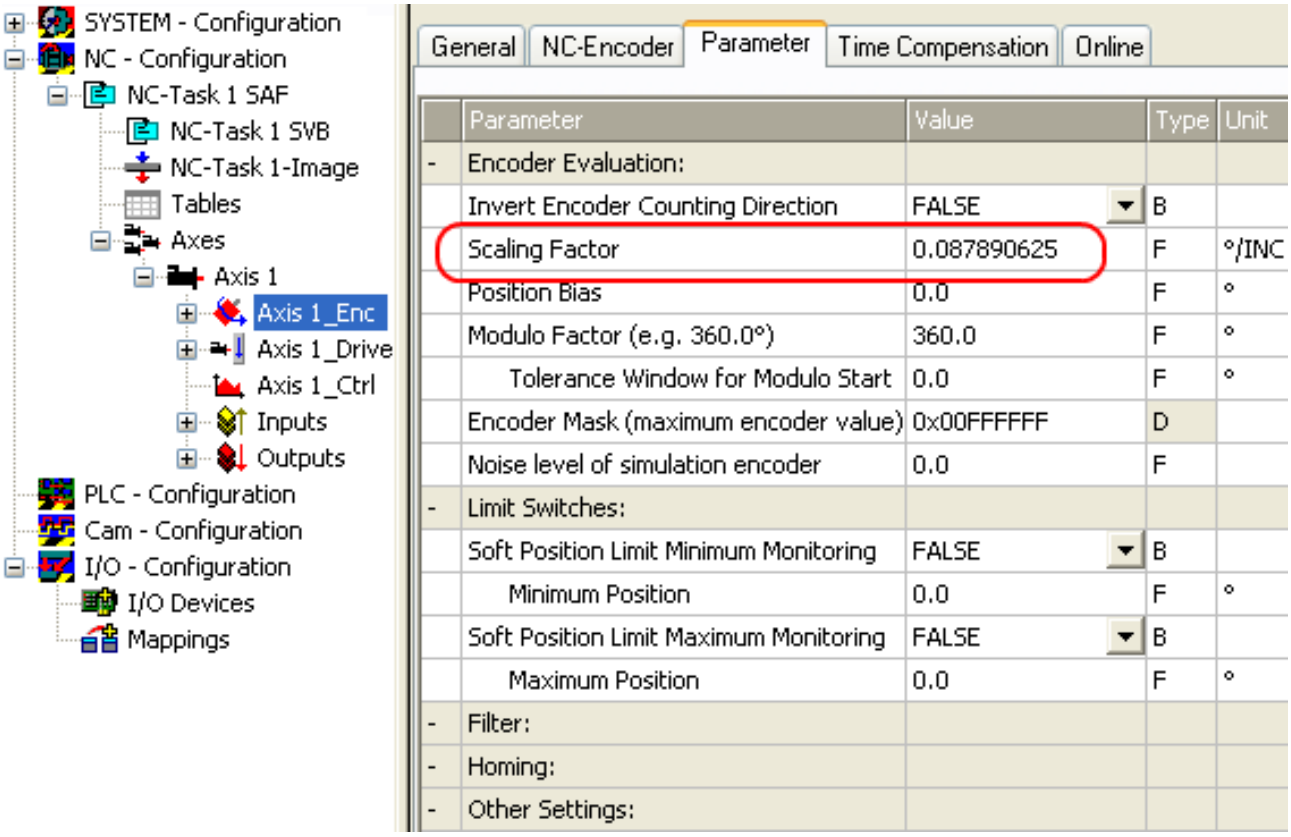


Fig. 63: Setting the scaling factor (example with encoder)

Calculation of the scaling factor

with encoder:

SF = distance per revolution / increments x 4 = 360° / 1024 x 4 = 0.087890625 mm / INC

without encoder:

SF = distance per revolution / full steps x microsteps = 360° / 200 x 64 = 0.028125 mm / INC

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 terminal 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

ATTENTION: 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.

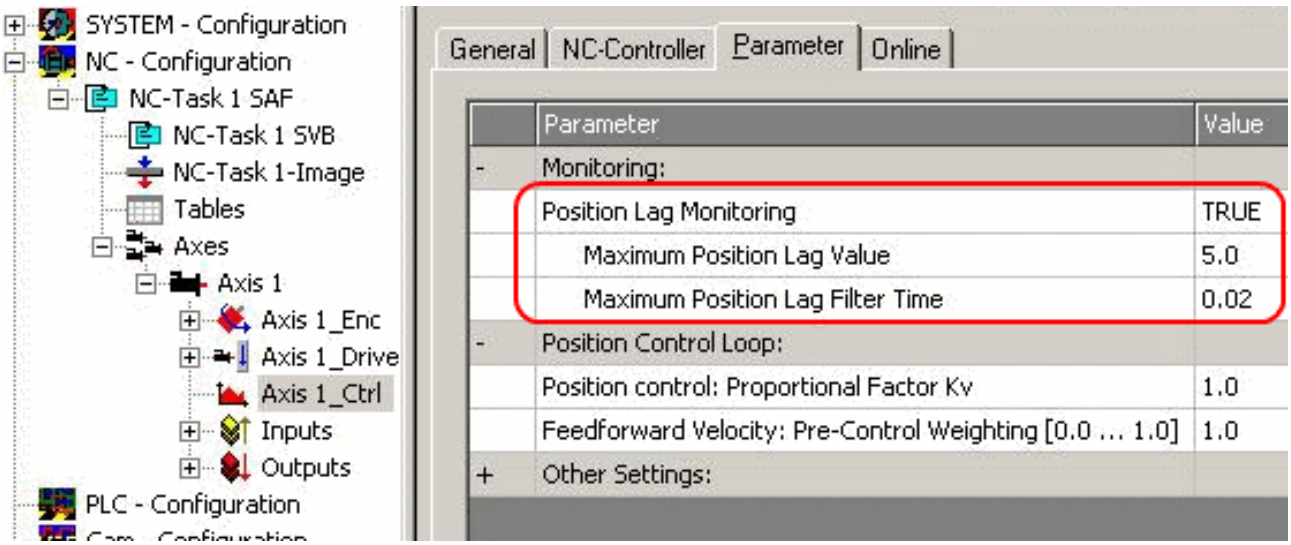


Fig. 64: Position lag monitoring parameters

K_v factors (only with external encoder)

In the NC two proportional factors K_v can be set under Axis *1_Ctrl* on the *Parameter* tab. First select the position controller Type *with two P constants (with KA)* under the NC *Controller* tab. The two P constants are for the *Standstill* range and for the *Moving* range (see Fig. *Setting the proportional factor K_V*). The factors can be used to set the start-up torque and the braking torque to a different value than the drive torque. The threshold value can be set directly below (Position control: Velocity threshold V dyn) between 0.0 (0%) and 1.0 (100%). Fig. *Velocity ramp with K_V factor limit values* shows a speed ramp with thresholds of 30%. The K_v factor for Standstill (t_1 and t_3) can be different than the K_v factor for Moving (t_2). In this case the same factor was used, since for stepper motors this function is less crucial than for DC motors.

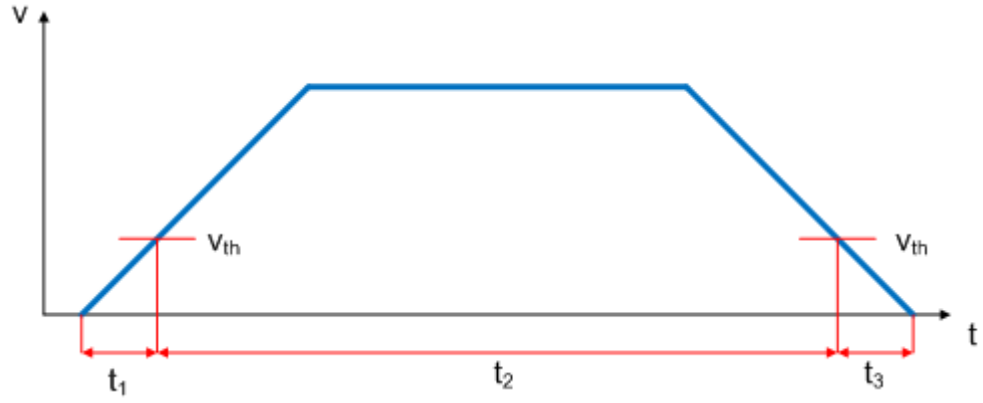


Fig. 65: Speed ramp with K_V factor limit values

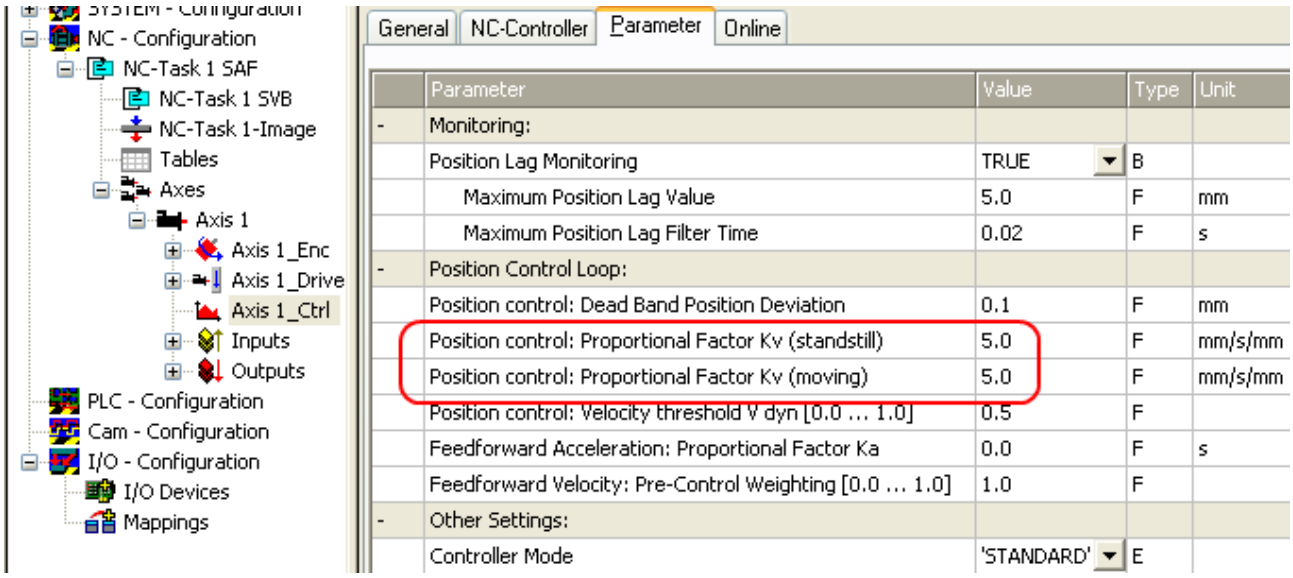


Fig. 66: Setting the proportional factor K_V

Dead band for position errors

Microstepping can be used to target 200 x 64 = 12800 positions. Since the encoder can only scan 1024 x 4 = 4096 positions, positions between two encoder scan points may not be picked up correctly, in which case the terminal will control around this position. The dead band for position errors is a tolerance range within which the position is regarded as "reached" (Fig. *Dead band for position errors*).

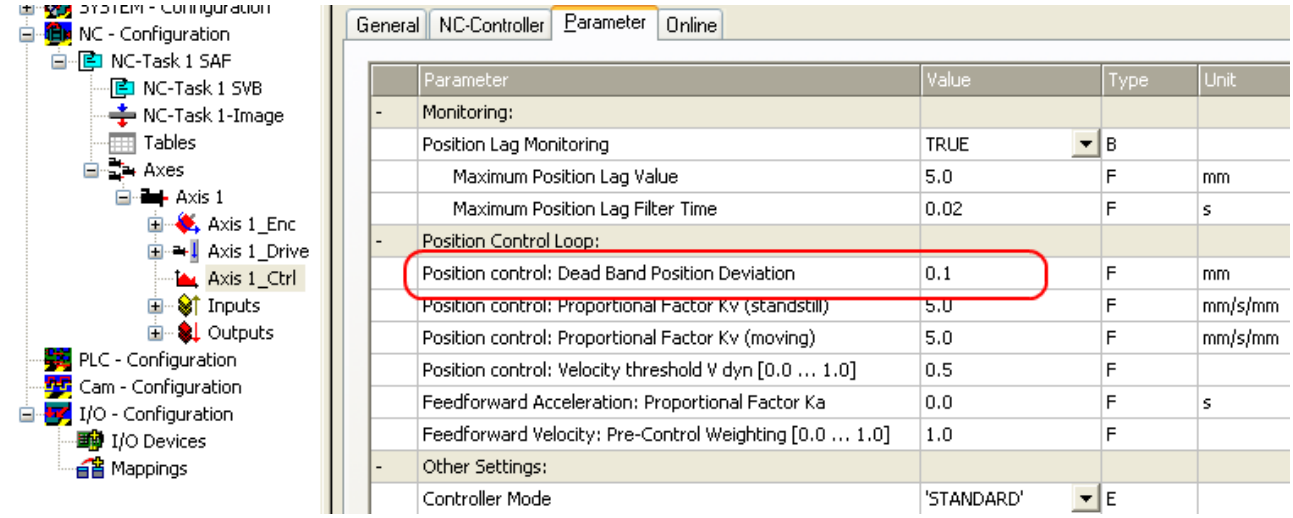


Fig. 67: Dead band for position errors

Setting the acceleration time

In order to pass through any resonances that may occur as quickly as possible, the ramps for the acceleration time and the deceleration time should be as steep as possible.

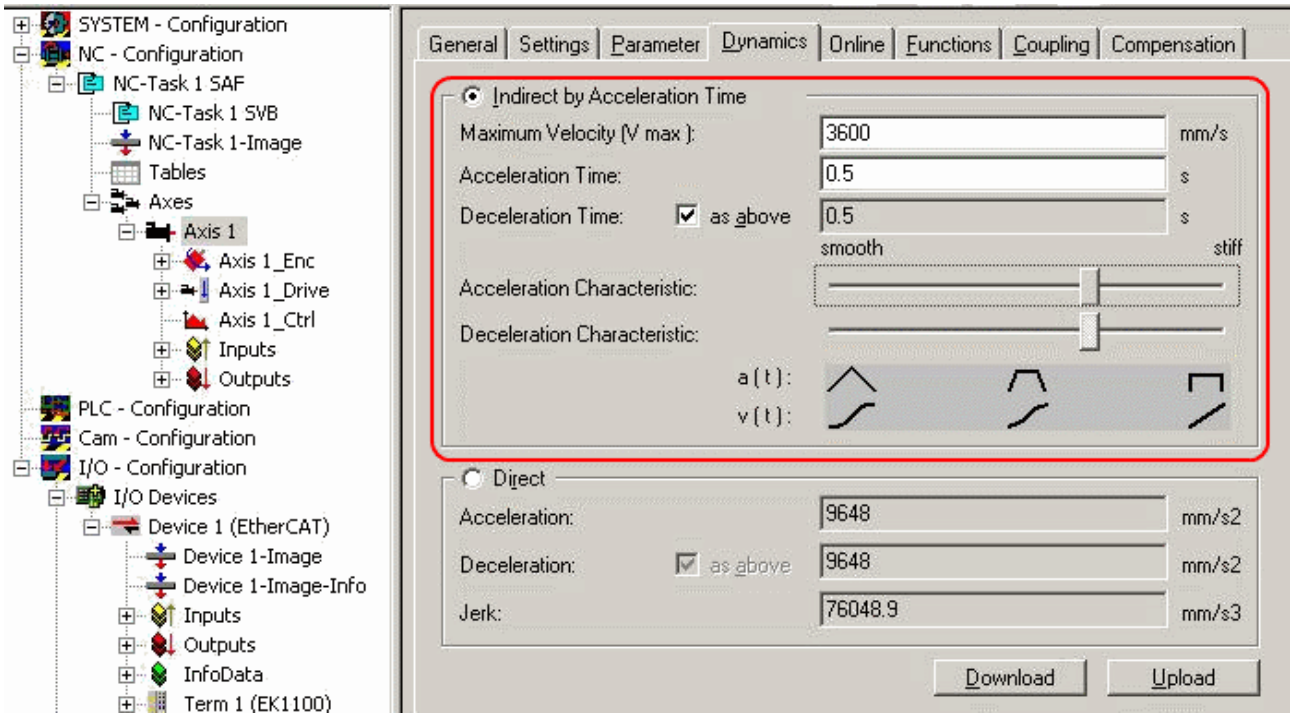


Fig. 68: Setting the acceleration time

4.1.5 Basic principles for the Positioning Interface

The *Positioning interface* offers the user a possibility to implement travel commands directly on the terminal.

4.1.5.1 Predefined PDO Assignment

The "Predefined PDO Assignment" enables a simplified selection of the process data. Select the function "Positioning interface" or "Positioning interface compact" in the lower part of the Process data tab. As a result, all necessary PDOs are automatically activated and the unnecessary PDOs are deactivated.

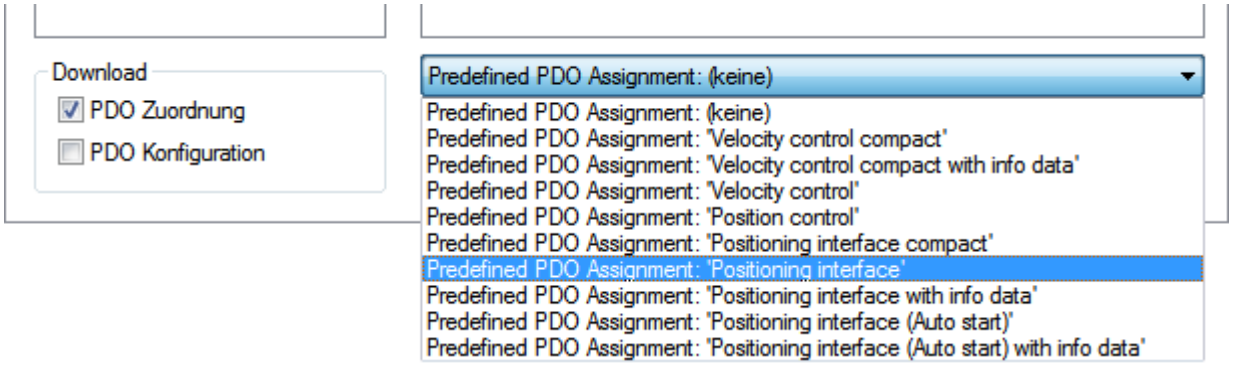


Fig. 69: Predefined PDO Assignment

4.1.5.2 Parameter set

Two objects are at the user's disposal in the CoE for the configuration – the "POS Settings" (Index 0x8020) and the "POS Features" (Index 0x8021).

Index	Name	Flags	Wert
8020:0	POS Settings Ch.1	RW	> 16 <
8020:01	Velocity min.	RW	100
8020:02	Velocity max.	RW	10000
8020:03	Acceleration pos.	RW	0x03E8 (1000)
8020:04	Acceleration neg.	RW	0x03E8 (1000)
8020:05	Deceleration pos.	RW	0x03E8 (1000)
8020:06	Deceleration neg.	RW	0x03E8 (1000)
8020:07	Emergency deceleration	RW	0x0064 (100)
8020:08	Calibration position	RW	0x00000000 (0)
8020:09	Calibration velocity (towards plc cam)	RW	200
8020:0A	Calibration Velocity (off plc cam)	RW	50
8020:0B	Target window	RW	0x000A (10)
8020:0C	In-Target timeout	RW	0x03E8 (1000)
8020:0D	Dead time compensation	RW	50
8020:0E	Modulo factor	RW	0x00000000 (0)
8020:0F	Modulo tolerance window	RW	0x00000000 (0)
8020:10	Position lag max.	RW	0x0000 (0)
8021:0	POS Features Ch.1	RW	> 22 <
8021:01	Start type	RW	Absolute (1)
8021:11	Time information	RW	Elapsed time (0)
8021:13	Invert calibration cam search direction	RW	TRUE
8021:14	Invert sync impulse search direction	RW	FALSE
8021:15	Emergency stop on position lag error	RW	FALSE
8021:16	Enhanced diag history	RW	FALSE

Fig. 70: Settings objects in the CoE

POS Settings: Velocity min.:

For reasons of performance when ramping down to the target position, the terminal needs a safety margin of 0.5%. That means that, depending on the maximum velocity reached and the configured deceleration, the time is calculated at which the deceleration ramp begins. In order to always reach the destination reliably, 0.5% is subtracted from the position determined. If the deceleration ramp has ended and the destination has not yet been reached, the terminal drives at the velocity “*Velocity min*.” to the destination. It must be configured in such a way that the motor is able to stop abruptly and without a step loss at this velocity.

Velocity max.:
The maximum velocity with which the motor drives during a travel command

"Speed range" (index 0x8012:05) [applies to EL70x1]

Velocity min./max. are standardized to the configured "Speed range" (Index 0x8012:05). This means that for a "Speed range" of 4000 full steps/second, for example, for a speed output of 100% (i.e. 4000 full steps/second) 10,000 should be entered under "Velocity max.", and 5,000 for 50% (i.e. 2000 full steps/second).

Acceleration pos.:
Acceleration time in the positive direction of rotation.
The 5 parameters for acceleration also refer to the set “*Speed range*” and are given in ms. With a setting of 1000, the terminal accelerates the motor from 0 to 100% in 1000 ms. At a speed of 50% the acceleration time is linearly reduced to half accordingly.

Acceleration neg.:
Acceleration time in the negative direction of rotation.

Deceleration pos.:
Deceleration time in the positive direction of rotation.

Deceleration neg.:
Deceleration time in the negative direction of rotation.

Emergency deceleration:
Emergency deceleration time (both directions of rotation). If “*Emergency stop*” is set in the appropriate PDO, the motor is stopped within this time.

Calibration position:
The current counter value is loaded with this value after calibration.

Calibration velocity (towards plc cam):
Velocity with which the motor travels towards the cam during calibration.

Calibration velocity (off plc cam):
Velocity with which the motor travels away from the cam during calibration.

Target window:
Target window of the travel distance control. "*In-Target*" is set if the motor comes to a stop within this target window.

In-Target timeout:
"In-Target" is not set if the motor is not within the target window after the expiry of the travel distance control after this set time. This condition can be recognized only by checking the falling edge of “*Busy*”.

Dead time compensation:
Compensation of the internal propagation delays. This parameter does not have to be changed with standard applications.

Modulo factor:
The “*Modulo factor*” is referred to for the calculation of the target position and the direction of rotation in the modulo operating modes. It refers to the controlled system.

Modulo tolerance window:
Tolerance window for the determination of the start condition of the modulo operating modes.

POS Features:

Start type:
The "*Start type*" specifies the type of calculation used to determine the target position (see below).

Time information:
The meaning of the "*Actual drive time*" displayed is configured by this parameter. At present this value cannot be changed, since there are no further selection options. The elapsed time of the travel command is displayed.

Invert calibration cam search direction:
In relation to a positive direction of rotation, the direction of the search for the calibration cam is configured here (travel towards the cam).

Invert sync impulse search direction:
In relation to a positive direction of rotation, the direction of the search is configured here in accordance with the HW sync pulse (travel away from the cam).

4.1.5.3 Information and diagnostic data

Via the information and diagnostic data, the user can obtain a more exact statement about which error occurred during a travel command.

Index	Name	Flags	Wert
9020:0	POS Info data Ch.1	RO	> 4 <
9020:01	Status word	RO	0x0000 (0)
9020:03	State (drive controller)	RO	Init (0)
9020:04	Actual position lag	RO	0
A010:0	STM Diag data Ch.1	RO	> 17 <
A020:0	POS Diag data Ch.1	RO	> 6 <
A020:01	Command rejected	RO	FALSE
A020:02	Command aborted	RO	FALSE
A020:03	Target overrun	RO	FALSE
A020:04	Target timeout	RO	FALSE
A020:05	Position lag	RO	FALSE
A020:06	Emergency stop	RO	FALSE

Fig. 71: Diagnostic objects in the CoE

POS Info data:

Status word:
The "*Status word*" reflects the status bits used in *Index 0xA020* in a data word, in order to be able to process them more simply in the PLC. The positions of the bits correspond to the number of the subindex-1.

Bit 0: Command rejected
Bit 1: Command aborded
Bit 2: Target overrun

State (drive controller):
The current status of the internal state machine is displayed here (see below).

POS Diag data:

Command rejected:
A dynamic change of the target position is not accepted each time by the terminal, since this is then not possible. The new command is rejected in this case and indicated by the setting of this bit.
These 3 diagnostic bits are transmitted synchronously to the controller by setting “*Warning*” in the PDO.

Command aborted:
The current travel command was prematurely aborted due to an internal error or by an "Emergency stop".

Target overrun:
In the case of a dynamic change of the target position, the change may take place at a relatively late point in time. The consequence of this may be that a change in the direction of rotation is necessary and that the new target position may be overrun. “*Target overrun*” is set if this occurs.

4.1.5.4 States of the internal state machine

The state (drive controller) (*Index* 0x9020:03) provides information about the current state of the internal state machine. For diagnostic purposes this can be read out by the PLC for the propagation delay. The internal cycle works constantly with 250 µs. A connected PLC cycle is very probably slower (e.g. 1 ms). For this reason it may be the case that some states are not visible at all in the PLC, since these will sometimes run through only one internal cycle.

Name	ID	Description
INIT	0x0000	Initialization/preparation for the next travel command.
IDLE	0x0001	Wait for the next travel command.
START	0x0010	The new command is evaluated and the corresponding calculations are performed.
ACCEL	0x0011	Acceleration phase.
CONST	0x0012	Constant phase
DECEL	0x0013	Deceleration phase
EMCY	0x0020	An "*Emergency stop"* has been triggered.
STOP	0x0021	The motor has stopped.
CALI_START	0x0100	Start of a calibration command.
CALI_GO_CAM	0x0110	The motor is being driven towards the cam.
CALI_ON_CAM	0x0111	The cam has been reached.
CALI_GO_SYNC	0x0120	The motor is being driven in the direction of the HW sync pulse.
CALI_LEAVE_CAM	0x0121	The motor is being driven away from the cam.
CALI_STOP	0x0130	End of the calibration phase.
CALIBRATED	0x0140	The motor is calibrated.
NOT_CALIBRATED	0x0141	The motor is not calibrated.
PRE_TARGET	0x1000	The set position has been reached; the position controller "pulls" the motor further into the target; "*In-Target timeout*" is started here.
TARGET	0x1001	The motor has reached the target window within the timeout.
TARGET_RESTART	0x1002	A dynamic change of the target position is processed here.
END	0x2000	End of the positioning phase.
WARNING	0x4000	A warning state occurred during the travel command; this is processed here.
ERROR	0x8000	An error state occurred during the travel command; this is processed here.
UNDEFINED	0xFFFF	Undefined state (can occur, for example, if the driver stage has no control voltage).

Table 1: States of the internal state machine

4.1.5.5 Standard sequence of a travel command

The “normally” sequence of a travel command is shown in the following flow diagram.
Coarse distinction is made between these four stages:

Startup

Test the system and the ready status of the motor.

Start positioning

Write all variables and calculate the desired target position with the appropriate “*Start type*”. Subsequently, start the travel command.

Evaluate status

Monitor the terminal state and, if necessary, dynamically change the target position.

Error handling

In case of error, procure the necessary information from the CoE and evaluate it.

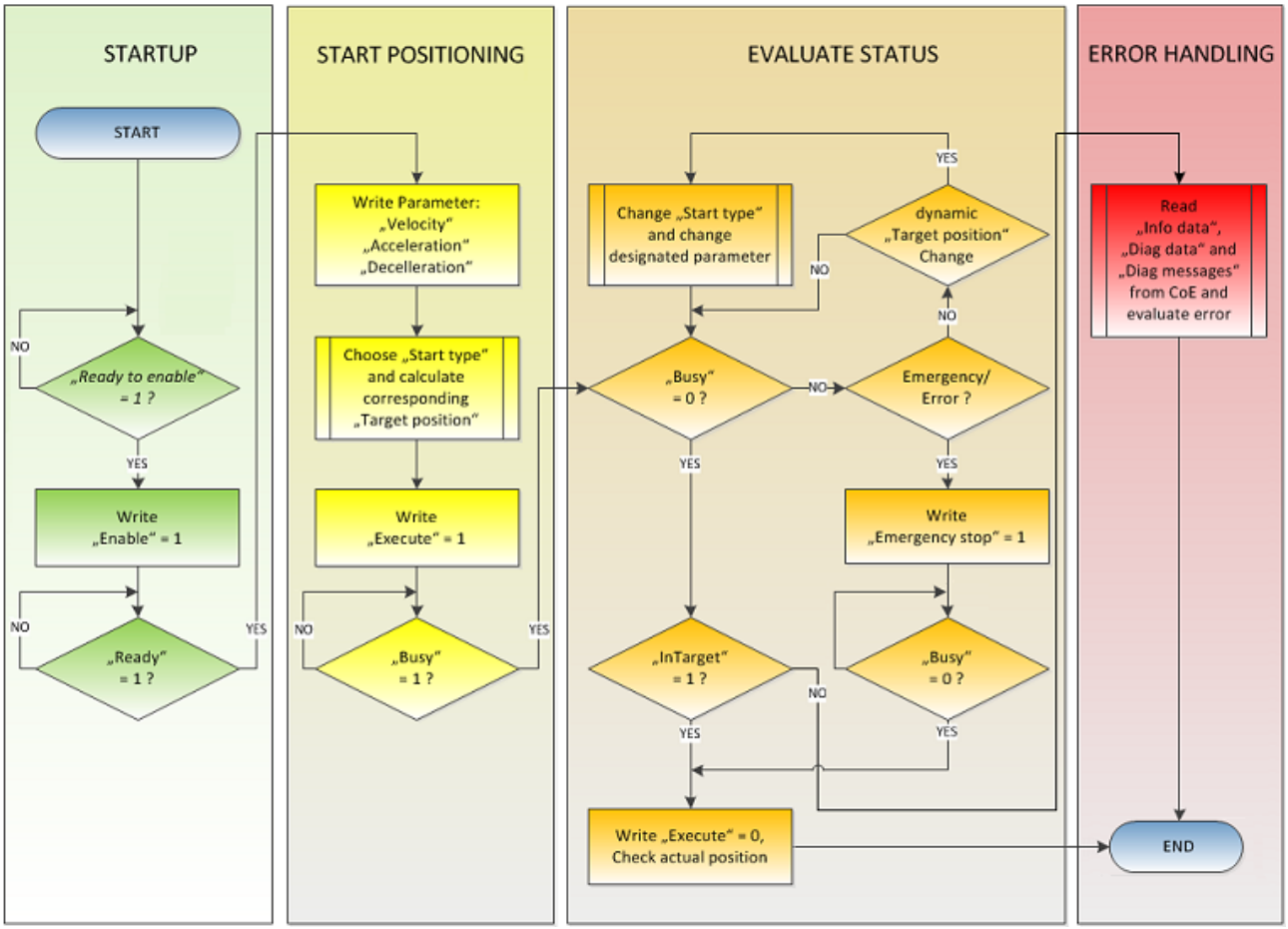


Fig. 72: Flow diagram for a travel command

4.1.5.6 Start types

The *Positioning interface* offers different types of positioning. The following table contains all commands supported; these are divided into 4 groups.

Name	Command	Group	Description
ABSOLUTE	0x0001	Standard [▶ 66]	Absolute positioning to a specified target position
RELATIVE	0x0002		Relative positioning to a calculated target position; a specified position difference is added to the current position
ENDLESS_PLUS	0x0003		Endless travel in the positive direction of rotation (direct specification of a speed)
ENDLESS_MINUS	0x0004		Endless travel in the negative direction of rotation (direct specification of a speed)
ADDITIVE	0x0006		Additive positioning to a calculated target position; a specified position difference is added to the last target position
ABSOLUTE_CHANGE	0x1001	Standard Ext. [▶ 67]	Dynamic change of the target position during a travel command to a new absolute position
RELATIVE_CHANGE	0x1002		Dynamic change of the target position during a travel command to a new relative position (the current changing position value is used here also)
ADDITIVE_CHANGE	0x1006		Dynamic change of the target position during a travel command to a new additive position (the last target position is used here)
MODULO_SHORT	0x0105	Modulo [▶ 69]	Modulo positioning along the shortest path to the modulo position (positive or negative), calculated by the "*Modulo factor*" (Index 0x8020:0E)
MODULO_SHORT_EXT	0x0115		Modulo positioning along the shortest path to the modulo position; the "*Modulo tolerance window*" (Index 0x8020:0F) is ignored
MODULO_PLUS	0x0205		Modulo positioning in the positive direction of rotation to the calculated modulo position
MODULO_PLUS_EXT	0x0215		Modulo positioning in the positive direction of rotation to the calculated modulo position; the "*Modulo tolerance window*" is ignored
MODULO_MINUS	0x0305		Modulo positioning in the negative direction of rotation to the calculated modulo position
MODULO_MINUS_EXT	0x0315		Modulo positioning in the negative direction of rotation to the calculated modulo position; the "*Modulo tolerance window*" is ignored
MODULO_CURRENT	0x0405		Modulo positioning in the last direction of rotation to the calculated modulo position
MODULO_CURRENT_EXT	0x0415		Modulo positioning in the last direction of rotation to the calculated modulo position; the "*Modulo tolerance window*" is ignored
CALI_PLC_CAM	0x6000	Calibration [▶ 68]	Start a calibration with cam (digital inputs)
CALI_HW_SYNC	0x6100		Start a calibration with cam and HW sync pulse (C-track)
SET_CALIBRATION	0x6E00		Manually set the terminal to "*Calibrated*"
SET_CALIBRATION_AUTO	0x6E01		Automatically set the terminal to "*Calibrated*" on the first rising edge on "*Enable*"
CLEAR_CALIBRATION	0x6F00		Manually delete the calibration

Table 2: Supported "*Start types*" of the "*Positioning interface*"

ABSOLUTE

The absolute positioning represents the simplest positioning case. A position B is specified and travelled to from the start point A.

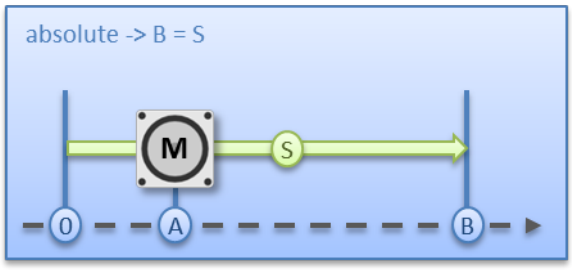


Fig. 73: Absolute positioning

RELATIVE

In relative positioning, the user specifies a position delta S, which is added to the current position A, producing the target position B.

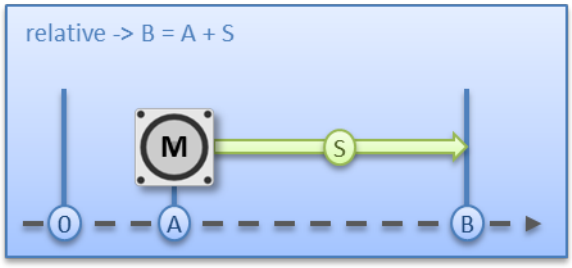


Fig. 74: Relative positioning

ENDLESS_PLUS / ENDLESS_MINUS

The two start types ENDLESS_PLUS and ENDLESS_MINUS offer the possibility in the *Positioning Interface* to specify a direct motor velocity in order to travel endlessly in the positive or negative direction with the specified accelerations.

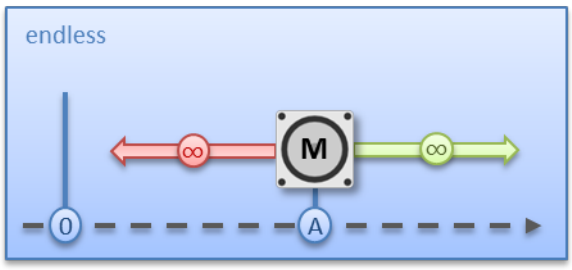


Fig. 75: Endless travel

ADDITIVE

For additive positioning, the position delta S specified by the user is added to the target position E used for the last travel command in order to calculate the target position B.

This kind of positioning resembles the relative positioning, but there is a difference. If the last travel command was completed successfully, the new target position is the same. If there was an error, however, be it that the motor entered a stall state or an *Emergency stop* was triggered, the current position is arbitrary and not foreseeable. The user now has the advantage that he can use the last target position for the calculation of the following target position.

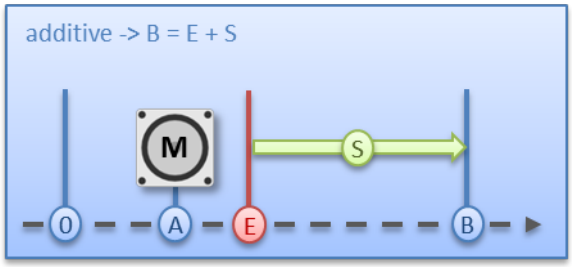


Fig. 76: Additive positioning

ABSOLUTE_CHANGE / RELATIVE_CHANGE / ADDITIVE_CHANGE

These three kinds of positioning are completely identical to those described above. The important difference thereby is that the user uses these commands during an active travel command in order to dynamically specify a new target position.

The same rules and conditions apply as to the “normal” start types. ABSOLUTE_CHANGE and ADDITIVE_CHANGE are unique in the calculation of the target position i.e. in absolute positioning an absolute position is specified and in additive positioning a position delta is added to the momentarily active target position.

NOTE

Caution when using the RELATIVE_CHANGE positioning

The change by means of RELATIVE_CHANGE must be used with caution, since the current position of the motor is also used here as the start position. Due to propagation delays in the system, the position indicated in the PDO never corresponds to the actual position of the motor! Therefore a difference to the desired target position always results in the calculation of the transferred position delta.

Time of the change of the target position

A change of the target position cannot take place at an arbitrary point in time. If the calculation of the output parameters shows that the new target position cannot be readily reached, the command is rejected by the terminal and the Command rejected [▶ 62] bit is set. This is the case, for example, at standstill (since the terminal expects a standard positioning here) and in the acceleration phase (since at this point the braking time cannot be calculated yet).

CALI_PLC_CAM / CALI_HW_SYNC / SET_CALIBRATION / SET_CALIBRATION_AUTO / CLEAR_CALIBRATION:

The simplest calibration case is calibration by cam only (connected to one digital input).

Here, the motor travels in the 1st step with velocity 1 (Index 0x8020:09) in direction 1 (Index 0x8021:13) towards the cam. Subsequently, in the 2nd step, it travels with velocity 2 (Index 0x8020:0A) in direction 2 (Index 0x8021:14) away from the cam. After the *In-Target timeout"*(Index 0x8020:0C) has elapsed, the calibration position (Index 0x8020:08) is taken on by the terminal as the current position.

NOTE

Observe the switching hysteresis of the cam switch

With this simple calibration it must be noted that the position detection of the cam is only exact to a certain degree. The digital inputs are not interrupt-controlled and are "only" polled. The internal propagation delays may therefore result in a system-related position difference.

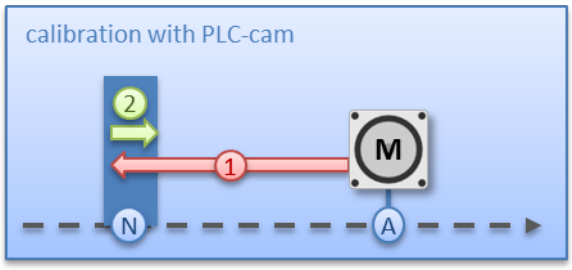


Fig. 77: Calibration with cam

For a more precise calibration, an HW sync pulse (C-track) is used in addition to the cam. This calibration proceeds in exactly the same way as described above, up to the point at which the motor travels away from the cam. The travel is not stopped immediately; instead, the sync pulse is awaited. Subsequently, the *In-Target timeout* runs down again and the calibration position is taken on by the terminal as the current position.

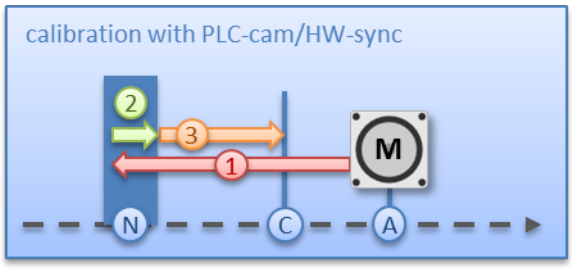


Fig. 78: Calibration with cam and C-track

If calibration by hardware is not possible due to the circumstances of the application, the user can also set the *Calibrated* bit manually or automatically. The manual setting or deletion takes place with the commands SET_CALIBRATION and CLEAR_CALIBRATION.

It is simpler, however, if the standard start types (Index 0x8021:01) are set to SET_CALIBRATION_AUTO. The *Calibrated* bit will now be set automatically by the first rising edge on *Enable*. The command is conceived only for this purpose; therefore, it does not make sense to use it via the synchronous data exchange.

4.1.5.7 Modulo - general description

MODULO

The modulo position of the axis is a piece of additional information about the absolute axis position. Modulo positioning represents the required target position in a different way. Contrary to the standard types of positioning, the modulo positioning has several pitfalls, since the desired target position can be interpreted differently.

The modulo positioning refers in principle to the *Modulo factor (*Index 0x8020:0E), which can be set in the CoE. In the following examples, a rotary axis with a "*Modulo factor"* equivalent to 360 degrees is assumed.

The *Modulo tolerance window* (Index 0x8020:0F) defines a position window around the current modulo target position of the axis. The window width is twice the specified value (set position ± tolerance value). A detailed description of the tolerance window is provided below.

The positioning of an axis is always referenced to its current actual position. The actual position of an axis is normally the position moved to with the last travel command. Under certain circumstances (incorrect positioning due to the axis stalling, or a very coarse resolution of the connected encoder), however, a position not expected by the user may arise. If this possibility is not considered, subsequent positioning may lead to unexpected behavior.

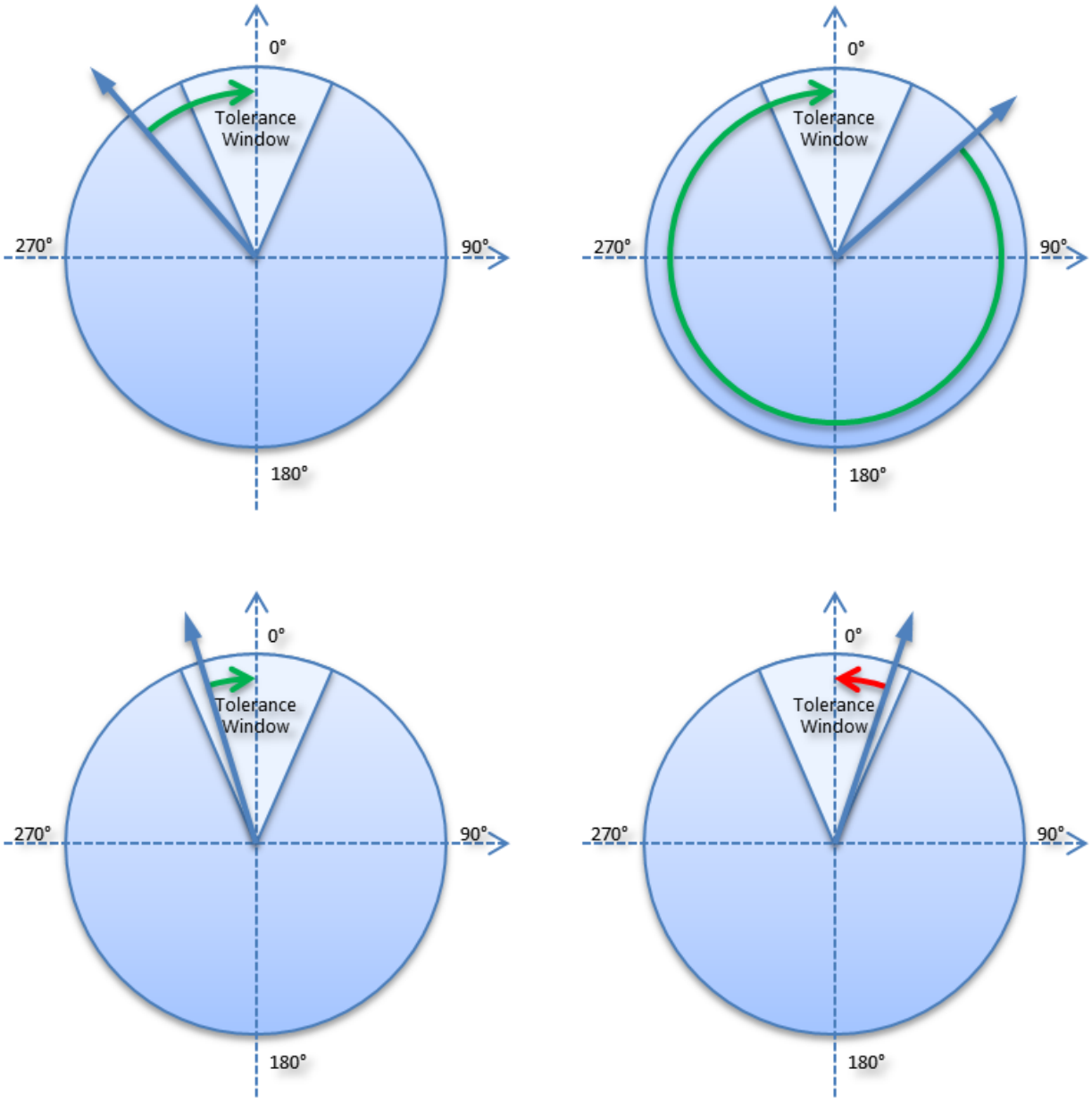


Fig. 79: Effect of the modulo tolerance window - modulo target position 0° in positive direction

Example

An axis is positioned to 0°, with the result that subsequently the actual position of the axis is exactly 0°. A further modulo travel command to 360° in *positive direction* results in a full turn, with the subsequent modulo position of the axis of once again being exactly 0°. If the axis comes to a stop somewhat in front of or behind the target position for mechanical reasons, the next travel command does not behave as one would expect. If the actual position lies slightly below 0° (see fig. *Calibration with cam*, below left), a new travel command to 0° in the *positive direction* leads only to a minimal movement. The deviation that arose beforehand is compensated and the position is subsequently exactly 0° once more. If the position lies slightly above 0°, however, the same travel command leads to a full revolution in order to reach the exact position of 0° again. This problem occurs if complete turns by 360° or multiples of 360° were initiated. For positioning to an angle that is significantly different from the current modulo position, the travel command is unambiguous.

In order to solve the problem, a "*Modulo tolerance window*" (Index 0x8020:0F) can be parameterized. This ensures that small deviations from the position that are within the window do not lead to different axis behavior. If, for example, a window of 1° is parameterized, in the case described above the axis will behave

identically, as long the actual position is between 359° and 1°. If the position exceeds 0° by less than 1°, the axis is re-positioned in *positive direction* at a modulo start. In both cases, a target position of 0° therefore leads to minimum movement to exactly 0°. A target position of 360° leads to a full turn in both cases.

For values that are within the window range, the modulo tolerance window can therefore lead to movements against the specified direction. For small windows this is usually not a problem, because system deviations between set and actual position are compensated in both directions. This means that the tolerance window may also be used for axes that may only be moved in one direction due to their construction.

Modulo positioning by less than one turn

Modulo positioning from a starting position to a non-identical target position is unambiguous and requires no special consideration. A modulo target position in the range [0 ≤; position < 360] reaches the required target in less than one whole turn. No motion occurs if target position and starting position are identical. Target positions of more than 360° lead to one or more full turns before the axis travels to the required target position.

For a movement from 270° to 0°, a modulo target position of 0° (not 360°) should therefore be specified, because 360° is outside the basic range and would lead to an additional turn.

The modulo positioning distinguishes between three direction specifications: *positive direction*, *negative direction* and *along the shortest path* (*MODULO_PLUS, MODULO_MINUS, MODULO_SHORT*). For positioning along the shortest path, target positions of more than 360° are not sensible, because the movement towards the target is always direct. In contrast to positive or negative direction, it is therefore not possible to carry out several turns before the axis moves to the target.

NOTE

Only basic periods of less than 360° are permitted

For modulo positioning with start type "MODULO_SHORT", only modulo target positions within the basic period (e.g. less than 360°) are permitted, otherwise an error is returned.

Positioning without the modulo tolerance window

The "Modulo tolerance window" (Index 0x8020:0F) is always taken into account in the "normal" types of modulo positioning. However, this is less desirable in some situations. In order to eliminate this "disadvantage", the comparable start types "MODULO_SHORT_EXT", "MODULO_PLUS_EXT", "MODULO_MINUS_EXT" and "MODULO_CURRENT_EXT" can be used, which ignore the modulo tolerance window.

The following table shows examples of modulo positioning with less than one revolution.

Modulo start type	Absolute start position	Modulo target position	Relative travel path	Absolute end position	Modulo end position
MODULO_PLUS	90°	0°	270°	360°	0°
MODULO_PLUS	90°	360°	630°	720°	0°
MODULO_PLUS	90°	720°	990°	1080°	0°
MODULO_MINUS	90°	0°	-90°	0°	0°
MODULO_MINUS	90°	360°	-450°	-360°	0°
MODULO_MINUS	90°	720°	-810°	-720°	0°
MODULO_SHORT	90°	0°	-90°	0°	0°

Modulo positioning with full turns

In principle, modulo positioning by one or full turns are no different than positioning to an angle that differs from the starting position. No motion occurs if target position and starting position are identical. For a full turn, 360° has to be added to the starting position. The behavior described in the example shows that special attention must be paid to positionings with whole revolutions. The following table shows positioning examples for a starting position of approximately 90°. The modulo tolerance window is set to 1° here. Special cases for which the starting position is outside this window are identified.

The following table shows examples of modulo positioning with whole revolutions

Modulo start type	Absolute start position	Modulo target position	Relative travel path	Absolute end position	Modulo end position	Note
MODULO_PLUS	90.00°	90.00°	0.00°	90.00°	90.00°	
MODULO_PLUS	90.90°	90.00°	-0.90°	90.00°	90.00°	
MODULO_PLUS	91.10°	90.00°	358.90°	450.00°	90.00°	outside TF
MODULO_PLUS	89.10°	90.00°	0.90°	90.00°	90.00°	
MODULO_PLUS	88.90°	90.00°	1.10°	90.00°	90.00°	outside TF
MODULO_PLUS	90.00°	450.00	360.00°	450.00°	90.00°	
MODULO_PLUS	90.90°	450.00°	359.10°	450.00°	90.00°	
MODULO_PLUS	91.10°	450.00°	718.90°	810.00°	90.00°	outside TF
MODULO_PLUS	89.10°	450.00°	360.90°	450.00°	90.00°	
MODULO_PLUS	88.90°	450.00°	361.10°	450.00°	90.00°	outside TF
MODULO_PLUS	90.00°	810.00	720.00°	810.00°	90.00°	
MODULO_PLUS	90.90°	810.00	719.10°	810.00°	90.00°	
MODULO_PLUS	91.10°	810.00	1078.90°	1170.00°	90.00°	outside TF
MODULO_PLUS	89.10°	810.00	720.90°	810.00°	90.00°	
MODULO_PLUS	88.90°	810.00	721.10°	810.00°	90.00°	outside TF
MODULO_MINUS	90.00°	90.00°	0.00°	90.00°	90.00°	
MODULO_MINUS	90.90°	90.00°	-0.90°	90.00°	90.00°	
MODULO_MINUS	91.10°	90.00°	-1.10°	90.00°	90.00°	outside TF
MODULO_MINUS	89.10°	90.00°	0.90°	90.00°	90.00°	
MODULO_MINUS	88.90°	90.00°	-358.90°	-270.00°	90.00°	outside TF
MODULO_MINUS	90.00°	450.00°	-360.00°	-270.00°	90.00°	
MODULO_MINUS	90.90°	450.00°	-360.90°	-270.00°	90.00°	
MODULO_MINUS	91.10°	450.00°	-361.10°	-270.00°	90.00°	outside TF
MODULO_MINUS	89.10°	450.00°	-359.10°	-270.00°	90.00°	
MODULO_MINUS	88.90°	450.00°	-718.90°	-630.00°	90.00°	outside TF
MODULO_MINUS	90.00°	810.00°	-720.00°	-630.00°	90.00°	
MODULO_MINUS	90.90°	810.00°	-720.90°	-630.00°	90.00°	
MODULO_MINUS	91.10°	810.00°	-721.10°	-630.00°	90.00°	outside TF
MODULO_MINUS	89.10°	810.00°	-719.10°	-630.00°	90.00°	
MODULO_MINUS	88.90°	810.00°	-1078.90°	-990.00°	90.00°	outside TF

4.1.5.8 Examples of two travel commands with a dynamic change of the target position

Without overrun of the target position

Time	POS Outputs	POS Inputs	Description
t1:	Execute = 1 Target position = 200000 Velocity = 2000 Start type = 0x0001 Acceleration = 1000 Deceleration = 1000	Busy = 1 Accelerate = 1	• Specification of the first parameter • Start of the acceleration phase
t2:		Accelerate = 0	• End of the acceleration phase
t3:	Target position = 100000 Velocity = 1500 Start type = 0x1001 Acceleration = 2000 Deceleration = 2000		• Change of the parameters • Activation by new start types
t4:		Decelerate = 1	• Start of the deceleration phase
t5:	Execute = 0	Busy = 0 In-Target = 1 Decelerate = 0	• End of the deceleration phase • Motor is at the new target position
t6 - t9:			• Absolute travel back to the start position 0

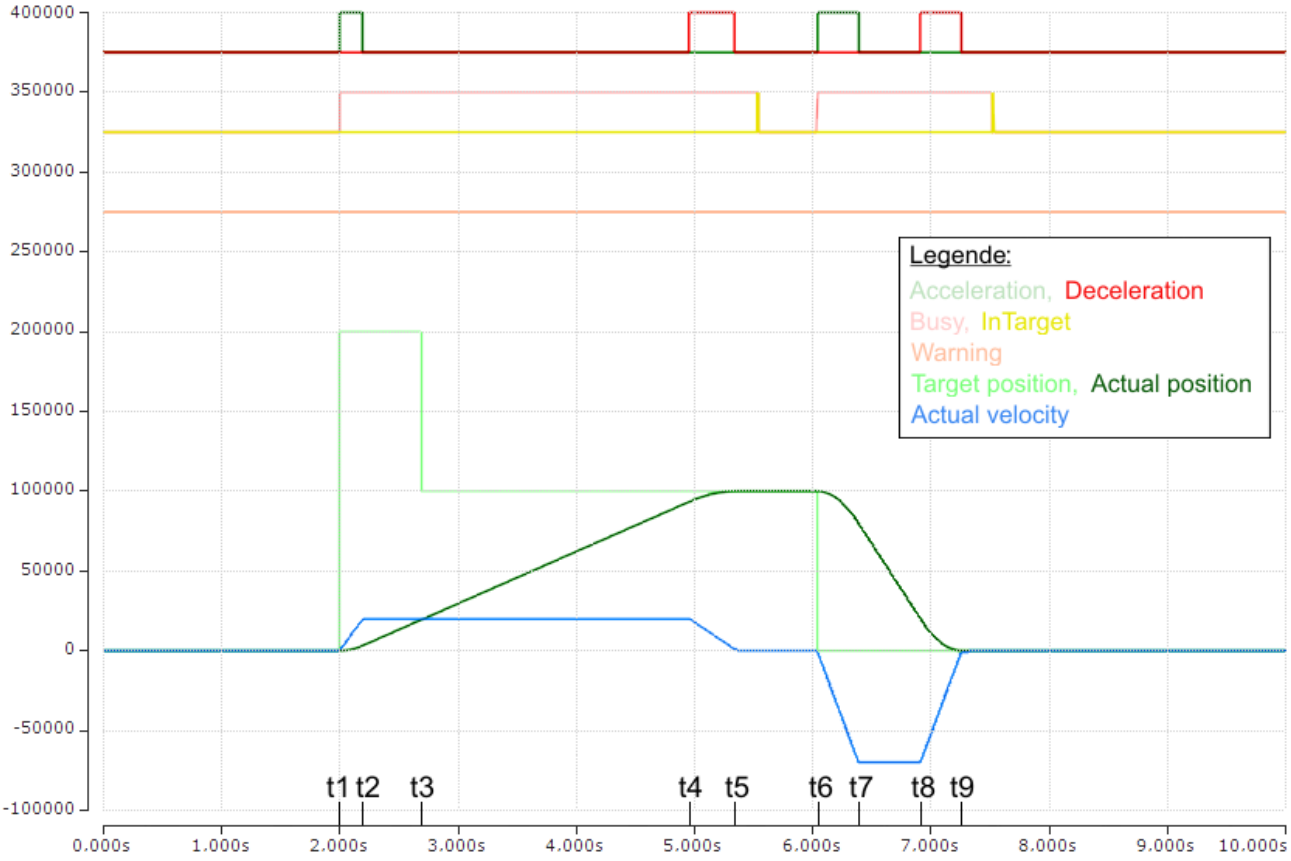


Fig. 80: Scope recording without overrunning the target position

The axis scaling refers only to the positions, not to the speed or the status bits.

With overrun of the target position

Time	POS Outputs	POS Inputs	Description
t1:	Execute = 1 Target position = 200000 Velocity = 5000 Start type = 0x0001 Acceleration = 3000 Deceleration = 5000	Busy = 1 Accelerate = 1	• Specification of the 1st parameter • Start of the 1st acceleration phase
t2:		Accelerate = 0	• End of the 1st acceleration phase
t3:	Target position = 100000 Velocity = 1500 Start type = 0x1001 Acceleration = 1000 Deceleration = 2000	Warning = 1 Decelerate = 1	• Change of the parameters • Activation by new start types • Warning of overrunning the target position • Start of the 1st deceleration phase
t4:		Accelerate = 1 Decelerate = 0	• End of the 1st deceleration phase • Start of the 2nd acceleration phase in the opposite direction
t5:		Accelerate = 0 Decelerate = 1	• End of the 2nd acceleration phase • Start of the 2nd deceleration phase
t6:	Execute = 0	Busy = 0 In-Target = 1 Decelerate = 0	• End of the 2nd deceleration phase • Motor is at the new target position
t7 - t10:			• Absolute travel back to the start position 0

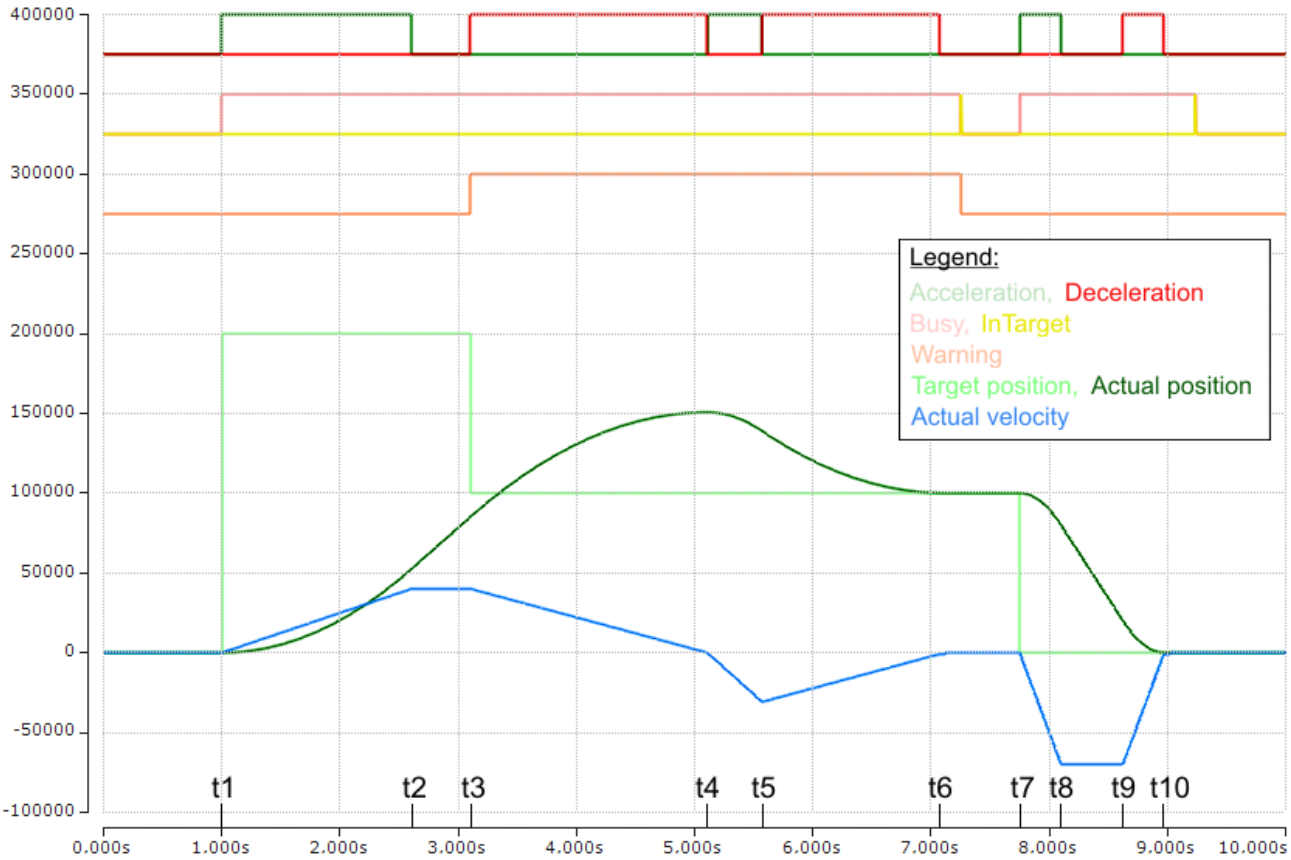
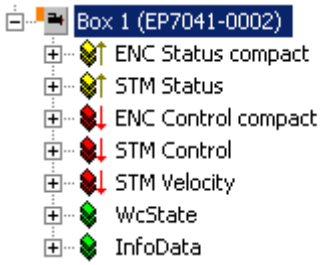


Fig. 81: Scope recording with overrunning of the final target position

The axis scaling refers only to the positions, not to the speed or the status bits.

4.1.6 EP7041 - Process image

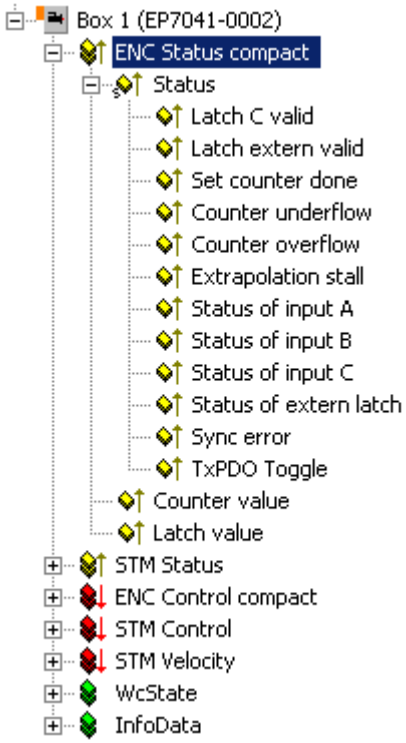
The TwinCAT System Manager displays the EP7041 data in a tree structure.



The tree shows

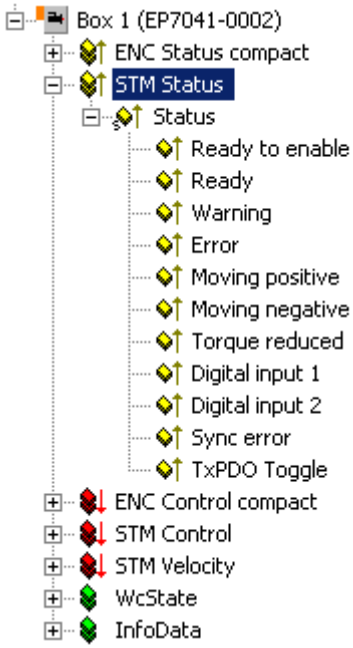
- ENC Status compact: encoder status
- STM Status: Stepper Motor Status
- ENC Control compact: Encoder Control
- STM Control: Stepper Motor Control
- STM Velocity: Stepper Motor Velocity

ENC Status compact



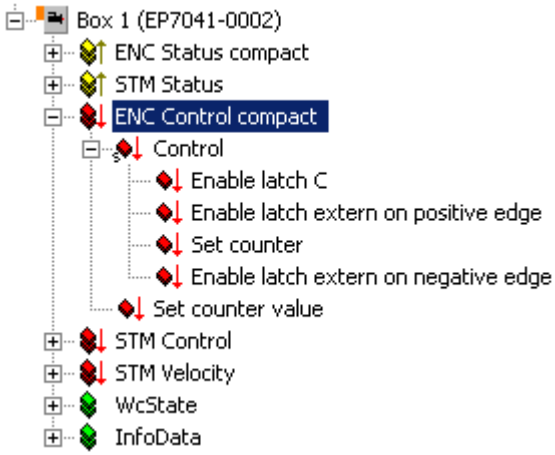
The status information for the encoder can be found under **ENC Status compact**.

STM Status



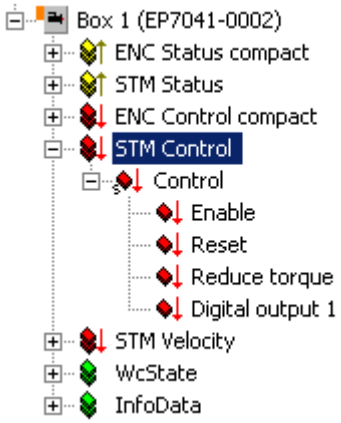
The status information for the stepper motor can be found under **STM Status**.

ENC Control compact



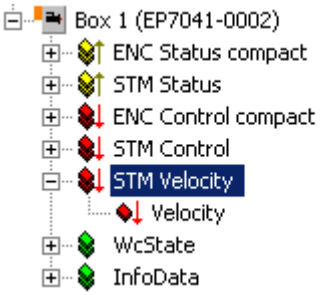
The control parameters for the encoder can be found under **ENC Control compact**.

STM Control



The control parameters for the stepper motor can be found under **STM Control**.

STM Velocity



The velocity settings for the stepper motor can be found under **STM Velocity**.

4.1.7 Application example

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.

Motor control with visualization

Sample program (https://infosys.beckhoff.com/content/1033/EP7041/Resources/zip/3696560907.zip)

Used Master: TwinCAT 2.11 (for older versions the control loop has to be programmed manually; in this case it is already implemented in the NC).
This application example demonstrates movement of a motor to any position or in continuous mode with the aid of visualization. The velocity, the starting acceleration and the deceleration can be specified.

The sample program consists of 2 files (PLC file and System Manager file).

First open the PLC file and compile it so that you have the *.tpy file available that is required for the System Manager.

Please note that you may have to adjust the target platform in the PLC program (default: PC or CX 8x86). If required, you can select the right target platform in the *Resources -> Controller configuration* tab.

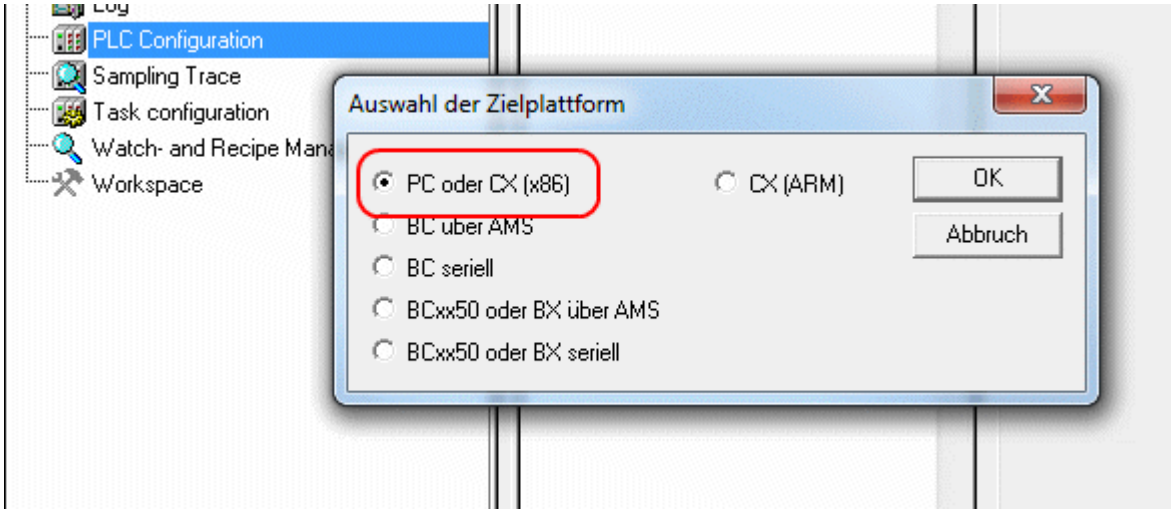


Fig. 82: Selection of the target platform

Please note the following for the System Manager file:

- Start the System Manager in Config mode.

- Please ensure that the I/O configuration matches your actual configuration. In the sample program only one EL7041 is integrated. If further terminals are connected you have to add them or re-scan your configuration.
- You have to adjust the MAC address. To do this, click on your *EtherCAT device*, then select the *Adapter* tab and click on *Search* after the MAC address (see Fig. *Selecting the MAC address*). Select the right adapter.

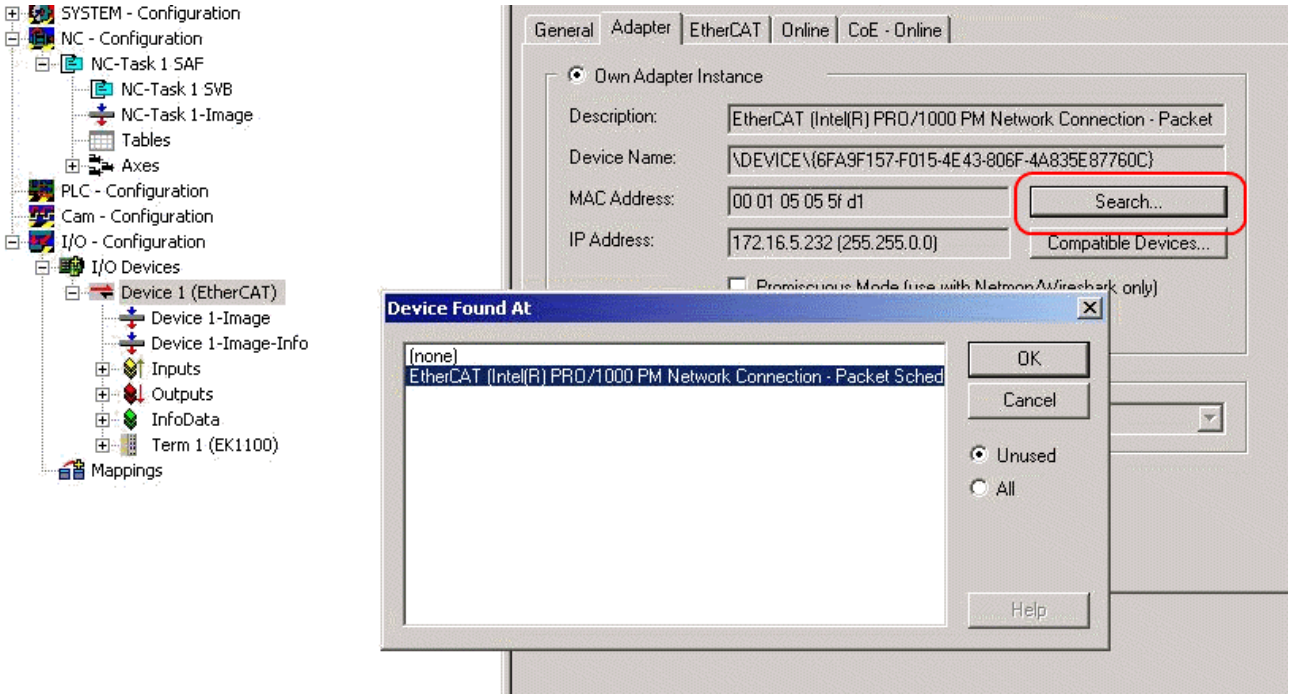


Fig. 83: Selecting the MAC address

- In the PLC configuration you have to adjust the path for the PLC program. Click on the appended PLC program and select the tab *IEC1131* (see Fig. *Changing the PLC path*). Select *Change* and enter the correct path.

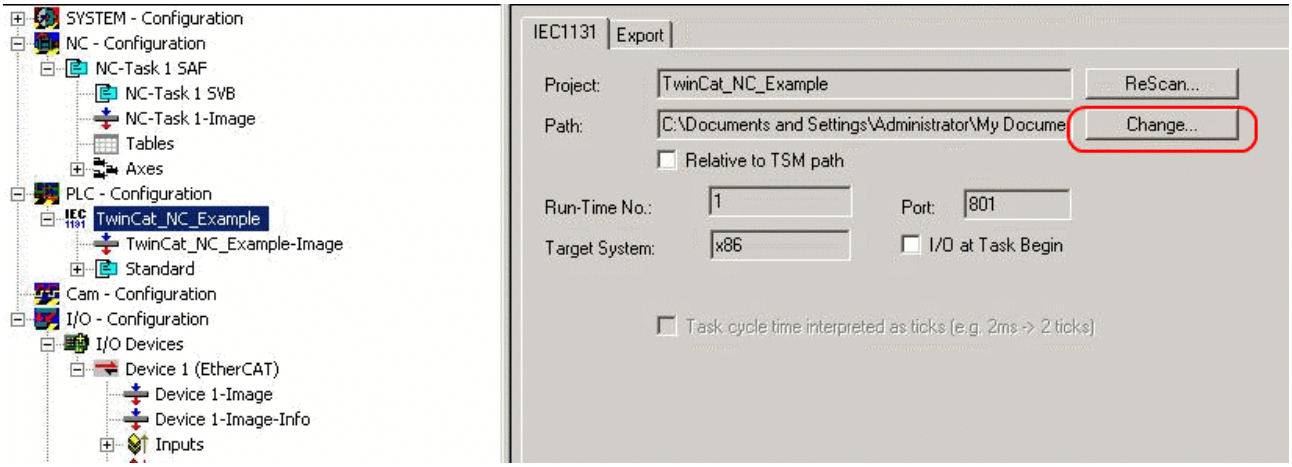


Fig. 84: Changing the PLC path

- Under NC configuration an EL7041 is already linked to the NC. To change the link or add additional devices proceed as described under "Integration into the NC configuration".

The PLC program is configured as follows. The libraries *TcMC.lib* and *TcNC.lib* must be integrated (see Fig. *Required libraries*).

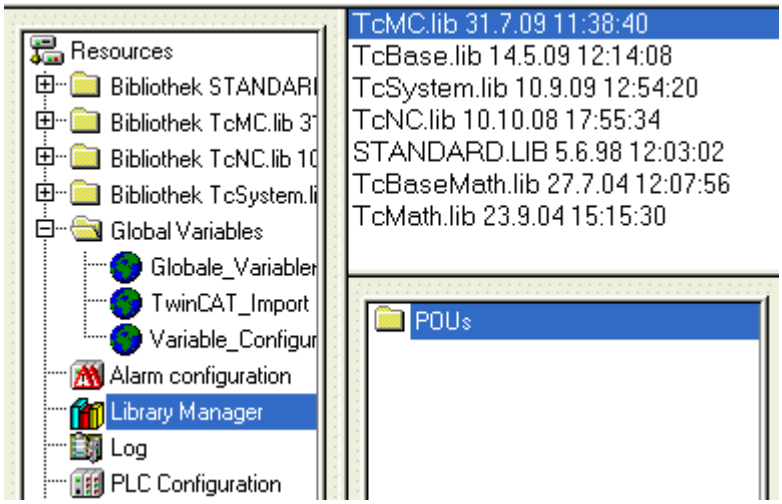


Fig. 85: Required libraries

Once this is done, certain global variables are declared (see Fig. *Global variables*). The data types *PLCTONC_AXLESTRUCT* and *NCTOPLC_AXLESTRUCT* deal with the communication between the PLC and the NC.

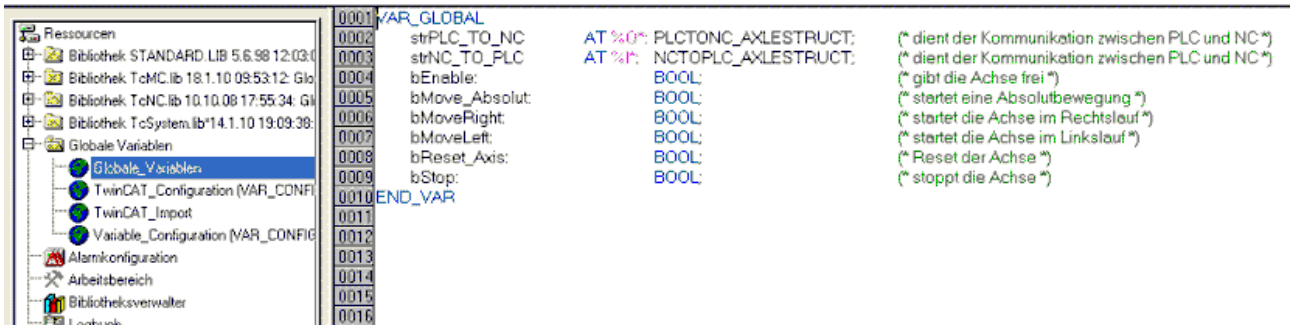


Fig. 86: Global variables

Once the global variables have been declared, programming can commence. Start with declaring local variables (see Fig. *Local variables*).
MC_Direction is an enumeration type that specifies the direction of movement for the MC_MoveVelocity function block, which in turn initiates continuous travel of the motor.
An axis reset is carried out with the MC_Reset function block. Absolute positioning is carried out with the MC_MoveAbsolute function block. The current axis position can be read with the MC_ActualPosition function block.
MC_Power enables the axis; MC_Stop is required for stopping the axis.

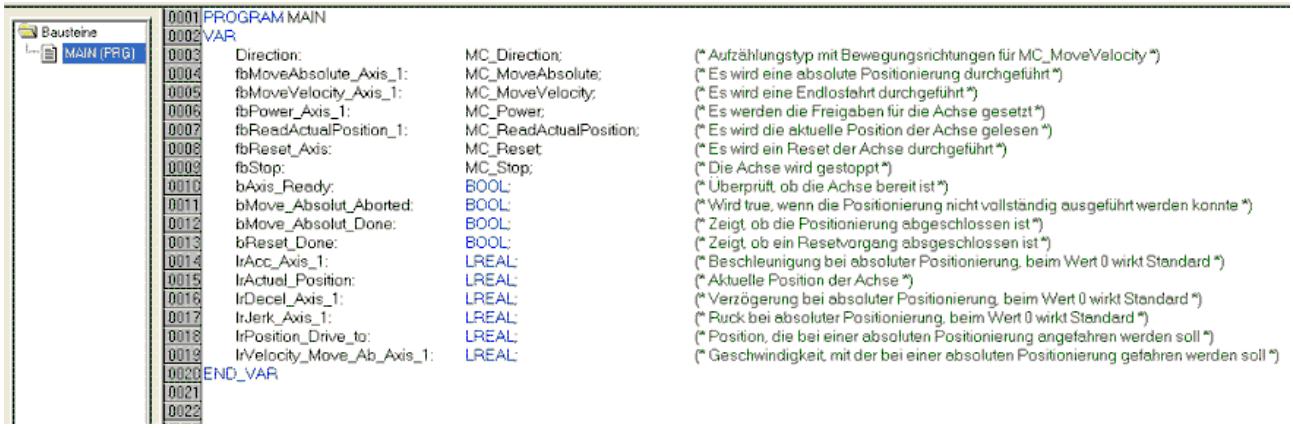
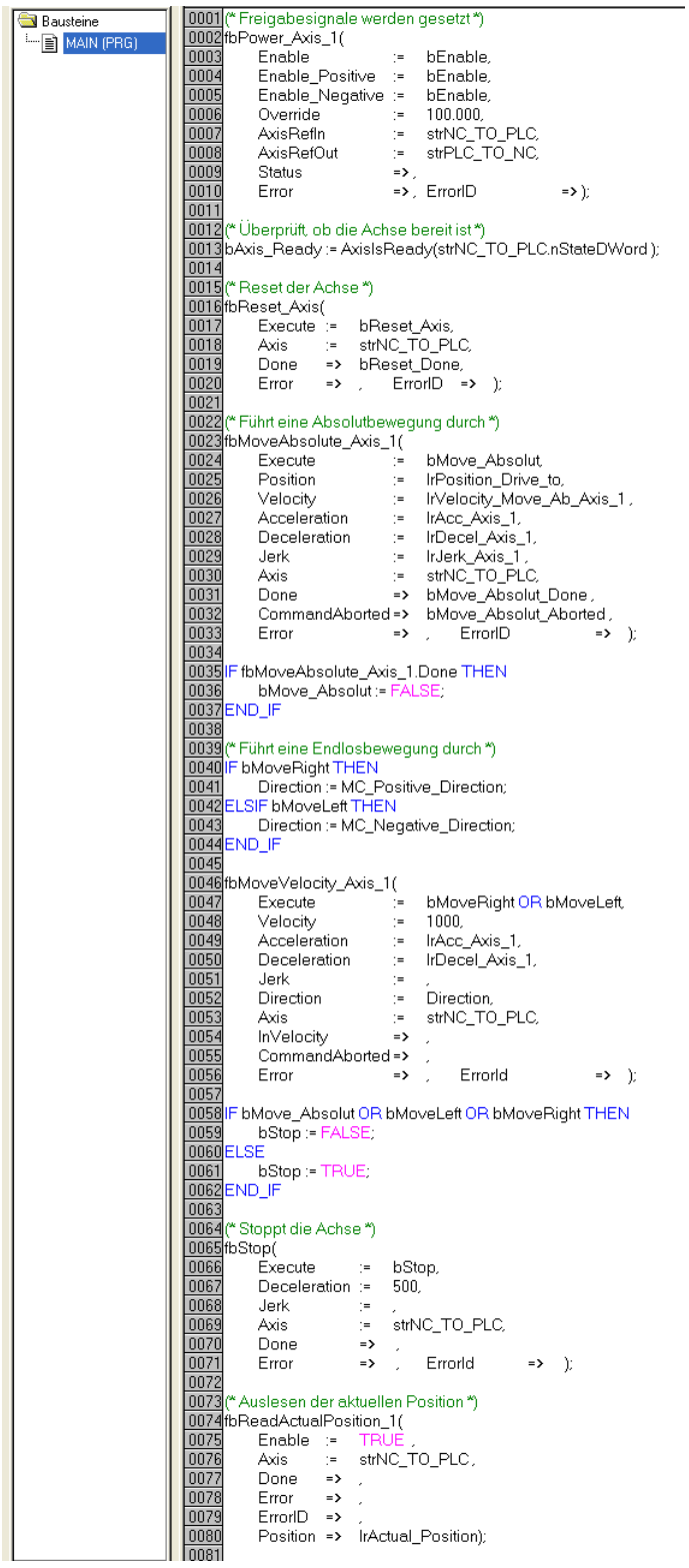


Fig. 87: Local variables

The program code is as follows (see Fig. *Program code*):




```
0001 (* Freigabesignale werden gesetzt *)
0002 fbPower_Axis_1(
0003     Enable              :=  bEnable,
0004     Enable_Positive     :=  bEnable,
0005     Enable_Negative     :=  bEnable,
0006     Override            :=  100.000,
0007     AxisRefIn           :=  strNC_TO_PLC,
0008     AxisRefOut          :=  strPLC_TO_NC,
0009     Status              =>  ,
0010     Error               =>  , ErrorID           => );
0011
0012 (* Überprüft, ob die Achse bereit ist *)
0013 bAxis_Ready := AxisIsReady(strNC_TO_PLC.nStateDWord );
0014
0015 (* Reset der Achse *)
0016 fbReset_Axis(
0017     Execute  :=  bReset_Axis,
0018     Axis     :=  strNC_TO_PLC,
0019     Done     =>  bReset_Done,
0020     Error    =>  ,    ErrorID  =>  );
0021
0022 (* Führt eine Absolutbewegung durch *)
0023 fbMoveAbsolute_Axis_1(
0024     Execute             :=  bMove_Absolut,
0025     Position            :=  lrPosition_Drive_to,
0026     Velocity            :=  lrVelocity_Move_Ab_Axis_1 ,
0027     Acceleration        :=  lrAcc_Axis_1,
0028     Deceleration        :=  lrDecel_Axis_1,
0029     Jerk                :=  lrJerk_Axis_1 ,
0030     Axis                :=  strNC_TO_PLC,
0031     Done                =>  bMove_Absolut_Done ,
0032     CommandAborted      =>  bMove_Absolut_Aborted ,
0033     Error               =>  ,    ErrorID            =>  );
0034
0035 IF fbMoveAbsolute_Axis_1.Done THEN
0036     bMove_Absolut := FALSE;
0037 END_IF
0038
0039 (* Führt eine Endlosbewegung durch *)
0040 IF bMoveRight THEN
0041     Direction := MC_Positive_Direction;
0042 ELSIF bMoveLeft THEN
0043     Direction := MC_Negative_Direction;
0044 END_IF
0045
0046 fbMoveVelocity_Axis_1(
0047     Execute             :=  bMoveRight OR bMoveLeft,
0048     Velocity            :=  1000,
0049     Acceleration        :=  lrAcc_Axis_1,
0050     Deceleration        :=  lrDecel_Axis_1,
0051     Jerk                :=  ,
0052     Direction           :=  Direction,
0053     Axis                :=  strNC_TO_PLC,
0054     InVelocity          =>  ,
0055     CommandAborted      =>  ,
0056     Error               =>  ,    ErrorId            =>  );
0057
0058 IF bMove_Absolut OR bMoveLeft OR bMoveRight THEN
0059     bStop := FALSE;
0060 ELSE
0061     bStop := TRUE;
0062 END_IF
0063
0064 (* Stoppt die Achse *)
0065 fbStop(
0066     Execute      :=  bStop,
0067     Deceleration :=  500,
0068     Jerk         :=  ,
0069     Axis         :=  strNC_TO_PLC,
0070     Done         =>  ,
0071     Error        =>  ,    ErrorId       =>  );
0072
0073 (* Auslesen der aktuellen Position *)
0074 fbReadActualPosition_1(
0075     Enable  :=  TRUE ,
0076     Axis    :=  strNC_TO_PLC ,
0077     Done    =>  ,
0078     Error   =>  ,
0079     ErrorID =>  ,
0080     Position =>  lrActual_Position);
0081
```

Fig. 88: Program code

The motor can then be operated with the aid of the following visualization (see Fig. *Visualization*).

Press *Enable* to enable the axis. In "Free run mode" you can now use the *Left* or *Right* buttons, and the motor will run with a speed defined under *fbMoveVelocity_Axis_1* in the selected direction. In "Absolute mode" you can specify a *Velocity*, *Acceleration*, *Deceleration* and the *Setpoint Position* and initiate the motion with *Start Job*. If no values are entered for *acceleration* and *deceleration* the default value of the NC is used.

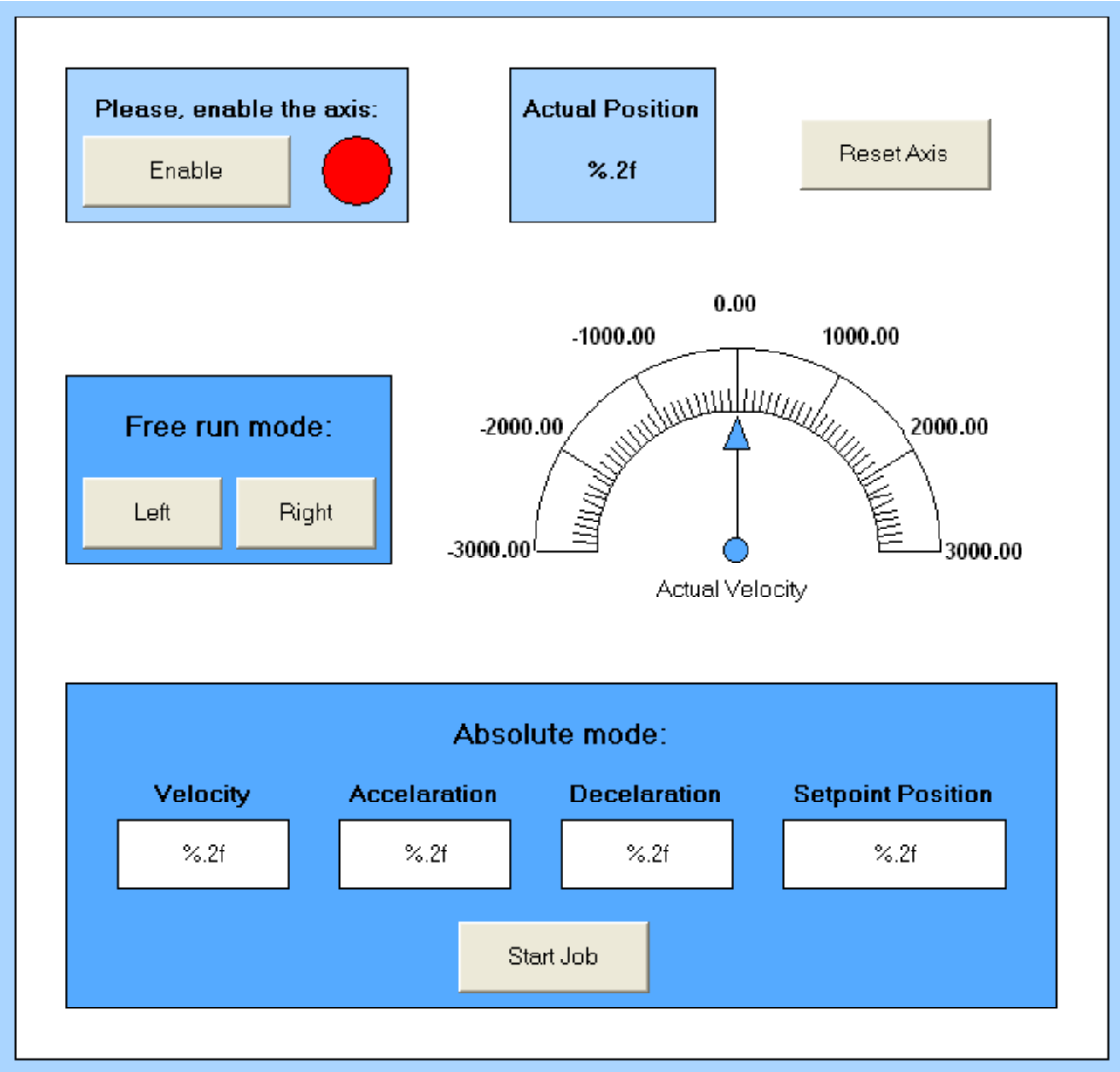


Fig. 89: Visualization

Information on function blocks and data types

Further information on the function blocks and data types used can be found in the Beckhoff Information System.

4.1.8 Restoring the delivery state

To restore the delivery state for backup objects in ELxxxx terminals / EPxxxx boxes, the CoE object *Restore default parameters, SubIndex 001* can be selected in the TwinCAT System Manager (Config mode).

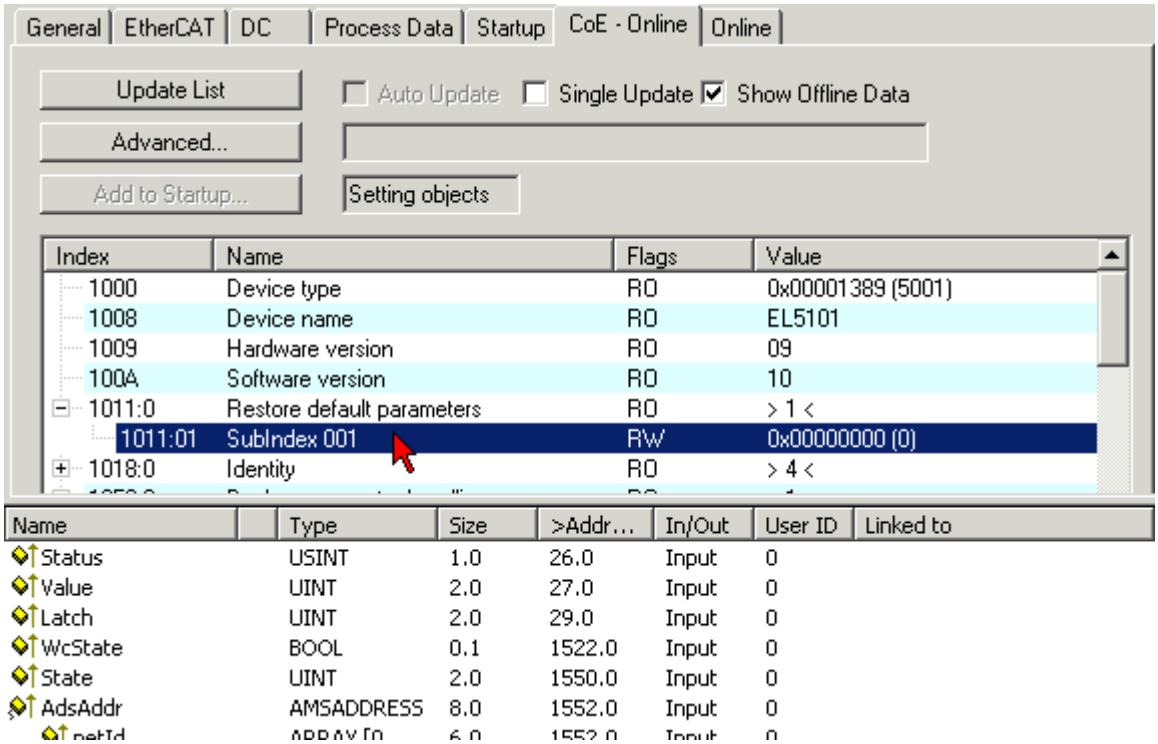


Fig. 90: Selecting the Restore default parameters PDO

Double-click on *SubIndex 001* to enter the Set Value dialog. Enter the value **1684107116** in field *Dec* or the value **0x64616F6C** in field *Hex* and confirm with OK.

All backup objects are reset to the delivery state.

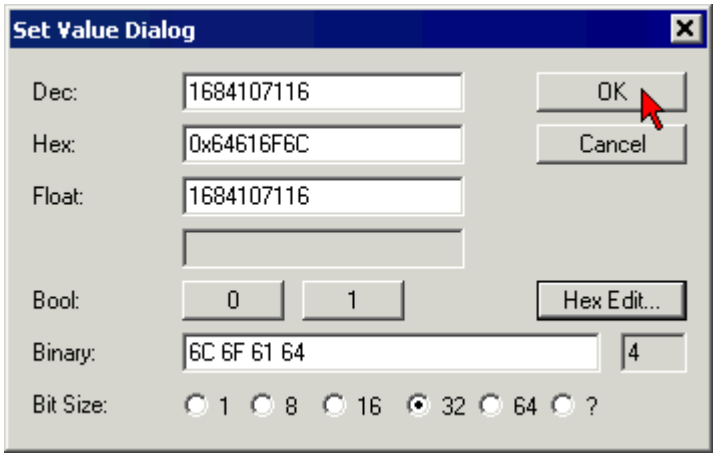


Fig. 91: Entering a restore value in the Set Value dialog

Alternative restore value

In some older terminals / boxes the backup objects can be switched with an alternative restore value:
Decimal value: 1819238756
Hexadecimal value: 0x6C6F6164

An incorrect entry for the restore value has no effect.

4.2 CoE objects EP7041-0002, EP7041-1002, EP7041-2002

4.2.1 Object overview

Applies to EP7041-0002 [▶ 12], EP7041-1002 [▶ 12] and EP7041-2002 [▶ 13].

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.

Index (hex)		Name	Flags	Default value
1000 [▶ 95]		Device type	RO	0x00001389 (5001_{dec})
1008 [▶ 95]		Device name	RO	EP7041-1002
1009 [▶ 95]		Hardware version	RO	00
100A [▶ 95]		Software version	RO	03
1011:0 [▶ 91]	**Subindex**	Restore default parameters	RO	0x01 (1_{dec})
	0x1011:01	SubIndex 001	RW	0x00000000 (0_{dec})
1018:0 [▶ 95]	**Subindex**	Identity	RO	0x04 (4_{dec})
	0x1018:01	Vendor ID	RO	0x00000002 (2_{dec})
	0x1018:02	Product code	RO	0x1B814052 (461455442_{dec})
	0x1018:03	Revision	RO	0x001103EA (1115114_{dec})
	0x1018:04	Serial number	RO	0x00000000 (0_{dec})
10F0:0 [▶ 96]	**Subindex**	Backup parameter handling	RO	0x01 (1_{dec})
	0x10F0:01	Checksum	RO	0x00000000 (0_{dec})
1400:0 [▶ 96]	**Subindex**	ENC RxPDO-Par Control compact	RO	0x06 (6_{dec})
	0x1400:06	Exclude RxPDOs	RO	01 16 00 00 00 00
1401:0 [▶ 96]	**Subindex**	ENC RxPDO-Par Control	RO	0x06 (6_{dec})
	0x1401:06	Exclude RxPDOs	RO	00 16 00 00 00 00
1403:0 [▶ 96]	**Subindex**	STM RxPDO-Par Position	RO	0x06 (6_{dec})
	0x1403:06	Exclude RxPDOs	RO	04 16 05 16 06 16
1404:0 [▶ 96]	**Subindex**	STM RxPDO-Par Velocity	RO	0x06 (6_{dec})
	0x1404:06	Exclude RxPDOs	RO	03 16 05 16 06 16
1600:0 [▶ 96]	**Subindex**	ENC RxPDO-Map Control compact	RO	0x07 (7_{dec})
	0x1600:01	SubIndex 001	RO	0x7000:01, 1
	0x1600:02	SubIndex 002	RO	0x7000:02, 1
	0x1600:03	SubIndex 003	RO	0x7000:03, 1
	0x1600:04	SubIndex 004	RO	0x7000:04, 1
	0x1600:05	SubIndex 005	RO	0x0000:00, 4
	0x1600:06	SubIndex 006	RO	0x0000:00, 8
	0x1600:07	SubIndex 007	RO	0x7000:11, 16

Index (hex)		Name	Flags	Default value
1601:0 [▶ 97]	**Subindex**	ENC RxPDO-Map Control	RO	0x07 (7_{dec})
	0x1601:01	SubIndex 001	RO	0x7000:01, 1
	0x1601:02	SubIndex 002	RO	0x7000:02, 1
	0x1601:03	SubIndex 003	RO	0x7000:03, 1
	0x1601:04	SubIndex 004	RO	0x7000:04, 1
	0x1601:05	SubIndex 005	RO	0x0000:00, 4
	0x1601:06	SubIndex 006	RO	0x0000:00, 8
	0x1601:07	SubIndex 007	RO	0x7000:11, 32
1602:0 [▶ 97]	**Subindex**	STM RxPDO-Map Control	RO	0x07 (7_{dec})
	0x1602:01	SubIndex 001	RO	0x7010:01, 1
	0x1602:02	SubIndex 002	RO	0x7010:02, 1
	0x1602:03	SubIndex 003	RO	0x7010:03, 1
	0x1602:04	SubIndex 004	RO	0x0000:00, 5
	0x1602:05	SubIndex 005	RO	0x0000:00, 3
	0x1602:06	SubIndex 006	RO	0x7010:0C, 1
	0x1602:07	SubIndex 007	RO	0x0000:00, 4
1603:0 [▶ 97]	**Subindex**	STM RxPDO-Map Position	RO	0x01 (1_{dec})
	0x1603:01	SubIndex 001	RO	0x7010:11, 32
1604:0 [▶ 97]	**Subindex**	STM RxPDO-Map Velocity	RO	0x01 (1_{dec})
	0x1604:01	SubIndex 001	RO	0x7010:21, 16
1800:0 [▶ 97]	**Subindex**	ENC TxPDO-Par Status compact	RO	0x09 (9_{dec})
	0x1800:06	Exclude TxPDOs	RO	01 1A
	0x1800:09	TxPDO Toggle	RO	0x00 (0_{dec})
1801:0 [▶ 98]	**Subindex**	ENC TxPDO-Par Status	RO	0x09 (9_{dec})
	0x1801:06	Exclude TxPDOs	RO	00 1A
	0x1801:09	TxPDO Toggle	RO	0x00 (0_{dec})
1A00:0 [▶ 98]	**Subindex**	ENC TxPDO-Map Status compact	RO	0x11 (17_{dec})
	0x1A00:01	SubIndex 001	RO	0x6000:01, 1
	0x1A00:02	SubIndex 002	RO	0x6000:02, 1
	0x1A00:03	SubIndex 003	RO	0x6000:03, 1
	0x1A00:04	SubIndex 004	RO	0x6000:04, 1
	0x1A00:05	SubIndex 005	RO	0x6000:05, 1
	0x1A00:06	SubIndex 006	RO	0x0000:00, 2
	0x1A00:07	SubIndex 007	RO	0x6000:08, 1
	0x1A00:08	SubIndex 008	RO	0x6000:09, 1
	0x1A00:09	SubIndex 009	RO	0x6000:0A, 1
	0x1A00:0A	SubIndex 010	RO	0x6000:0B, 1
	0x1A00:0B	SubIndex 011	RO	0x0000:00, 1
	0x1A00:0C	SubIndex 012	RO	0x6000:0D, 1
	0x1A00:0D	SubIndex 013	RO	0x1C32:20, 1
	0x1A00:0E	SubIndex 014	RO	0x0000:00, 1
	0x1A00:0F	SubIndex 015	RO	0x1800:09, 1
	0x1A00:10	SubIndex 016	RO	0x6000:11, 16
	0x1A00:11	SubIndex 017	RO	0x6000:12, 16

Index (hex)		Name	Flags	Default value
1A01:0 [▶ 99]	**Subindex**	ENC TxPDO-Map Status	RO	0x11 (17_{dec})
	0x1A01:01	SubIndex 001	RO	0x6000:01, 1
	0x1A01:02	SubIndex 002	RO	0x6000:02, 1
	0x1A01:03	SubIndex 003	RO	0x6000:03, 1
	0x1A01:04	SubIndex 004	RO	0x6000:04, 1
	0x1A01:05	SubIndex 005	RO	0x6000:05, 1
	0x1A01:06	SubIndex 006	RO	0x0000:00, 2
	0x1A01:07	SubIndex 007	RO	0x6000:08, 1
	0x1A01:08	SubIndex 008	RO	0x6000:09, 1
	0x1A01:09	SubIndex 009	RO	0x6000:0A, 1
	0x1A01:0A	SubIndex 010	RO	0x6000:0B, 1
	0x1A01:0B	SubIndex 011	RO	0x0000:00, 1
	0x1A01:0C	SubIndex 012	RO	0x6000:0D, 1
	0x1A01:0D	SubIndex 013	RO	0x1C32:20, 1
	0x1A01:0E	SubIndex 014	RO	0x0000:00, 1
	0x1A01:0F	SubIndex 015	RO	0x1801:09, 1
	0x1A01:10	SubIndex 016	RO	0x6000:11, 32
	0x1A01:11	SubIndex 017	RO	0x6000:12, 32
1A02:0 [▶ 99]	**Subindex**	ENC TxPDO-Map Timest. compact	RO	0x01 (1_{dec})
	0x1A02:01	SubIndex 001	RO	0x6000:16, 32
1A03:0 [▶ 100]	**Subindex**	STM TxPDO-Map Status	RO	0x0E (14_{dec})
	0x1A03:01	SubIndex 001	RO	0x6010:01, 1
	0x1A03:02	SubIndex 002	RO	0x6010:02, 1
	0x1A03:03	SubIndex 003	RO	0x6010:03, 1
	0x1A03:04	SubIndex 004	RO	0x6010:04, 1
	0x1A03:05	SubIndex 005	RO	0x6010:05, 1
	0x1A03:06	SubIndex 006	RO	0x6010:06, 1
	0x1A03:07	SubIndex 007	RO	0x6010:07, 1
	0x1A03:08	SubIndex 008	RO	0x0000:00, 1
	0x1A03:09	SubIndex 009	RO	0x0000:00, 3
	0x1A03:0A	SubIndex 010	RO	0x6010:0C, 1
	0x1A03:0B	SubIndex 011	RO	0x6010:0D, 1
	0x1A03:0C	SubIndex 012	RO	0x1C32:20, 1
	0x1A03:0D	SubIndex 013	RO	0x0000:00, 1
	0x1A03:0E	SubIndex 014	RO	0x1803:09, 1
1A04:0 [▶ 100]	**Subindex**	STM TxPDO-Map Synchron info data	RO	0x02 (2_{dec})
	0x1A04:01	SubIndex 001	RO	0x6010:11, 16
	0x1A04:02	SubIndex 002	RO	0x6010:12, 16

Index (hex)		Name	Flags	Default value
1C00:0 [▶ 100]	**Subindex**	Sync manager type	RO	0x04 (4_{dec})
	0x1C00:01	SubIndex 001	RO	0x01 (1_{dec})
	0x1C00:02	SubIndex 002	RO	0x02 (2_{dec})
	0x1C00:03	SubIndex 003	RO	0x03 (3_{dec})
	0x1C00:04	SubIndex 004	RO	0x04 (4_{dec})
1C12:0 [▶ 100]	**Subindex**	RxPDO assign	RW	0x03 (3_{dec})
	0x1C12:01	SubIndex 001	RW	0x1600 (5632_{dec})
	0x1C12:02	SubIndex 002	RW	0x1602 (5634_{dec})
	0x1C12:03	SubIndex 003	RW	0x1604 (5636_{dec})
1C13:0 [▶ 101]	**Subindex**	TxPDO assign	RW	0x02 (2_{dec})
	0x1C13:01	SubIndex 001	RW	0x1A00 (6656_{dec})
	0x1C13:02	SubIndex 002	RW	0x1A03 (6659_{dec})
	0x1C13:03	SubIndex 003	RW	0x0000 (0_{dec})
	0x1C13:04	SubIndex 004	RW	0x0000 (0_{dec})
1C32:0 [▶ 101]	**Subindex**	SM output parameter	RO	0x20 (32_{dec})
	0x1C32:01	Sync mode	RW	0x0001 (1_{dec})
	0x1C32:02	Cycle time	RW	0x000F4240 (1000000_{dec})
	0x1C32:03	Shift time	RO	0x00000000 (0_{dec})
	0x1C32:04	Sync modes supported	RO	0xC007 (49159_{dec})
	0x1C32:05	Minimum cycle time	RO	0x000249F0 (150000_{dec})
	0x1C32:06	Calc and copy time	RO	0x00000000 (0_{dec})
	0x1C32:07	Minimum delay time	RO	0x00000000 (0_{dec})
	0x1C32:08	Command	RW	0x0000 (0_{dec})
	0x1C32:09	Maximum Delay time	RO	0x00000000 (0_{dec})
	0x1C32:0B	SM event missed counter	RO	0x0000 (0_{dec})
	0x1C32:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	0x1C32:0D	Shift too short counter	RO	0x0000 (0_{dec})
	0x1C32:20	Sync error	RO	0x00 (0_{dec})
1C33:0 [▶ 102]	**Subindex**	SM input parameter	RO	0x20 (32_{dec})
	0x1C33:01	Sync mode	RW	0x0022 (34_{dec})
	0x1C33:02	Cycle time	RW	0x000F4240 (1000000_{dec})
	0x1C33:03	Shift time	RO	0x00000000 (0_{dec})
	0x1C33:04	Sync modes supported	RO	0xC007 (49159_{dec})
	0x1C33:05	Minimum cycle time	RO	0x000249F0 (150000_{dec})
	0x1C33:06	Calc and copy time	RO	0x00000000 (0_{dec})
	0x1C33:07	Minimum delay time	RO	0x00000000 (0_{dec})
	0x1C33:08	Command	RW	0x0000 (0_{dec})
	0x1C33:09	Maximum Delay time	RO	0x00000000 (0_{dec})
	0x1C33:0B	SM event missed counter	RO	0x0000 (0_{dec})
	0x1C33:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	0x1C33:0D	Shift too short counter	RO	0x0000 (0_{dec})
	0x1C33:20	Sync error	RO	0x00 (0_{dec})

Index (hex)		Name	Flags	Default value
6000:0 [▶ 103]	**Subindex**	ENC Inputs Ch.1	RO	0x16 (22_{dec})
	0x6000:01	Latch C valid	RO	0x00 (0_{dec})
	0x6000:02	Latch extern valid	RO	0x00 (0_{dec})
	0x6000:03	Set counter done	RO	0x00 (0_{dec})
	0x6000:04	Counter underflow	RO	0x00 (0_{dec})
	0x6000:05	Counter overflow	RO	0x00 (0_{dec})
	0x6000:08	Extrapolation stall	RO	0x00 (0_{dec})
	0x6000:09	Status of input A	RO	0x00 (0_{dec})
	0x6000:0A	Status of input B	RO	0x00 (0_{dec})
	0x6000:0B	Status of input C	RO	0x00 (0_{dec})
	0x6000:0D	Status of extern latch	RO	0x00 (0_{dec})
	0x6000:0E	Sync error	RO	0x00 (0_{dec})
	0x6000:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6000:11	Counter value	RO	0x00000000 (0_{dec})
	0x6000:12	Latch value	RO	0x00000000 (0_{dec})
	0x6000:16	Timestamp	RO	0x00000000 (0_{dec})
6010:0 [▶ 103]	**Subindex**	STM Inputs Ch.1	RO	0x12 (18_{dec})
	0x6010:01	Ready to enable	RO	0x00 (0_{dec})
	0x6010:02	Ready	RO	0x00 (0_{dec})
	0x6010:03	Warning	RO	0x00 (0_{dec})
	0x6010:04	Error	RO	0x00 (0_{dec})
	0x6010:05	Moving positive	RO	0x00 (0_{dec})
	0x6010:06	Moving negative	RO	0x00 (0_{dec})
	0x6010:07	Torque reduced	RO	0x00 (0_{dec})
	0x6010:0C	Digital input 1	RO	0x00 (0_{dec})
	0x6010:0D	Digital input 2	RO	0x00 (0_{dec})
	0x6010:0E	Sync error	RO	0x00 (0_{dec})
	0x6010:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6010:11	Info data 1	RO	0x0000 (0_{dec})
	0x6010:12	Info data 2	RO	0x0000 (0_{dec})
7000:0 [▶ 104]	**Subindex**	ENC Outputs Ch.1	RO	0x11 (17_{dec})
	0x7000:01	Enable latch C	RO	0x00 (0_{dec})
	0x7000:02	Enable latch extern on positive edge	RO	0x00 (0_{dec})
	0x7000:03	Set counter	RO	0x00 (0_{dec})
	0x7000:04	Enable latch extern on negative edge	RO	0x00 (0_{dec})
	0x7000:11	Set counter value	RO	0x00000000 (0_{dec})

Index (hex)		Name	Flags	Default value
7010:0 [▶ 104]	**Subindex**	STM Outputs Ch.1	RO	0x21 (33_{dec})
	0x7010:01	Enable	RO	0x00 (0_{dec})
	0x7010:02	Reset	RO	0x00 (0_{dec})
	0x7010:03	Reduce torque	RO	0x00 (0_{dec})
	0x7010:0C	Digital output 1	RO	0x00 (0_{dec})
	0x7010:11	Position	RO	0x00000000 (0_{dec})
	0x7010:21	Velocity	RO	0x0000 (0_{dec})
8000:0 [▶ 91]	**Subindex**	ENC Settings Ch.1	RW	0x0F (15_{dec})
	0x8000:08	Disable filter	RW	0x00 (0_{dec})
	0x8000:0A	Enable micro increments	RW	0x00 (0_{dec})
	0x8000:0E	Reversion of rotation	RW	0x00 (0_{dec})
8010:0 [▶ 92]	**Subindex**	STM Motor Settings Ch.1	RW	0x11 (17_{dec})
	0x8010:01	Maximal current	RW	0x05DC (1500_{dec})
	0x8010:02	Reduced current	RW	0x01F4 (500_{dec})
	0x8010:03	Nominal voltage	RW	0xC350 (50000_{dec})
	0x8010:04	Motor coil resistance	RW	0x0064 (100_{dec})
	0x8010:05	Motor EMF	RW	0x0000 (0_{dec})
	0x8010:06	Motor fullsteps	RW	0x00C8 (200_{dec})
	0x8010:07	Encoder increments (4-fold)	RW	0x0000 (0_{dec})
	0x8010:09	Start velocity	RW	0x0000 (0_{dec})
	0x8010:10	Drive on delay time	RW	0x0064 (100_{dec})
	0x8010:11	Drive off delay time	RW	0x0096 (150_{dec})
8011:0 [▶ 92]	**Subindex**	STM Controller Settings Ch.1	RW	0x07 (7_{dec})
	0x8011:01	Kp factor (curr.)	RW	0x00C8 (200_{dec})
	0x8011:02	Ki factor (curr.)	RW	0x0002 (2_{dec})
	0x8011:03	Inner window (curr.)	RW	0x00 (0_{dec})
	0x8011:05	Outer window (curr.)	RW	0x00 (0_{dec})
	0x8011:06	Filter cut off frequency (curr.)	RW	0x0000 (0_{dec})
	0x8011:07	Ka factor (curr.)	RW	0x0000 (0_{dec})

Index (hex)		Name	Flags	Default value
8012:0 [▶ 93]	**Subindex**	STM Features Ch.1	RW	0x3E (62_{dec})
	0x8012:01	Operation mode	RW	0x01 (1_{dec})
	0x8012:05	Speed range	RW	0x01 (1_{dec})
	0x8012:08	Feedback type	RW	0x01 (1_{dec})
	0x8012:09	Invert motor polarity	RW	0x00 (0_{dec})
	0x8012:11	Select info data 1	RW	0x03 (3_{dec})
	0x8012:19	Select info data 2	RW	0x04 (4_{dec})
	0x8012:30	Invert digital input 1	RW	0x00 (0_{dec})
	0x8012:31	Invert digital input 2	RW	0x00 (0_{dec})
	0x8012:32	Function for input 1	RW	0x00 (0_{dec})
	0x8012:36	Function for input 2	RW	0x00 (0_{dec})
	0x8012:3A	Function for output 1	RW	0x00 (0_{dec})
8013:0 [▶ 94]	**Subindex**	STM Controller Settings 2 Ch.1	RW	0x06 (6_{dec})
	0x8013:01	Kp factor (velo.)	RW	0x03E8 (1000_{dec})
	0x8013:02	Ki factor (velo.)	RW	0x0000 (0_{dec})
	0x8013:03	Inner window (velo.)	RW	0x00 (0_{dec})
	0x8013:05	Outer window (velo.)	RW	0x00 (0_{dec})
	0x8013:06	Filter cut off frequency (velo.)	RW	0x0000 (0_{dec})
9010:0 [▶ 104]	**Subindex**	STM Info data Ch.1	RO	0x08 (8_{dec})
	0x9010:01	Status word	RO	0x0000 (0_{dec})
	0x9010:02	Motor coil voltage A	RO	0x0000 (0_{dec})
	0x9010:03	Motor coil voltage B	RO	0x0000 (0_{dec})
	0x9010:04	Motor coil current A	RO	0x0000 (0_{dec})
	0x9010:05	Motor coil current B	RO	0x0000 (0_{dec})
	0x9010:06	Duty cycle A	RO	0x00 (0_{dec})
	0x9010:07	Duty cycle B	RO	0x00 (0_{dec})
	0x9010:08	Motor velocity	RO	0x0000 (0_{dec})
A010:0 [▶ 104]	**Subindex**	STM Diag data Ch.1	RO	0x11 (17_{dec})
	0xA010:01	Saturated	RO	0x00 (0_{dec})
	0xA010:02	Over temperature	RO	0x00 (0_{dec})
	0xA010:03	Torque overload	RO	0x00 (0_{dec})
	0xA010:04	Under voltage	RO	0x00 (0_{dec})
	0xA010:05	Over voltage	RO	0x00 (0_{dec})
	0xA010:06	Short circuit A	RO	0x00 (0_{dec})
	0xA010:07	Short circuit B	RO	0x00 (0_{dec})
	0xA010:08	No control power	RO	0x00 (0_{dec})
	0xA010:09	Misc error	RO	0x00 (0_{dec})
	0xA010:11	Actual operation mode	RO	0x00 (0_{dec})

Index (hex)		Name	Flags	Default value
F000:0 [▶ 105]	**Subindex**	Modular device profile	RO	0x02 (2_{dec})
	0xF000:01	Module index distance	RO	0x0010 (16_{dec})
	0xF000:02	Maximum number of modules	RO	0x0002 (2_{dec})
F008 [▶ 105]		Code word	RW	0x00000000 (0_{dec})
F010:0 [▶ 105]	**Subindex**	Module list	RW	0x02 (2_{dec})
	0xF010:01	SubIndex 001	RW	0x000001FF (511_{dec})
	0xF010:02	SubIndex 002	RW	0x000002BF (703_{dec})
F80F:0 [▶ 105]	**Subindex**	STM Vendor data	RW	0x08 (8_{dec})
	0xF80F:01	PWM Frequency	RW	0x7530 (30000_{dec})
	0xF80F:02	Deadtime	RW	0x0100 (256_{dec})
	0xF80F:03	Deadtime space	RW	0x0009 (9_{dec})
	0xF80F:04	Warning temperature	RW	0x50 (80_{dec})
	0xF80F:05	Switch off temperature	RW	0x64 (100_{dec})
	0xF80F:06	Analog trigger point	RW	0x000A (10_{dec})
	0xF80F:07	Calibration offset A	RW	0x0000 (0_{dec})
	0xF80F:08	Calibration offset B	RW	0x0000 (0_{dec})
F900:0 [▶ 105]	**Subindex**	STM Info data	RO	0x06 (6_{dec})
	0xF900:01	Software version (driver)	RO	
	0xF900:02	Internal temperature	RO	0x00 (0_{dec})
	0xF900:04	Control voltage	RO	0x0000 (0_{dec})
	0xF900:05	Motor supply voltage	RO	0x0000 (0_{dec})
	0xF900:06	Cycle time	RO	0x0000 (0_{dec})
FB00:0 [▶ 95]	**Subindex**	STM Command	RO	0x03 (3_{dec})
	0xFB00:01	Request	RW	{0}
	0xFB00:02	Status	RO	0x00 (0_{dec})
	0xFB00:03	Response	RO	{0}

Key

Flags:
RO (Read Only): this object can be read only
RW (Read/Write): this object can be read and written to

4.2.2 Object description and parameterization

Applies to EP7041-0002 [▶ 12], EP7041-1002 [▶ 12] and EP7041-2002 [▶ 13].

Parameterization

The terminal is parameterized via the CoE - Online tab [▶ 44] (double-click on the respective object) or via the Process Data tab [▶ 41](assignment of PDOs).

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.

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization during commissioning [▶ 91]
- Objects for indicating internal settings [▶ 95] (may be fixed)
- Further profile-specific objects [▶ 103] indicating inputs, outputs and status information

The following section first describes the objects required for normal operation, followed by a complete overview of missing objects.

Additional objects

4.2.2.1 Objects for commissioning

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})

Index 8000 ENC Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	ENC Settings Ch.1	Maximum subindex	UINT8	RO	0x0F (15_{dec})
8000:08	Disable filter	Deactivates the input filters.	BOOLEAN	RW	0x00 (0_{dec})
8000:0A	Enable micro increments	The lower 8 bits of the counter value are extrapolated.	BOOLEAN	RW	0x00 (0_{dec})
8000:0E	Reversion of rotation	Activates reversion of rotation of the encoder.	BOOLEAN	RW	0x00 (0_{dec})

Index 8010 STM Motor Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0	STM Motor Settings Ch.1	Maximum subindex	UINT8	RO	0x11 (17_{dec})
8010:01	Maximal current	Maximum permanent motor coil current (unit: 1 mA)	UINT16	RW	0x1388 (5000_{dec})
8010:02	Reduced current	Reduced coil current (reduced torque, unit: 1 mA)	UINT16	RW	0x09C4 (2500_{dec})
8010:03	Nominal voltage	Nominal voltage (supply voltage) of the motor (unit: 1 mV)	UINT16	RW	0xC350 (50000_{dec})
8010:04	Motor coil resistance	Internal resistance of a coil (unit: 0.01 ohm)	UINT16	RW	0x0064 (100_{dec})
8010:05	Motor EMF	Motor countervoltage (unit: 1 mV / 1000 digit)	UINT16	RW	0x0000 (0_{dec})
8010:06	Motor fullsteps	Motor full steps per revolution	UINT16	RW	0x00C8 (200_{dec})
8010:07	Encoder increments (4-fold)	Encoder increments per revolution (quadruple evaluation)	UINT16	RW	0x0000 (0_{dec})
8010:09	Start frequency	Maximum possible start velocity of the motor	UINT16	RW	0x0064 (100_{dec})
8010:10	Drive on delay time	Switch-on delay of the driver stage (unit: ms)	UINT16	RW	0x0064 (100_{dec})
8010:11	Drive off delay time	Switch-off delay of the driver stage (unit: ms)	UINT16	RW	0x0096 (150_{dec})

Index 8011 STM Controller Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8011:0	STM Controller Settings Ch.1	Maximum subindex	UINT8	RO	0x06 (6_{dec})
8011:01	Kp factor (curr.)	Kp control factor (proportional component) for the current controller (unit: 0.001)	UINT16	RW	0x00C8 (200_{dec})
8011:02	Ki factor (curr.)	Ki control factor (integral component) for the current controller (unit: 0.001)	UINT16	RW	0x0002 (2_{dec})
8011:03	Inner window (curr.)	Inner window for the I component of the current controller (unit: 1%)	UINT8	RW	0x00 (0_{dec})
8011:05	Outer window (curr.)	Outer window for the I component of the current controller (unit: 1%)	UINT8	RW	0x00 (0_{dec})
8011:06	Filter cut off frequency (curr.)	Filter limit frequency of the current controller (low-pass, unit: 1 Hz)	UINT16	RW	0x0000 (0_{dec})
8011:07	Ka factor (curr.)	Ka control factor (acceleration component) for the current controller (unit: 0.001)	UINT16	RW	0x0000 (0_{dec})

Index 8012 STM Features Ch.1

Index (hex)	Name	Meaning		Data type	Flags	Default
8012:0	STM Features Ch.1	Maximum subindex		UINT8	RO	0x36 (54_{dec})
8012:01	Operation mode	Operation mode (currently only direct velocity is supported)		BIT4	RW	0x01 (1_{dec})
		0	Automatic			
		1	Direct velocity			
		2	Velocity controller			
		3	Position controller			
8012:05	Speed range	Preselection of the speed range		BIT3	RW	0x01 (1_{dec})
		0	1000 full steps/second			
		1	2000 full steps/second			
		2	4000 full steps/second			
		3	8000 full steps/second			
8012:08	Feedback type	Selection of the feedback system		BIT1	RW	0x01 (1_{dec})
		0	External encoder			
		1	Internal counter			
8012:09	Invert motor polarity	Activates reversal of the motor rotation direction.		BOOLEAN	RW	0x00 (0_{dec})
8012:11	Select info data 1	Select "Info data 1" (see 0x6010:11 [▶ 103])		UINT8	RW	0x03 (3_{dec})
		0	Status word			
		1	Motor voltage coil A (unit 1 mV)			
		2	Motor voltage coil B (unit 1 mV)			
		3	Motor current coil A (unit 1 mA)			
		4	Motor current coil B (unit 1 mA)			
		5	Duty cycle coil A (unit 1%)			
		6	Duty cycle coil B (unit 1%)			
		7	Current velocity (value range +/- 10000)			
		...	reserved			
		101	Internal temperature of the driver card			
		...	reserved			
		103	Control voltage			
		104	Motor supply voltage			
		...	reserved			
		255	reserved			

Index (hex)	Name	Meaning		Data type	Flags	Default
8012:19	Select info data 2	Selection "Info data 2"		UINT8	RW	0x04 (4_{dec})
		0	Status word			
		1	Motor voltage coil A (unit 1 mV)			
		2	Motor voltage coil B (unit 1 mV)			
		3	Motor current coil A (unit 1 mA)			
		4	Motor current coil B (unit 1 mA)			
		5	Duty cycle coil A (unit 1%)			
		6	Duty cycle coil B (unit 1%)			
		7	Current velocity (value range +/- 10000)			
		...	reserved			
		101	Internal temperature of the driver card			
		...	reserved			
		103	Control voltage			
		104	Motor supply voltage			
		...	reserved			
		255	reserved			
8012:30	Invert digital input 1	Inversion of digital input 1		BOOLEAN	RW	0x00 (0_{dec})
8012:31	Invert digital input 2	Inversion of digital input 2		BOOLEAN	RW	0x00 (0_{dec})
8012:32	Function for input 1	Selection of the function for input 1		BIT4	RW	0x00 (0_{dec})
		0	Normal input			
		1	Hardware Enable			
8012:36	Function for input 2	Selection of the function for input 2		BIT4	RW	0x00 (0_{dec})
		0	Normal input			
		1	Hardware Enable			
8012:3A	Function for output 1	Selection of the function for output 1		BIT4	RW	0x00 (0_{dec})
		0	Normal output			
		1	Brake If the bit in 0x7010:01 [▶ 104] is set, the output is switched with the delay time set in 0x8010:10 [▶ 92] and 0x8010:11 [▶ 92] of the driver stage.			

Index 8013 STM Controller Settings 2 Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8013:0	STM Controller Settings 2 Ch.1	Maximum subindex	UINT8	RO	0x06 (6_{dec})
8013:01	Kp factor (velo.)	Kp control factor (proportional component) for the velocity controller (unit: 0.001)	UINT16	RW	0x03E8 (1000_{dec})
8013:02	Ki factor (velo.)	Ki control factor (integral component) for the velocity controller (unit: 0.001)	UINT16	RW	0x0000 (0_{dec})
8013:03	Inner window (velo.)	Inner window for the I component of the velocity controller (unit: 1%)	UINT8	RW	0x00 (0_{dec})
8013:05	Outer window (velo.)	Outer window for the I component of the velocity controller (unit: 1%)	UINT8	RW	0x00 (0_{dec})
8013:06	Filter cut off frequency (velo.)	Filter limit frequency of the velocity controller (low-pass, unit: 1 Hz)	UINT16	RW	0x0000 (0_{dec})

Index FB00 STM Command

Index (hex)	Name	Meaning		Data type	Flags	Default
FB00:0	STM Command	Maximum subindex		UINT8	RO	0x03 (3_{dec})
FB00:01	Request	Requesting a command		OCTET-STRING[2]	RW	{0}
		0x8000	Software reset			
FB00:02	Status	Status of the command		UINT8	RO	0x00 (0_{dec})
		0	No error, without return value			
		1	No error, with return value			
		2	With error, without return value			
		3	With error, with return value			
		...	reserved			
		255	Command execution active			
FB00:03	Response	Return value of the executed command		OCTET-STRING[4]	RO	{0}

4.2.2.2 Standard objects (0x1000-0x1FFF)

The standard objects have the same meaning for all EtherCAT slaves.

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	EP7041

Index 1009 Hardware version

Index (hex)	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT slave	STRING	RO	00

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	01

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	0x1B813052 (461451346_{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	0x00100000 (1048576_{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 1400 ENC RxPDO-Par Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1400:0	ENC RxPDO-Par Control compact	PDO Parameter RxPDO 1	UINT8	RO	0x06 (6_{dec})
1400:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 1	OCTET-STRING[6]	RO	01 16 00 00 00 00

Index 1401 ENC RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1401:0	ENC RxPDO-Par Control	PDO Parameter RxPDO 2	UINT8	RO	0x06 (6_{dec})
1401:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 2	OCTET-STRING[6]	RO	00 16 00 00 00 00

Index 1403 STM RxPDO-Par Position

Index (hex)	Name	Meaning	Data type	Flags	Default
1403:0	STM RxPDO-Par Position	PDO Parameter RxPDO 4	UINT8	RO	0x06 (6_{dec})
1403:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 4	OCTET-STRING[6]	RO	04 16 05 16 06 16

Index 1404 STM RxPDO-Par Velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
1404:0	STM RxPDO-Par Velocity	PDO Parameter RxPDO 5	UINT8	RO	0x06 (6_{dec})
1404:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 5	OCTET-STRING[6]	RO	03 16 05 16 06 16

Index 1600 ENC RxPDO-Map Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	ENC RxPDO-Map Control compact	PDO Mapping RxPDO 1	UINT8	RO	0x07 (7_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (1 bits align)	UINT32	RO	0x7000:01, 1
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x02 (Enable latch extern on positive edge))	UINT32	RO	0x7000:02, 1
1600:03	SubIndex 003	3. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x03 (Set counter))	UINT32	RO	0x7000:03, 1
1600:04	SubIndex 004	4. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x04 (Enable latch extern on negative edge))	UINT32	RO	0x7000:04, 1
1600:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1600:06	SubIndex 006	6. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1600:07	SubIndex 007	7. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x11 (Set counter value))	UINT32	RO	0x7000:11, 16

Index 1601 ENC RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	ENC RxPDO-Map Control	PDO Mapping RxPDO 2	UINT8	RO	0x05 (5_{dec}) [1] 0x07 (7_{dec}) [2]
1601:01	SubIndex 001	1. PDO Mapping entry (1 bits align)	UINT32	RO	0x7000:01, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x02 (Enable latch extern on positive edge))	UINT32	RO	0x7000:02, 1
1601:03	SubIndex 003	3. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x03 (Set counter))	UINT32	RO	0x7000:03, 1
1601:04	SubIndex 004	4. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x04 (Enable latch extern on negative edge))	UINT32	RO	0x7000:04, 1
1601:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1602:06	SubIndex 006	6. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1602:07	SubIndex 007	7. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x11 (Set counter value))	UINT32	RO	0x7000:11, 32

Index 1602 STM RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	STM RxPDO-Map Control	PDO Mapping RxPDO 3	UINT8	RO	0x07 (7_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x01 (Enable))	UINT32	RO	0x7010:01, 1
1602:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x02 (Reset))	UINT32	RO	0x7010:02, 1
1602:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x03 (Reduce torque))	UINT32	RO	0x7010:03, 1
1602:04	SubIndex 004	4. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1602:05	SubIndex 005	5. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1602:06	SubIndex 006	6. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x0C (Digital output 1))	UINT32	RO	0x7010:0C, 1
1602:07	SubIndex 007	7. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4

Index 1603 STM RxPDO-Map Position

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	STM RxPDO-Map Position	PDO Mapping RxPDO 4	UINT8	RO	0x01 (1_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (8 bits align)	UINT32	RO	0x7010:11, 32

Index 1604 STM RxPDO-Map Velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	STM RxPDO-Map Velocity	PDO Mapping RxPDO 5	UINT8	RO	0x01 (1_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x21 (Velocity))	UINT32	RO	0x7010:21, 16

Index 1800 ENC TxPDO-Par Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1800:0	ENC TxPDO-Par Status compact	PDO Parameter TxPDO 1	UINT8	RO	0x09 (9_{dec})
1800:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 1	OCTET-STRING[2]	RO	01 1A
1800:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data	BOOLEAN	RO	0x00 (0_{dec})

Index 1801 ENC TxPDO-Par Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1801:0	ENC TxPDO-Par Status	PDO Parameter TxPDO 2	UINT8	RO	0x09 (9_{dec})
1801:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 2	OCTET-STRING[2]	RO	00 1A
1801:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data	BOOLEAN	RO	0x00 (0_{dec})

Index 1A00 ENC TxPDO-Map Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	ENC TxPDO-Map Status compact	PDO Mapping TxPDO 1	UINT8	RO	0x11 (17_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (1 bits align)	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x02 (Latch extern valid))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x03 (Set counter done))	UINT32	RO	0x6000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x04 (Counter underflow))	UINT32	RO	0x6000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x05 (Counter overflow))	UINT32	RO	0x6000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x08 (Extrapolation stall))	UINT32	RO	0x6000:08, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x09 (Status of input A))	UINT32	RO	0x6000:09, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0A (Status of input B))	UINT32	RO	0x6000:0A, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (1 bits align)	UINT32	RO	0x6000:0B, 1
1A00:0B	SubIndex 011	11. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A00:0C	SubIndex 012	12. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0D (Status of extern latch))	UINT32	RO	0x6000:0D, 1
1A00:0D	SubIndex 013	13. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A00:0E	SubIndex 014	14. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A00:0F	SubIndex 015	15. PDO Mapping entry (object 0x1800 (ENC TxPDO-Par Status compact), entry 0x09 (TxPDO Toggle))	UINT32	RO	0x1800:09, 1
1A00:10	SubIndex 016	16. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x11 (Counter value))	UINT32	RO	0x6000:11, 16
1A00:11	SubIndex 017	17. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x12 (Latch value))	UINT32	RO	0x6000:12, 16

Index 1A01 ENC TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	ENC TxPDO-Map Status	PDO Mapping TxPDO 2	UINT8	RO	0x11 (17_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (1 bits align)	UINT32	RO	0x6000:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x02 (Latch extern valid))	UINT32	RO	0x6000:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x03 (Set counter done))	UINT32	RO	0x6000:03, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x04 (Counter underflow))	UINT32	RO	0x6000:04, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x05 (Counter overflow))	UINT32	RO	0x6000:05, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A01:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x08 (Extrapolation stall))	UINT32	RO	0x6000:08, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x09 (Status of input A))	UINT32	RO	0x6000:09, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0A (Status of input B))	UINT32	RO	0x6000:0A, 1
1A01:0A	SubIndex 010	10. PDO Mapping entry (1 bits align)	UINT32	RO	0x6000:0B, 1
1A01:0B	SubIndex 011	11. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A01:0C	SubIndex 012	12. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0D (Status of extern latch))	UINT32	RO	0x6000:0D, 1
1A01:0D	SubIndex 013	13. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A01:0E	SubIndex 014	14. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A01:0F	SubIndex 015	15. PDO Mapping entry (object 0x1801 (ENC TxPDO-Par Status), entry 0x09 (TxPDO Toggle))	UINT32	RO	0x1801:09, 1
1A01:10	SubIndex 016	16. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x11 (Counter value))	UINT32	RO	0x6000:11, 32
1A01:11	SubIndex 017	17. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x12 (Latch value))	UINT32	RO	0x6000:12, 32

Index 1A02 ENC TxPDO-Map Timest. compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	ENC TxPDO-Map Timest. compact	PDO Mapping TxPDO 3	UINT8	RO	0x01 (1_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x16 (Timestamp))	UINT32	RO	0x6000:16, 32

Index 1A03 STM TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	STM TxPDO-Map Status	PDO Mapping TxPDO 4	UINT8	RO	0x0E (14_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x01 (Ready to enable))	UINT32	RO	0x6010:01, 1
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x02 (Ready))	UINT32	RO	0x6010:02, 1
1A03:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x03 (Warning))	UINT32	RO	0x6010:03, 1
1A03:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x04 (Error))	UINT32	RO	0x6010:04, 1
1A03:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x05 (Moving positive))	UINT32	RO	0x6010:05, 1
1A03:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x06 (Moving negative))	UINT32	RO	0x6010:06, 1
1A03:07	SubIndex 007	7. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x07 (Torque reduced))	UINT32	RO	0x6010:07, 1
1A03:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A03:09	SubIndex 009	9. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1A03:0A	SubIndex 010	10. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x0C (Digital input 1))	UINT32	RO	0x6010:0C, 1
1A03:0B	SubIndex 011	11. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x0D (Digital input 2))	UINT32	RO	0x0000:00, 1
1A03:0C	SubIndex 012	12. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A03:0D	SubIndex 013	13. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A03:0E	SubIndex 014	14. PDO Mapping entry (object 0x1803, entry 0x09)	UINT32	RO	0x1803:09, 1

Index 1A04 STM TxPDO-Map Synchron info data

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	STM TxPDO-Map Synchron info data	PDO Mapping TxPDO 5	UINT8	RO	0x02 (2_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x11 (Info data 1))	UINT32	RO	0x6010:11, 16
1A04:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x12 (Info data 2))	UINT32	RO	0x6010:12, 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	0x03 (3_{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	0x1602 (5634_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1604 (5636_{dec})

Index 1C13 TxPDO assign

Index (hex)	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	0x1A03 (6659_{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})

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: • 0: Free Run • 1: Synchron with SM 2 Event • 2: DC-Mode - Synchron with SYNC0 Event • 3: DC-Mode - Synchron with SYNC1 Event	UINT16	RW	0x0001 (1_{dec})
1C32:02	Cycle time	Cycle time (in ns): • Free Run: Cycle time of the local timer • Synchron with SM 2 Event: Master cycle time • DC-Mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x000F4240 (1000000_{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 [▶ 101])	UINT16	RO	0xC007 (49159_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x000249F0 (150000_{dec})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C32:03 [▶ 101], 0x1C32:05 [▶ 101], 0x1C32:06 [▶ 101], 0x1C32:09 [▶ 101], 0x1C33:03 [▶ 102], 0x1C33:06 [▶ 101], 0x1C33:09 [▶ 102] are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0_{dec})
1C32:09	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: • 0: Free Run • 1: Synchronous with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchronous with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 101]	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{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 [▶ 101] or 0x1C33:08 [▶ 102])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 101]	UINT32	RO	0x000249F0 (150000_{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})
1C33:08	Command	as 0x1C32:08 [▶ 101]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11 [▶ 101]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12 [▶ 101]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13 [▶ 101]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32 [▶ 101]	BOOLEAN	RO	0x00 (0_{dec})

4.2.2.3 Profile-specific objects (0x6000-0xFFFF)

The profile-specific objects have the same meaning for all EtherCAT slaves that support the profile 5001.

Index 6000 ENC Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	ENC Inputs Ch.1	Maximum subindex	UINT8	RO	0x16 (22_{dec})
6000:01	Latch C valid	The counter value was latched with the C track.	BOOLEAN	RO	0x00 (0_{dec})
6000:02	Latch extern valid	The counter value was stored via the external latch.	BOOLEAN	RO	0x00 (0_{dec})
6000:03	Set counter done	The counter was set.	BOOLEAN	RO	0x00 (0_{dec})
6000:04	Counter underflow	Counter underflow.	BOOLEAN	RO	0x00 (0_{dec})
6000:05	Counter overflow	Counter overflow.	BOOLEAN	RO	0x00 (0_{dec})
6000:08	Extrapolation stall	The extrapolated part of the counter is invalid	BOOLEAN	RO	0x00 (0_{dec})
6000:09	Status of input A	Status of the A-input.	BOOLEAN	RO	0x00 (0_{dec})
6000:0A	Status of input B	Status of the B-input.	BOOLEAN	RO	0x00 (0_{dec})
6000:0B	Status of input C	Status of the C-input.	BOOLEAN	RO	0x00 (0_{dec})
6000:0D	Status of extern latch	Status of the ext. latch input.	BOOLEAN	RO	0x00 (0_{dec})
6000:0E	Sync error	The Sync error bit is only required for DC mode. It indicates whether a synchronization error has occurred during the previous cycle.	BOOLEAN	RO	0x00 (0_{dec})
6000:10	TxPDO Toggle	The TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated.	BOOLEAN	RO	0x00 (0_{dec})
6000:11	Counter value	The counter value.	UINT32	RO	0x00000000 (0_{dec})
6000:12	Latch value	The latch value.	UINT32	RO	0x00000000 (0_{dec})
6000:16	Timestamp	Time stamp of the last counter change.	UINT32	RO	0x00000000 (0_{dec})

Index 6010 STM Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	STM Inputs Ch.1	Maximum subindex	UINT8	RO	0x12 (18_{dec})
6010:01	Ready to enable	Driver stage is ready for enabling	BOOLEAN	RO	0x00 (0_{dec})
6010:02	Ready	Driver stage is ready for operation	BOOLEAN	RO	0x00 (0_{dec})
6010:03	Warning	A warning has occurred	BOOLEAN	RO	0x00 (0_{dec})
6010:04	Error	An error has occurred (see index 0xA010 [▶ 104])	BOOLEAN	RO	0x00 (0_{dec})
6010:05	Moving positive	Motor turns in positive direction	BOOLEAN	RO	0x00 (0_{dec})
6010:06	Moving negative	Motor turns in negative direction	BOOLEAN	RO	0x00 (0_{dec})
6010:07	Torque reduced	Reduced torque is active	BOOLEAN	RO	0x00 (0_{dec})
6010:0C	Digital input 1	Digital input 1	BOOLEAN	RO	0x00 (0_{dec})
6010:0D	Digital input 2	Digital input 2	BOOLEAN	RO	0x00 (0_{dec})
6010:0E	Sync error	The Sync error bit is only required for DC mode. It indicates whether a synchronization error has occurred during the previous cycle.	BOOLEAN	RO	0x00 (0_{dec})
6010:10	TxPDO Toggle	The TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated.	BOOLEAN	RO	0x00 (0_{dec})
6010:11	Info data 1	Synchronous information (selection via subindex 0x8012:11 [▶ 93])	UINT16	RO	0x0000 (0_{dec})
6010:12	Info data 2	Synchronous information (selection via subindex 0x8012:19 [▶ 93])	UINT16	RO	0x0000 (0_{dec})

Index 7000 ENC Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	ENC Outputs Ch.1	Maximum subindex	UINT8	RO	0x11 (17_{dec})
7000:01	Enable latch C	Activate latching via the C-track.	BOOLEAN	RO	0x00 (0_{dec})
7000:02	Enable latch extern on positive edge	Activate external latch with positive edge.	BOOLEAN	RO	0x00 (0_{dec})
7000:03	Set counter	Set the counter value.	BOOLEAN	RO	0x00 (0_{dec})
7000:04	Enable latch extern on negative edge	Activate external latch with negative edge.	BOOLEAN	RO	0x00 (0_{dec})
7000:11	Set counter value	This is the counter value to be set via "Set counter".	UINT32	RO	0x00000000 (0_{dec})

Index 7010 STM Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	STM Outputs Ch.1	Maximum subindex	UINT8	RO	0x21 (33_{dec})
7010:01	Enable	activates the output stage (see subindex 0x8012:3A [▶ 93])	BOOLEAN	RO	0x00 (0_{dec})
7010:02	Reset	all errors that may have occurred are reset by setting this bit (rising edge)	BOOLEAN	RO	0x00 (0_{dec})
7010:03	Reduce torque	Activation of reduced torque (coil current) (see subindex 0x8010:02 [▶ 92])	BOOLEAN	RO	0x00 (0_{dec})
7010:0C	Digital output 1	Signal at digital output 1	BOOLEAN	RO	0x00 (0_{dec})
7010:11	Position	Set position	UINT32	RO	0x00000000 (0_{dec})
7010:21	Velocity	Set velocity	INT16	RO	0x0000 (0_{dec})

Index 9010 STM Info data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
9010:0	STM Info data Ch.1	Maximum subindex	UINT8	RO	0x08 (8_{dec})
9010:01	Status word	Status word (see index 0xA010 [▶ 104])	UINT16	RO	0x0000 (0_{dec})
9010:02	Motor coil voltage A	Motor voltage coil A (unit 1 mV)	UINT16	RO	0x0000 (0_{dec})
9010:03	Motor coil voltage B	Motor voltage coil B (unit 1 mV)	UINT16	RO	0x0000 (0_{dec})
9010:04	Motor coil current A	Motor current coil A (unit 1 mA)	INT16	RO	0x0000 (0_{dec})
9010:05	Motor coil current B	Motor current coil B (unit 1 mA)	INT16	RO	0x0000 (0_{dec})
9010:06	Duty cycle A	Duty cycle coil A (unit 1%)	INT8	RO	0x00 (0_{dec})
9010:07	Duty cycle B	Duty cycle coil B (unit 1%)	INT8	RO	0x00 (0_{dec})
9010:08	Motor velocity	Current velocity (value range +/- 10000)	INT16	RO	0x0000 (0_{dec})

Index A010 STM Diag data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
A010:0	STM Diag data Ch.1	Maximum subindex	UINT8	RO	0x11 (17_{dec})
A010:01	Saturated	Driver stage operates with maximum duty cycle	BOOLEAN	RO	0x00 (0_{dec})
A010:02	Over temperature	Internal terminal temperature is higher than 80°C (see subindex 0xF80F:04 [▶ 105])	BOOLEAN	RO	0x00 (0_{dec})
A010:03	Torque overload	Motor current is higher than the rated current	BOOLEAN	RO	0x00 (0_{dec})
A010:04	Under voltage	Motor supply voltage is 20% lower than the configured rated voltage (warning) or motor supply voltage is lower than 8 V (error, see 0xA010:09 [▶ 104])	BOOLEAN	RO	0x00 (0_{dec})
A010:05	Over voltage	Motor supply voltage is 10% higher than the configured nominal voltage	BOOLEAN	RO	0x00 (0_{dec})
A010:06	Short circuit A	Short circuit in motor coil A	BOOLEAN	RO	0x00 (0_{dec})
A010:07	Short circuit B	Short circuit in motor coil B	BOOLEAN	RO	0x00 (0_{dec})
A010:08	No control power	Control voltage at the power contacts is less than 12 V	BOOLEAN	RO	0x00 (0_{dec})
A010:09	Misc error	Initialization of the terminal failed or supply voltage is lower than 8 V or internal temperature of the terminal is higher than 100°C (see Subindex 0xF80F:05 [▶ 105])	BOOLEAN	RO	0x00 (0_{dec})
A010:11	Actual operation mode	Current operation mode (relevant for activated automatic mode, see 0x8012:01 [▶ 93])	BIT4	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 distance of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0002 (2_{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	0x02 (2_{dec})
F010:01	SubIndex 001	Profile number of the encoder interface	UINT32	RW	0x000001FF (511_{dec})
F010:02	SubIndex 002	Profile number of the stepper motor interface	UINT32	RW	0x000002BF (703_{dec})

Index F80F STM Vendor data

Index (hex)	Name	Meaning	Data type	Flags	Default
F80F:0	STM Vendor data	Maximum subindex	UINT8	RO	0x08 (8_{dec})
F80F:01	PWM Frequency	DC link frequency (unit: 1 Hz)	UINT16	RW	0x7530 (30000_{dec})
F80F:02	Deadtime	Dead time for pulse width modulation	UINT16	RW	0x0102 (258_{dec})
F80F:03	Deadtime space	Duty cycle limitation	UINT16	RW	0x0009 (9_{dec})
F80F:04	Warning temperature	Threshold for temperature warning (unit: 1°C, see subindex 0xA010:02 [▶ 104])	INT8	RW	0x50 (80_{dec})
F80F:05	Switch off temperature	Switch-off temperature (unit: 1°C)	INT8	RW	0x64 (100_{dec})
F80F:06	Analog trigger point	Trigger point for AD conversion	UINT16	RW	0x000A (10_{dec})
F80F:07	Calibration offset A	Current measurement offset calibration for coil A (set by the manufacturer)	INT16	RW	0x0000 (0_{dec})
F80F:08	Calibration offset B	Current measurement offset calibration for coil B (set by the manufacturer)	INT16	RW	0x0000 (0_{dec})

Index F900 STM Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
F900:0	STM Info data	Maximum subindex	UINT8	RO	0x06 (6_{dec})
F900:01	Software version (driver)	Software version of the driver card	STRING	RO	{0}
F900:02	Internal temperature	Internal terminal temperature (unit: 1°C)	INT8	RO	0x00 (0_{dec})
F900:04	Control voltage	Control voltage (unit: 1 mV)	UINT16	RO	0x0000 (0_{dec})
F900:05	Motor supply voltage	Motor supply voltage (unit: 1 mV)	UINT16	RO	0x0000 (0_{dec})
F900:06	Cycle time	Measured cycle time (unit: 1 µs)	UINT16	RO	0x0000 (0_{dec})

4.3 CoE objects EP7041-3002, EP7041-3102

4.3.1 Object overview

Applies to EP7041-3002 [▶ 14] and EP7041-3102 [▶ 14]

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.

Index (hex)		Name	Flags	Default value
1000 [▶ 123]		Device type	RO	0x00001389 (5001_{dec})
1008 [▶ 123]		Device name	RO	EP7041-3002
1009 [▶ 123]		Hardware version	RO	00
100A [▶ 123]		Software version	RO	03
1011:0 [▶ 119]	**Subindex**	Restore default parameters	RO	0x01 (1_{dec})
	0x1011:01	SubIndex 001	RW	0x00000000 (0_{dec})
1018:0 [▶ 123]	**Subindex**	Identity	RO	0x04 (4_{dec})
	0x1018:01	Vendor ID	RO	0x00000002 (2_{dec})
	0x1018:02	Product code	RO	0x1B814052 (461455442_{dec})
	0x1018:03	Revision	RO	0x00110BBA (1117114_{dec})
	0x1018:04	Serial number	RO	0x00000000 (0_{dec})
10F0:0 [▶ 123]	**Subindex**	Backup parameter handling	RO	0x01 (1_{dec})
	0x10F0:01	Checksum	RO	0x00000000 (0_{dec})

Index (hex)		Name	Flags	Default value
10F3:0 [▶ 124]	**Subindex**	Diagnosis History	RO	0x37 (55_{dec})
	0x10F3:01	Maximum Messages	RO	0x00 (0_{dec})
	0x10F3:02	Newest Message	RO	0x00 (0_{dec})
	0x10F3:03	Newest Acknowledged Message	RW	0x00 (0_{dec})
	0x10F3:04	New Messages Available	RO	0x00 (0_{dec})
	0x10F3:05	Flags	RW	0x0000 (0_{dec})
	0x10F3:06	Diagnosis Message 001	RO	{0}
	0x10F3:07	Diagnosis Message 002	RO	{0}
	0x10F3:08	Diagnosis Message 003	RO	{0}
	0x10F3:09	Diagnosis Message 004	RO	{0}
	0x10F3:0A	Diagnosis Message 005	RO	{0}
	0x10F3:0B	Diagnosis Message 006	RO	{0}
	0x10F3:0C	Diagnosis Message 007	RO	{0}
	0x10F3:0D	Diagnosis Message 008	RO	{0}
	0x10F3:0E	Diagnosis Message 009	RO	{0}
	0x10F3:0F	Diagnosis Message 010	RO	{0}
	0x10F3:10	Diagnosis Message 011	RO	{0}
	0x10F3:11	Diagnosis Message 012	RO	{0}
	0x10F3:12	Diagnosis Message 013	RO	{0}
	0x10F3:13	Diagnosis Message 014	RO	{0}
	0x10F3:14	Diagnosis Message 015	RO	{0}
	0x10F3:15	Diagnosis Message 016	RO	{0}
	0x10F3:16	Diagnosis Message 017	RO	{0}
	0x10F3:17	Diagnosis Message 018	RO	{0}
	0x10F3:18	Diagnosis Message 019	RO	{0}
	0x10F3:19	Diagnosis Message 020	RO	{0}
	0x10F3:1A	Diagnosis Message 021	RO	{0}
	0x10F3:1B	Diagnosis Message 022	RO	{0}
	0x10F3:1C	Diagnosis Message 023	RO	{0}
	0x10F3:1D	Diagnosis Message 024	RO	{0}
	0x10F3:1E	Diagnosis Message 025	RO	{0}
	0x10F3:1F	Diagnosis Message 026	RO	{0}
	0x10F3:20	Diagnosis Message 027	RO	{0}
	0x10F3:21	Diagnosis Message 028	RO	{0}
	0x10F3:22	Diagnosis Message 029	RO	{0}
	0x10F3:23	Diagnosis Message 030	RO	{0}
	0x10F3:24	Diagnosis Message 031	RO	{0}
	0x10F3:25	Diagnosis Message 032	RO	{0}
	0x10F3:26	Diagnosis Message 033	RO	{0}
	0x10F3:27	Diagnosis Message 034	RO	{0}
	0x10F3:28	Diagnosis Message 035	RO	{0}
	0x10F3:29	Diagnosis Message 036	RO	{0}
	0x10F3:2A	Diagnosis Message 037	RO	{0}
	0x10F3:2B	Diagnosis Message 038	RO	{0}
	0x10F3:2C	Diagnosis Message 039	RO	{0}
	0x10F3:2D	Diagnosis Message 040	RO	{0}
	0x10F3:2E	Diagnosis Message 041	RO	{0}
	0x10F3:2F	Diagnosis Message 042	RO	{0}
	0x10F3:30	Diagnosis Message 043	RO	{0}
	0x10F3:31	Diagnosis Message 044	RO	{0}
	0x10F3:32	Diagnosis Message 045	RO	{0}
	0x10F3:33	Diagnosis Message 046	RO	{0}
	0x10F3:34	Diagnosis Message 047	RO	{0}
	0x10F3:35	Diagnosis Message 048	RO	{0}
	0x10F3:36	Diagnosis Message 049	RO	{0}
	0x10F3:37	Diagnosis Message 050	RO	{0}
10F8 [▶ 126]		Actual Time Stamp	RO	

Index (hex)		Name	Flags	Default value
1400:0 [▶ 126]	**Subindex**	ENC RxPDO-Par Control compact	RO	0x06 (6_{dec})
	0x1400:06	Exclude RxPDOs	RO	01 16 00 00 00 00
1401:0 [▶ 126]	**Subindex**	ENC RxPDO-Par Control	RO	0x06 (6_{dec})
	0x1401:06	Exclude RxPDOs	RO	00 16 00 00 00 00
1403:0 [▶ 126]	**Subindex**	STM RxPDO-Par Position	RO	0x06 (6_{dec})
	0x1403:06	Exclude RxPDOs	RO	04 16 05 16 06 16
1404:0 [▶ 126]	**Subindex**	STM RxPDO-Par Velocity	RO	0x06 (6_{dec})
	0x1404:06	Exclude RxPDOs	RO	03 16 05 16 06 16
1405:0 [▶ 126]	**Subindex**	POS RxPDO-Par Control compact	RO	0x06 (6_{dec})
	0x1405:06	Exclude RxPDOs	RO	03 16 04 16 06 16
1406:0 [▶ 126]	**Subindex**	POS RxPDO-Par Control	RO	0x06 (6_{dec})
	0x1406:06	Exclude RxPDOs	RO	03 16 04 16 05 16
1600:0 [▶ 127]	**Subindex**	ENC RxPDO-Map Control compact	RO	0x07 (7_{dec})
	0x1600:01	SubIndex 001	RO	0x7000:01, 1
	0x1600:02	SubIndex 002	RO	0x7000:02, 1
	0x1600:03	SubIndex 003	RO	0x7000:03, 1
	0x1600:04	SubIndex 004	RO	0x7000:04, 1
	0x1600:05	SubIndex 005	RO	0x0000:00, 4
	0x1600:06	SubIndex 006	RO	0x0000:00, 8
	0x1600:07	SubIndex 007	RO	0x7000:11, 16
1601:0 [▶ 127]	**Subindex**	ENC RxPDO-Map Control	RO	0x07 (7_{dec})
	0x1601:01	SubIndex 001	RO	0x7000:01, 1
	0x1601:02	SubIndex 002	RO	0x7000:02, 1
	0x1601:03	SubIndex 003	RO	0x7000:03, 1
	0x1601:04	SubIndex 004	RO	0x7000:04, 1
	0x1601:05	SubIndex 005	RO	0x0000:00, 4
	0x1601:06	SubIndex 006	RO	0x0000:00, 8
	0x1601:07	SubIndex 007	RO	0x7000:11, 32
1602:0 [▶ 127]	**Subindex**	STM RxPDO-Map Control	RO	0x07 (7_{dec})
	0x1602:01	SubIndex 001	RO	0x7010:01, 1
	0x1602:02	SubIndex 002	RO	0x7010:02, 1
	0x1602:03	SubIndex 003	RO	0x7010:03, 1
	0x1602:04	SubIndex 004	RO	0x0000:00, 5
	0x1602:05	SubIndex 005	RO	0x0000:00, 3
	0x1602:06	SubIndex 006	RO	0x7010:0C, 1
	0x1602:07	SubIndex 007	RO	0x0000:00, 4

Index (hex)		Name	Flags	Default value
1603:0 [▶ 127]	**Subindex**	STM RxPDO-Map Position	RO	0x01 (1_{dec})
	0x1603:01	SubIndex 001	RO	0x7010:11, 32
1604:0 [▶ 128]	**Subindex**	STM RxPDO-Map Velocity	RO	0x01 (1_{dec})
	0x1604:01	SubIndex 001	RO	0x7010:21, 16
1605:0 [▶ 128]	**Subindex**	POS RxPDO-Map Control compact	RO	0x05 (5_{dec})
	0x1605:01	SubIndex 001	RO	0x7020:01, 1
	0x1605:02	SubIndex 002	RO	0x7020:02, 1
	0x1605:03	SubIndex 003	RO	0x0000:00, 6
	0x1605:04	SubIndex 004	RO	0x0000:00, 8
	0x1605:05	SubIndex 005	RO	0x7020:11, 32
1606:0 [▶ 128]	**Subindex**	POS RxPDO-Map Control	RO	0x09 (9_{dec})
	0x1606:01	SubIndex 001	RO	0x7020:01, 1
	0x1606:02	SubIndex 002	RO	0x7020:02, 1
	0x1606:03	SubIndex 003	RO	0x0000:00, 6
	0x1606:04	SubIndex 004	RO	0x0000:00, 8
	0x1606:05	SubIndex 005	RO	0x7020:11, 32
	0x1606:06	SubIndex 006	RO	0x7020:21, 16
	0x1606:07	SubIndex 007	RO	0x7020:22, 16
	0x1606:08	SubIndex 008	RO	0x7020:23, 16
	0x1606:09	SubIndex 009	RO	0x7020:24, 16
1800:0 [▶ 128]	**Subindex**	ENC TxPDO-Par Status compact	RO	0x06 (6_{dec})
	0x1800:06	Exclude TxPDOs	RO	01 1A
1801:0 [▶ 128]	**Subindex**	ENC TxPDO-Par Status	RO	0x06 (6_{dec})
	0x1801:06	Exclude TxPDOs	RO	00 1A
1806:0 [▶ 128]	**Subindex**	POS TxPDO-Par Status compact	RO	0x06 (6_{dec})
	0x1806:06	Exclude TxPDOs	RO	07 1A
1807:0 [▶ 129]	**Subindex**	POS TxPDO-Par Status	RO	0x06 (6_{dec})
	0x1807:06	Exclude TxPDOs	RO	06 1A

Index (hex)		Name	Flags	Default value
1A00:0	**Subindex**	ENC TxPDO-Map Status compact	RO	0x11 (17_{dec})
[▶ 129]	0x1A00:01	SubIndex 001	RO	0x6000:01, 1
	0x1A00:02	SubIndex 002	RO	0x6000:02, 1
	0x1A00:03	SubIndex 003	RO	0x6000:03, 1
	0x1A00:04	SubIndex 004	RO	0x6000:04, 1
	0x1A00:05	SubIndex 005	RO	0x6000:05, 1
	0x1A00:06	SubIndex 006	RO	0x0000:00, 2
	0x1A00:07	SubIndex 007	RO	0x6000:08, 1
	0x1A00:08	SubIndex 008	RO	0x6000:09, 1
	0x1A00:09	SubIndex 009	RO	0x6000:0A, 1
	0x1A00:0A	SubIndex 010	RO	0x6000:0B, 1
	0x1A00:0B	SubIndex 011	RO	0x0000:00, 1
	0x1A00:0C	SubIndex 012	RO	0x6000:0D, 1
	0x1A00:0D	SubIndex 013	RO	0x1C32:20, 1
	0x1A00:0E	SubIndex 014	RO	0x0000:00, 1
	0x1A00:0F	SubIndex 015	RO	0x1800:09, 1
	0x1A00:10	SubIndex 016	RO	0x6000:11, 16
	0x1A00:11	SubIndex 017	RO	0x6000:12, 16
1A01:0	**Subindex**	ENC TxPDO-Map Status	RO	0x11 (17_{dec})
[▶ 130]	0x1A01:01	SubIndex 001	RO	0x6000:01, 1
	0x1A01:02	SubIndex 002	RO	0x6000:02, 1
	0x1A01:03	SubIndex 003	RO	0x6000:03, 1
	0x1A01:04	SubIndex 004	RO	0x6000:04, 1
	0x1A01:05	SubIndex 005	RO	0x6000:05, 1
	0x1A01:06	SubIndex 006	RO	0x0000:00, 2
	0x1A01:07	SubIndex 007	RO	0x6000:08, 1
	0x1A01:08	SubIndex 008	RO	0x6000:09, 1
	0x1A01:09	SubIndex 009	RO	0x6000:0A, 1
	0x1A01:0A	SubIndex 010	RO	0x6000:0B, 1
	0x1A01:0B	SubIndex 011	RO	0x0000:00, 1
	0x1A01:0C	SubIndex 012	RO	0x6000:0D, 1
	0x1A01:0D	SubIndex 013	RO	0x1C32:20, 1
	0x1A01:0E	SubIndex 014	RO	0x0000:00, 1
	0x1A01:0F	SubIndex 015	RO	0x1801:09, 1
	0x1A01:10	SubIndex 016	RO	0x6000:11, 32
	0x1A01:11	SubIndex 017	RO	0x6000:12, 32
1A02:0	**Subindex**	ENC TxPDO-Map Timest. compact	RO	0x01 (1_{dec})
[▶ 130]	0x1A02:01	SubIndex 001	RO	0x6000:16, 32

Index (hex)		Name	Flags	Default value
1A03:0 [▶ 131]	**Subindex**	STM TxPDO-Map Status	RO	0x0E (14_{dec})
	0x1A03:01	SubIndex 001	RO	0x6010:01, 1
	0x1A03:02	SubIndex 002	RO	0x6010:02, 1
	0x1A03:03	SubIndex 003	RO	0x6010:03, 1
	0x1A03:04	SubIndex 004	RO	0x6010:04, 1
	0x1A03:05	SubIndex 005	RO	0x6010:05, 1
	0x1A03:06	SubIndex 006	RO	0x6010:06, 1
	0x1A03:07	SubIndex 007	RO	0x6010:07, 1
	0x1A03:08	SubIndex 008	RO	0x6010:08, 1
	0x1A03:09	SubIndex 009	RO	0x0000:00, 3
	0x1A03:0A	SubIndex 010	RO	0x6010:0C, 1
	0x1A03:0B	SubIndex 011	RO	0x6010:0D, 1
	0x1A03:0C	SubIndex 012	RO	0x6010:0E, 1
	0x1A03:0D	SubIndex 013	RO	0x0000:00, 1
	0x1A03:0E	SubIndex 014	RO	0x6010:10, 1
1A04:0 [▶ 131]	**Subindex**	STM TxPDO-Map Synchron info data	RO	0x02 (2_{dec})
	0x1A04:01	SubIndex 001	RO	0x6010:11, 16
	0x1A04:02	SubIndex 002	RO	0x6010:12, 16
1A05:0 [▶ 131]	**Subindex**	STM TxPDO-Map Motor load	RO	0x01 (1_{dec})
	0x1A05:01	SubIndex 001	RO	0x6010:13, 16
1A06:0 [▶ 132]	**Subindex**	POS TxPDO-Map Status compact	RO	0x09 (9_{dec})
	0x1A06:01	SubIndex 001	RO	0x6020:01, 1
	0x1A06:02	SubIndex 002	RO	0x6020:02, 1
	0x1A06:03	SubIndex 003	RO	0x6020:03, 1
	0x1A06:04	SubIndex 004	RO	0x6020:04, 1
	0x1A06:05	SubIndex 005	RO	0x6020:05, 1
	0x1A06:06	SubIndex 006	RO	0x6020:06, 1
	0x1A06:07	SubIndex 007	RO	0x6020:07, 1
	0x1A06:08	SubIndex 008	RO	0x0000:00, 1
	0x1A06:09	SubIndex 009	RO	0x0000:00, 8
1A07:0 [▶ 132]	**Subindex**	POS TxPDO-Map Status	RO	0x0C (12_{dec})
	0x1A07:01	SubIndex 001	RO	0x6020:01, 1
	0x1A07:02	SubIndex 002	RO	0x6020:02, 1
	0x1A07:03	SubIndex 003	RO	0x6020:03, 1
	0x1A07:04	SubIndex 004	RO	0x6020:04, 1
	0x1A07:05	SubIndex 005	RO	0x6020:05, 1
	0x1A07:06	SubIndex 006	RO	0x6020:06, 1
	0x1A07:07	SubIndex 007	RO	0x6020:07, 1
	0x1A07:08	SubIndex 008	RO	0x0000:00, 1
	0x1A07:09	SubIndex 009	RO	0x0000:00, 8
	0x1A07:0A	SubIndex 010	RO	0x6020:11, 32
	0x1A07:0B	SubIndex 011	RO	0x6020:21, 16
	0x1A07:0C	SubIndex 012	RO	0x6020:22, 32

Index (hex)		Name	Flags	Default value
1C00:0 [▶ 132]	**Subindex**	Sync manager type	RO	0x04 (4_{dec})
	0x1C00:01	SubIndex 001	RO	0x01 (1_{dec})
	0x1C00:02	SubIndex 002	RO	0x02 (2_{dec})
	0x1C00:03	SubIndex 003	RO	0x03 (3_{dec})
	0x1C00:04	SubIndex 004	RO	0x04 (4_{dec})
1C12:0 [▶ 133]	**Subindex**	RxPDO assign	RW	0x03 (3_{dec})
	0x1C12:01	SubIndex 001	RW	0x1600 (5632_{dec})
	0x1C12:02	SubIndex 002	RW	0x1602 (5634_{dec})
	0x1C12:03	SubIndex 003	RW	0x1604 (5636_{dec})
1C13:0 [▶ 133]	**Subindex**	TxPDO assign	RW	0x02 (2_{dec})
	0x1C13:01	SubIndex 001	RW	0x1A00 (6656_{dec})
	0x1C13:02	SubIndex 002	RW	0x1A03 (6659_{dec})
	0x1C13:03	SubIndex 003	RW	0x0000 (0_{dec})
	0x1C13:04	SubIndex 004	RW	0x0000 (0_{dec})
	0x1C13:05	SubIndex 005	RW	0x0000 (0_{dec})
	0x1C13:06	SubIndex 006	RW	0x0000 (0_{dec})
1C32:0 [▶ 134]	**Subindex**	SM output parameter	RO	0x20 (32_{dec})
	0x1C32:01	Sync mode	RW	0x0001 (1_{dec})
	0x1C32:02	Cycle time	RW	0x000F4240 (1000000_{dec})
	0x1C32:03	Shift time	RO	0x00000000 (0_{dec})
	0x1C32:04	Sync modes supported	RO	0xC007 (49159_{dec})
	0x1C32:05	Minimum cycle time	RO	0x0003D090 (250000_{dec})
	0x1C32:06	Calc and copy time	RO	0x00000000 (0_{dec})
	0x1C32:07	Minimum delay time	RO	0x00000000 (0_{dec})
	0x1C32:08	Command	RW	0x0000 (0_{dec})
	0x1C32:09	Maximum delay time	RO	0x00000000 (0_{dec})
	0x1C32:0B	SM event missed counter	RO	0x0000 (0_{dec})
	0x1C32:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	0x1C32:0D	Shift too short counter	RO	0x0000 (0_{dec})
	0x1C32:20	Sync error	RO	0x00 (0_{dec})

Index (hex)		Name	Flags	Default value
1C33:0 [▶ 135]	**Subindex**	SM input parameter	RO	0x20 (32_{dec})
	0x1C33:01	Sync mode	RW	0x0022 (34_{dec})
	0x1C33:02	Cycle time	RW	0x000F4240 (1000000_{dec})
	0x1C33:03	Shift time	RO	0x00000000 (0_{dec})
	0x1C33:04	Sync modes supported	RO	0xC007 (49159_{dec})
	0x1C33:05	Minimum cycle time	RO	0x0003D090 (250000_{dec})
	0x1C33:06	Calc and copy time	RO	0x00000000 (0_{dec})
	0x1C33:07	Minimum delay time	RO	0x00000000 (0_{dec})
	0x1C33:08	Command	RW	0x0000 (0_{dec})
	0x1C33:09	Maximum delay time	RO	0x00000000 (0_{dec})
	0x1C33:0B	SM event missed counter	RO	0x0000 (0_{dec})
	0x1C33:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	0x1C33:0D	Shift too short counter	RO	0x0000 (0_{dec})
	0x1C33:20	Sync error	RO	0x00 (0_{dec})
6000:0 [▶ 136]	**Subindex**	ENC Inputs Ch.1	RO	0x16 (22_{dec})
	0x6000:01	Latch C valid	RO	0x00 (0_{dec})
	0x6000:02	Latch extern valid	RO	0x00 (0_{dec})
	0x6000:03	Set counter done	RO	0x00 (0_{dec})
	0x6000:04	Counter underflow	RO	0x00 (0_{dec})
	0x6000:05	Counter overflow	RO	0x00 (0_{dec})
	0x6000:08	Extrapolation stall	RO	0x00 (0_{dec})
	0x6000:09	Status of input A	RO	0x00 (0_{dec})
	0x6000:0A	Status of input B	RO	0x00 (0_{dec})
	0x6000:0B	Status of input C	RO	0x00 (0_{dec})
	0x6000:0D	Status of extern latch	RO	0x00 (0_{dec})
	0x6000:0E	Sync error	RO	0x00 (0_{dec})
	0x6000:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6000:11	Counter value	RO	0x00000000 (0_{dec})
	0x6000:12	Latch value	RO	0x00000000 (0_{dec})
	0x6000:16	Timestamp	RO	0x00000000 (0_{dec})

Index (hex)		Name	Flags	Default value
6010:0 [▶ 136]	**Subindex**	STM Inputs Ch.1	RO	0x13 (19_{dec})
	0x6010:01	Ready to enable	RO	0x00 (0_{dec})
	0x6010:02	Ready	RO	0x00 (0_{dec})
	0x6010:03	Warning	RO	0x00 (0_{dec})
	0x6010:04	Error	RO	0x00 (0_{dec})
	0x6010:05	Moving positive	RO	0x00 (0_{dec})
	0x6010:06	Moving negative	RO	0x00 (0_{dec})
	0x6010:07	Torque reduced	RO	0x00 (0_{dec})
	0x6010:08	Motor stall	RO	0x00 (0_{dec})
	0x6010:0C	Digital input 1	RO	0x00 (0_{dec})
	0x6010:0D	Digital input 2	RO	0x00 (0_{dec})
	0x6010:0E	Sync error	RO	0x00 (0_{dec})
	0x6010:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6010:11	Info data 1	RO	0x0000 (0_{dec})
	0x6010:12	Info data 2	RO	0x0000 (0_{dec})
	0x6010:13	Moto load	RO	0x0000 (0_{dec})
6020:0 [▶ 136]	**Subindex**	POS Inputs Ch.1	RO	0x22 (34_{dec})
	0x6020:01	Busy	RO	0x00 (0_{dec})
	0x6020:02	In-Target	RO	0x00 (0_{dec})
	0x6020:03	Warning	RO	0x00 (0_{dec})
	0x6020:04	Error	RO	0x00 (0_{dec})
	0x6020:05	Calibrated	RO	0x00 (0_{dec})
	0x6020:06	Accelerate	RO	0x00 (0_{dec})
	0x6020:07	Decelerate	RO	0x00 (0_{dec})
	0x6020:11	Actual position	RO	0x00007FFF (32767_{dec})
	0x6020:21	Actual velocity	RO	0x0000 (0_{dec})
	0x6020:22	Actual drive time	RO	0x00000000 (0_{dec})
7000:0 [▶ 137]	**Subindex**	ENC Outputs Ch.1	RO	0x11 (17_{dec})
	7000:01	Enable latch C	RO	0x00 (0_{dec})
	7000:02	Enable latch extern on positive edge	RO	0x00 (0_{dec})
	7000:03	Set counter	RO	0x00 (0_{dec})
	7000:04	Enable latch extern on negative edge	RO	0x00 (0_{dec})
	7000:11	Set counter value	RO	0x00000000 (0_{dec})
7010:0 [▶ 137]	**Subindex**	STM Outputs Ch.1	RO	0x21 (33_{dec})
	0x7010:01	Enable	RO	0x00 (0_{dec})
	0x7010:02	Reset	RO	0x00 (0_{dec})
	0x7010:03	Reduce torque	RO	0x00 (0_{dec})
	0x7010:0C	Digital output 1	RO	0x00 (0_{dec})
	0x7010:11	Position	RO	0x00000000 (0_{dec})
	0x7010:21	Velocity	RO	0x0000 (0_{dec})

Index (hex)		Name	Flags	Default value
7020:0 [▶ 137]	**Subindex**	POS Outputs Ch.1	RO	0x24 (36_{dec})
	0x7020:01	Execute	RO	0x00 (0_{dec})
	0x7020:02	Emergency stop	RO	0x00 (0_{dec})
	0x7020:11	Target position	RO	0x00007FFF (32767_{dec})
	0x7020:21	Velocity	RO	0x0000 (0_{dec})
	0x7020:22	Start type	RO	0x0000 (0_{dec})
	0x7020:23	Acceleration	RO	0x0000 (0_{dec})
	0x7020:24	Deceleration	RO	0x0000 (0_{dec})
8000:0 [▶ 119]	**Subindex**	ENC Settings Ch.1	RW	0x0E (14_{dec})
	0x8000:08	Disable filter	RW	0x00 (0_{dec})
	0x8000:0A	Enable micro increments	RW	0x00 (0_{dec})
	0x8000:0E	Reversion of rotation	RW	0x00 (0_{dec})
8010:0 [▶ 119]	**Subindex**	STM Motor Settings Ch.1	RW	0x11 (17_{dec})
	0x8010:01	Maximal current	RW	0x1388 (5000_{dec})
	0x8010:02	Reduced current	RW	0x09C4 (2500_{dec})
	0x8010:03	Nominal voltage	RW	0xC350 (50000_{dec})
	0x8010:06	Motor fullsteps	RW	0x00C8 (200_{dec})
	0x8010:07	Encoder increments (4-fold)	RW	0x0000 (0_{dec})
	0x8010:09	Start velocity	RW	0x0000 (0_{dec})
	0x8010:10	Drive on delay time	RW	0x0064 (100_{dec})
	0x8010:11	Drive off delay time	RW	0x0096 (150_{dec})
8012:0 [▶ 120]	**Subindex**	STM Features Ch.1	RW	0x45 (69_{dec})
	0x8012:01	Operation mode	RW	0x00 (0_{dec})
	0x8012:05	Speed range	RW	0x01 (1_{dec})
	0x8012:08	Feedback type	RW	0x01 (1_{dec})
	0x8012:09	Invert motor polarity	RW	0x00 (0_{dec})
	0x8012:11	Select info data 1	RW	0x00 (0_{dec})
	0x8012:19	Select info data 2	RW	0x09 (9_{dec})
	0x8012:30	Invert digital input 1	RW	0x00 (0_{dec})
	0x8012:31	Invert digital input 2	RW	0x00 (0_{dec})
	0x8012:32	Function for input 1	RW	0x00 (0_{dec})
	0x8012:36	Function for input 2	RW	0x00 (0_{dec})
	0x8012:3A	Function for output 1	RW	0x00 (0_{dec})
	0x8012:45	Microstepping	RW	0x00 (0_{dec})
8013:0 [▶ 121]	**Subindex**	STM Controller Settings 2 Ch.1	RW	0x07 (7_{dec})
	0x8013:01	Kp factor (velo./pos.)	RW	0x03E8 (1000_{dec})
	0x8013:02	Ki factor (velo./pos.)	RW	0x0000 (0_{dec})
	0x8013:03	Inner window (velo./pos.)	RW	0x00 (0_{dec})
	0x8013:05	Outer window (velo./pos.)	RW	0x00 (0_{dec})
	0x8013:06	Filter cut off frequency (velo./pos.)	RW	0x0000 (0_{dec})
	0x8013:07	Ka factor (velo./pos.)	RW	0x0000 (0_{dec})

Index (hex)		Name	Flags	Default value
8014:0 [▶ 138]	**Subindex**	STM Motor Features Ch.1	RW	0x31 (49_{dec})
	0x8014:01	Chopper: Mode	RW	0x00 (0_{dec})
	0x8014:03	Chopper: Off time	RW	0x05 (5_{dec})
	0x8014:07	Chopper: Comparator disabled	RW	0x00 (0_{dec})
	0x8014:08	Chopper: Fast decay time	RW	0x03 (3_{dec})
	0x8014:0C	Chopper: Sine wave offset	RW	0x03 (3_{dec})
	0x8014:11	Chopper: Hysteresis start value	RW	0x02 (2_{dec})
	0x8014:14	Chopper: Hysteresis end value	RW	0x06 (6_{dec})
	0x8014:18	Chopper: Hysteresis decrement time	RW	0x00 (0_{dec})
	0x8014:1A	Stall guard: Filter enable	RW	0x01 (1_{dec})
	0x8014:1B	Stall guard: Current up step width	RW	0x00 (0_{dec})
	0x8014:1D	Stall guard: Current down step speed	RW	0x00 (0_{dec})
	0x8014:1F	Stall guard: Minimum current	RW	0x00 (0_{dec})
	0x8014:21	Stall guard: Minimum value	RW	0x00 (0_{dec})
	0x8014:25	Stall guard: Hysteresis value	RW	0x00 (0_{dec})
	0x8014:31	Stall guard: Threshold value	RW	0x01 (1_{dec})
8020:0 [▶ 122]	**Subindex**	POS Settings Ch.1	RW	0x0F (15_{dec})
	0x8020:01	Velocity min.	RW	0x0064 (100_{dec})
	0x8020:02	Velocity max.	RW	0x2710 (10000_{dec})
	0x8020:03	Acceleration pos.	RW	0x03E8 (1000_{dec})
	0x8020:04	Acceleration neg.	RW	0x03E8 (1000_{dec})
	0x8020:05	Deceleration pos.	RW	0x03E8 (1000_{dec})
	0x8020:06	Deceleration neg.	RW	0x03E8 (1000_{dec})
	0x8020:07	Emergency deceleration	RW	0x0064 (100_{dec})
	0x8020:08	Calibration position	RW	0x00000000 (0_{dec})
	0x8020:09	Calibration velocity (towards plc cam)	RW	0x0064 (100_{dec})
	0x8020:0A	Calibration Velocity (off plc cam)	RW	0x000A (10_{dec})
	0x8020:0B	Target window	RW	0x000A (10_{dec})
	0x8020:0C	In-Target timeout	RW	0x03E8 (1000_{dec})
	0x8020:0D	Dead time compensation	RW	0x0032 (50_{dec})
	0x8020:0E	Modulo factor	RW	0x00000000 (0_{dec})
	0x8020:0F	Modulo tolerance window	RW	0x00000000 (0_{dec})
8021:0 [▶ 122]	**Subindex**	POS Features Ch.1	RW	0x14 (20_{dec})
	0x8021:01	Start type	RW	0x0001 (1_{dec})
	0x8021:11	Time information	RW	0x00 (0_{dec})
	0x8021:13	Invert calibration cam search direction	RW	0x01 (1_{dec})
	0x8021:14	Invert sync impulse search direction	RW	0x00 (0_{dec})

Index (hex)		Name	Flags	Default value
9010:0 [▶ 138]	**Subindex**	STM Info data Ch.1	RO	0x0C (12_{dec})
	0x9010:01	Status word	RO	0x0000 (0_{dec})
	0x9010:08	Motor velocity	RO	0x0000 (0_{dec})
	0x9010:09	Internal position	RO	0x00000000 (0_{dec})
	0x9010:0A	Status word 2	RO	0x0000 (0_{dec})
	0x9010:0B	Motor load	RO	0x0000 (0_{dec})
	0x9010:0C	Motor smart current	RO	0x00 (0_{dec})
9020:0 [▶ 138]	**Subindex**	POS Info data Ch.1	RO	0x03 (3_{dec})
	0x9020:01	Status word	RO	0x0000 (0_{dec})
	0x9020:03	State (drive controller)	RO	0xFFFF (65535_{dec})
A010:0 [▶ 139]	**Subindex**	STM Diag data Ch.1	RO	0x11 (17_{dec})
	0xA010:01	Saturated	RO	0x00 (0_{dec})
	0xA010:02	Over temperature	RO	0x00 (0_{dec})
	0xA010:03	Torque overload	RO	0x00 (0_{dec})
	0xA010:04	Under voltage	RO	0x00 (0_{dec})
	0xA010:05	Over voltage	RO	0x00 (0_{dec})
	0xA010:06	Short circuit	RO	0x00 (0_{dec})
	0xA010:08	No control power	RO	0x00 (0_{dec})
	0xA010:09	Misc error	RO	0x00 (0_{dec})
	0xA010:0A	Configuration	RO	0x00 (0_{dec})
	0xA010:0B	Motor stall	RO	0x00 (0_{dec})
	0xA010:11	Actual operation mode	RO	0x00 (0_{dec})
A020:0 [▶ 139]	**Subindex**	POS Diag data Ch.1	RO	0x03 (3_{dec})
	0xA020:01	Command rejected	RO	0x00 (0_{dec})
	0xA020:02	Command aborted	RO	0x00 (0_{dec})
	0xA020:03	Target overrun	RO	0x00 (0_{dec})
F000:0 [▶ 139]	**Subindex**	Modular device profile	RO	0x02 (2_{dec})
	0xF000:01	Module index distance	RO	0x0010 (16_{dec})
	0xF000:02	Maximum number of modules	RO	0x0003 (3_{dec})
F008 [▶ 139]		Code word	RW	0x00000000 (0_{dec})
F010:0 [▶ 139]	**Subindex**	Module list	RW	0x03 (3_{dec})
	0xF010:01	SubIndex 001	RW	0x000001FF (511_{dec})
	0xF010:02	SubIndex 002	RW	0x000002BF (703_{dec})
	0xF010:03	SubIndex 003	RW	0x000002C0 (704_{dec})
F80F:0 [▶ 139]	**Subindex**	STM Vendor data	RW	0x09 (9_{dec})
	0xF80F:04	Warning temperature	RW	0x50 (80_{dec})
	0xF80F:05	Switch off temperature	RW	0x64 (100_{dec})
	0xF80F:09	Maximum current	RW	0x1DC9 (7625_{dec})
F81F:0 [▶ 140]	**Subindex**	STM Vendor data 2	RW	0x08 (8_{dec})
	0xF81F:01	Slope control low side	RW	0x03 (3_{dec})
	0xF81F:03	Slope control high side	RW	0x03 (3_{dec})
	0xF81F:05	Sense voltage	RW	0x00 (0_{dec})
	0xF81F:08	Blank time	RW	0x02 (2_{dec})
F900:0 [▶ 140]	**Subindex**	STM Info data	RO	0x07 (7_{dec})
	0xF900:01	Software version (driver)	RO	
	0xF900:02	Internal temperature	RO	0x00 (0_{dec})
	0xF900:04	Control voltage	RO	0x0000 (0_{dec})
	0xF900:05	Motor supply voltage	RO	0x0000 (0_{dec})
	0xF900:06	Cycle time	RO	0x0000 (0_{dec})
	0xF900:07	Motor supply current	RO	0x0000 (0_{dec})
FB00:0 [▶ 122]	**Subindex**	STM Command	RO	0x03 (3_{dec})
	0xFB00:01	Request	RW	{0}
	0xFB00:02	Status	RO	0x00 (0_{dec})
	0xFB00:03	Response	RO	{0}

Key

Flags:
RO (Read Only): this object can be read only
RW (Read/Write): this object can be read and written to

4.3.2 Object description and parameterization

Applies to EP7041-3002 [▶ 14] and EP7041-3102 [▶ 14]

Parameterization

The terminal is parameterized via the CoE - Online tab [▶ 44] (double-click on the respective object) or via the Process Data tab [▶ 41](assignment of PDOs).

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.

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization during commissioning [▶ 119]
- Objects for indicating internal settings [▶ 123] (may be fixed)
- Further profile-specific objects [▶ 135] indicating inputs, outputs and status information

The following section first describes the objects required for normal operation, followed by a complete overview of missing objects.

Additional objects

4.3.2.1 Objects for commissioning

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})

Index 8000 ENC Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	ENC Settings Ch.1	Maximum subindex	UINT8	RO	0x0F (15_{dec})
8000:08	Disable filter	Deactivates the input filters.	BOOLEAN	RW	0x00 (0_{dec})
8000:0A	Enable micro increments	The lower 8 bits of the counter value are extrapolated.	BOOLEAN	RW	0x00 (0_{dec})
8000:0E	Reversion of rotation	Activates reversion of rotation of the encoder.	BOOLEAN	RW	0x00 (0_{dec})

Index 8010 STM Motor Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0	STM Motor Settings Ch.1	Maximum subindex	UINT8	RO	0x11 (17_{dec})
8010:01	Maximal current	Maximum permanent motor coil current (unit: 1 mA)	UINT16	RW	0x1388 (5000_{dec})
8010:02	Reduced current	Reduced coil current (reduced torque, unit: 1 mA)	UINT16	RW	0x09C4 (2500_{dec})
8010:03	Nominal voltage	Nominal voltage (supply voltage) of the motor (unit: 1 mV)	UINT16	RW	0xC350 (50000_{dec})
8010:06	Motor fullsteps	Motor full steps per revolution	UINT16	RW	0x00C8 (200_{dec})
8010:07	Encoder increments (4-fold)	Encoder increments per revolution (quadruple evaluation)	UINT16	RW	0x0000 (0_{dec})
8010:09	Start velocity	Maximum possible start velocity of the motor	UINT16	RW	0x0000 (0_{dec})
8010:10	Drive on delay time	Switch-on delay of the driver stage (unit: ms)	UINT16	RW	0x0064 (100_{dec})
8010:11	Drive off delay time	Switch-off delay of the driver stage (unit: ms)	UINT16	RW	0x0096 (150_{dec})

Index 8012 STM Features Ch.1

Index (hex)	Name	Meaning		Data type	Flags	Default
8012:0	STM Features Ch.1	Maximum subindex		UINT8	RO	0x45 (69_{dec})
8012:01	Operation mode	Operation mode (currently only direct velocity is supported)		BIT4	RW	0x00 (0_{dec})
		0	Automatic			
		1	Direct velocity			
		2	Velocity controller			
		3	Position controller			
8012:05	Speed range	Preselection of the speed range		BIT3	RW	0x01 (1_{dec})
		0	1000 full steps/second			
		1	2000 full steps/second			
		2	4000 full steps/second			
		3	8000 full steps/second			
		4	16000 full steps/second			
		5	32000 full steps/second			
8012:08	Feedback type	Selection of the feedback system		BIT1	RW	0x01 (1_{dec})
		0	External encoder			
		1	Internal counter			
8012:09	Invert motor polarity	Activates reversal of the motor rotation direction.		BOOLEAN	RW	0x00 (0_{dec})
8012:11	Select info data 1	Select "Info data 1" (see 0x6010:11 [▶ 136])		UINT8	RW	0x00 (0_{dec})
		0	Status word			
		1	reserved			
		...	...			
		6	reserved			
		7	Current velocity (value range +/- 10000)			
		8	reserved			
		9	Status word 2			
		10	Motor: Load			
		11	Motor: "Smart Current"			
		12	reserved			
		...	...			
		100	reserved			
		101	Internal temperature of the driver card			
		...	reserved			
		103	Control voltage			
		104	Motor supply: Voltage			
		...	reserved			
		106	Motor supply: Current			
		107	reserved			
		...	...			
		149	reserved			
		150	Position interface - status word			
		151	Position interface - status of the internal state machine			
		152	Position interface – lag error (low word)			
		153	Position interface – lag error (high word)			
		154	reserved			
		...	...			
		255	reserved			

Index 8012 STM Features Ch.1

Index (hex)	Name	Meaning		Data type	Flags	Default
8012:19	Select info data 2	Selection "Info data 2" (see 0x8012:11 [▶ 120])		UINT8	RW	0x09 (9_{dec})
8012:30	Invert digital input 1	Inversion of digital input 1		BOOLEAN	RW	0x00 (0_{dec})
8012:31	Invert digital input 2	Inversion of digital input 2		BOOLEAN	RW	0x00 (0_{dec})
8012:32	Function for input 1	Selection of the function for input 1		BIT4	RW	0x00 (0_{dec})
		0	Normal input			
		1	Hardware Enable			
8012:36	Function for input 2	Selection of the function for input 2		BIT4	RW	0x00 (0_{dec})
		0	Normal input			
		1	Hardware Enable			
8012:3A	Function for output 1	Selection of the function for output 1		BIT4	RW	0x00 (0_{dec})
		0	Normal output			
		1	Brake If the bit in 0x7010:01 [▶ 137] is set, the output is switched with the delay time set in 0x8010:10 [▶ 119] and 0x8010:11 [▶ 119] of the driver stage.			
8012:45	Microstepping	0	Full step	BIT4	RW	0x08 (8_{dec})
		1	Half step			
		2	1/4 micro-step			
		3	1/8 micro-step			
		4	1/16 micro-step			
		5	1/32 micro-step			
		6	1/64 micro-step			
		7	1/128 micro-step			
		8	1/256 micro-step			

Index 8013 STM Controller Settings 2 Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8013:0	STM Controller Settings 2 Ch.1	Maximum subindex	UINT8	RO	0x07 (7_{dec})
8013:01	Kp factor (velo./pos.)	Kp control factor (proportional component) for the velocity controller (unit: 0.001)	UINT16	RW	0x03E8 (1000_{dec})
8013:02	Ki factor (velo./pos.)	Ki control factor (integral component) for the velocity controller (unit: 0.001)	UINT16	RW	0x0000 (0_{dec})
8013:03	Inner window (velo./pos.)	Inner window for the I component of the velocity controller (unit: 1%)	UINT8	RW	0x00 (0_{dec})
8013:05	Outer window (velo./pos.)	Outer window for the I component of the velocity controller (unit: 1%)	UINT8	RW	0x00 (0_{dec})
8013:06	Filter cut off frequency (velo./pos.)	Filter limit frequency of the velocity controller (low-pass, unit: 1 Hz)	UINT16	RW	0x0000 (0_{dec})
8013:07	Ka factor (velo./pos.)	Ka control factor of the velocity/position controller	UINT16	RW	0x0000 (0_{dec})

Index 8020 POS Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8020:0	POS Settings Ch.1	Maximum subindex	UINT8	RO	0x0F (15_{dec})
8020:01	Velocity min.	Minimum target velocity (range: 0 ... 10000)	INT16	RW	0x0064 (100_{dec})
8020:02	Velocity max.	Maximum target velocity (range: 0 ... 10000)	INT16	RW	0x2710 (10000_{dec})
8020:03	Acceleration pos.	Acceleration in positive direction of rotation (unit: 1 ms)	UINT16	RW	0x03E8 (1000_{dec})
8020:04	Acceleration neg.	Acceleration in negative direction of rotation (unit: 1 ms)	UINT16	RW	0x03E8 (1000_{dec})
8020:05	Deceleration pos.	Deceleration in positive direction of rotation (unit: 1 ms)	UINT16	RW	0x03E8 (1000_{dec})
8020:06	Deceleration neg.	Deceleration in negative direction of rotation (unit: 1 ms)	UINT16	RW	0x03E8 (1000_{dec})
8020:07	Emergency deceleration	Emergency deceleration (both directions of rotation, unit: 1 ms)	UINT16	RW	0x0064 (100_{dec})
8020:08	Calibration position	Calibration position	UINT32	RW	0x00000000 (0_{dec})
8020:09	Calibration velocity (towards plc cam)	Calibration velocity towards the cam (range: 0 ... 10000)	INT16	RW	0x0064 (100_{dec})
8020:0A	Calibration Velocity (off plc cam)	Calibration velocity away from the cam (range: 0 ... 10000)	INT16	RW	0x000A (10_{dec})
8020:0B	Target window	Target window	UINT16	RW	0x000A (10_{dec})
8020:0C	In-Target timeout	Timeout at target position (unit: 1 ms)	UINT16	RW	0x03E8 (1000_{dec})
8020:0D	Dead time compensation	Dead time compensation (unit: 1 µs)	INT16	RW	0x0032 (50_{dec})
8020:0E	Modulo factor	Modulo factor/position	UINT32	RW	0x00000000 (0_{dec})
8020:0F	Modulo tolerance window	Tolerance window for modulo positioning	UINT32	RW	0x00000000 (0_{dec})

Index 8021 POS Features Ch.1

Index (hex)	Name	Meaning		Data type	Flags	Default
8021:0	POS Features Ch.1	Maximum subindex		UINT8	RO	0x14 (20_{dec})
8021:01	Start type	Standard start type		UINT16	RW	0x0001 (1_{dec})
8021:11	Time information	Time information in subindex 0x6pp0:22 ("Actual drive time")		BIT2	RW	0x00 (0_{dec})
		0	Elapsed time: current drive time since start of the travel command			
		...	reserved			
8021:13	Invert calibration cam search direction	Inversion of the direction of rotation towards the cam		BOOLEAN	RW	0x01 (1_{dec})
8021:14	Invert sync impulse search direction	Inversion of the direction of rotation away from the cam		BOOLEAN	RW	0x00 (0_{dec})

Index FB00 STM Command

Index (hex)	Name	Meaning		Data type	Flags	Default
FB00:0	STM Command	Maximum subindex		UINT8	RO	0x03 (3_{dec})
FB00:01	Request	Requesting a command		OCTET-STRING[2]	RW	{0}
		0x8000	Software reset			
FB00:02	Status	Status of the command		UINT8	RO	0x00 (0_{dec})
		0	No error, without return value			
		1	No error, with return value			
		2	With error, without return value			
		3	With error, with return value			
		...	reserved			
		255	Command execution active			
FB00:03	Response	Return value of the executed command (dependent on the command)		OCTET-STRING[4]	RO	{0}

4.3.2.2 Standard objects (0x1000-0x1FFF)

The standard objects have the same meaning for all EtherCAT slaves.

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	EP7041-3002

Index 1009 Hardware version

Index (hex)	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT slave	STRING	RO	00

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	02

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	0x1B814052 (461455442_{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	0x00100BBA (1051578_{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 10F3 Diagnosis History

Index (hex)	Name	Meaning	Data type	Flags	Default
10F3:0	Diagnosis History	Maximum sub-index	UINT8	RO	0x37 (55_{dec})
10F3:01	Maximum Messages		UINT8	RO	0x00 (0_{dec})
10F3:02	Newest Message		UINT8	RO	0x00 (0_{dec})
10F3:03	Newest Acknowledged Message		UINT8	RW	0x00 (0_{dec})
10F3:04	New Messages Available		BOOLEAN	RO	0x00 (0_{dec})
10F3:05	Flags		UINT16	RW	0x0000 (0_{dec})
10F3:06	Diagnosis Message 001		OCTET-STRING[28]	RO	{0}
10F3:07	Diagnosis Message 002		OCTET-STRING[28]	RO	{0}
10F3:08	Diagnosis Message 003		OCTET-STRING[28]	RO	{0}
10F3:09	Diagnosis Message 004		OCTET-STRING[28]	RO	{0}
10F3:0A	Diagnosis Message 005		OCTET-STRING[28]	RO	{0}
10F3:0B	Diagnosis Message 006		OCTET-STRING[28]	RO	{0}
10F3:0C	Diagnosis Message 007		OCTET-STRING[28]	RO	{0}
10F3:0D	Diagnosis Message 008		OCTET-STRING[28]	RO	{0}
10F3:0E	Diagnosis Message 009		OCTET-STRING[28]	RO	{0}
10F3:0F	Diagnosis Message 010		OCTET-STRING[28]	RO	{0}
10F3:10	Diagnosis Message 011		OCTET-STRING[28]	RO	{0}
10F3:11	Diagnosis Message 012		OCTET-STRING[28]	RO	{0}
10F3:12	Diagnosis Message 013		OCTET-STRING[28]	RO	{0}
10F3:13	Diagnosis Message 014		OCTET-STRING[28]	RO	{0}
10F3:14	Diagnosis Message 015		OCTET-STRING[28]	RO	{0}
10F3:15	Diagnosis Message 016		OCTET-STRING[28]	RO	{0}
10F3:16	Diagnosis Message 017		OCTET-STRING[28]	RO	{0}
10F3:17	Diagnosis Message 018		OCTET-STRING[28]	RO	{0}

Index 10F3 Diagnosis History

Index (hex)	Name	Meaning	Data type	Flags	Default
10F3:18	Diagnosis Message 019		OCTET-STRING[28]	RO	{0}
10F3:19	Diagnosis Message 020		OCTET-STRING[28]	RO	{0}
10F3:1A	Diagnosis Message 021		OCTET-STRING[28]	RO	{0}
10F3:1B	Diagnosis Message 022		OCTET-STRING[28]	RO	{0}
10F3:1C	Diagnosis Message 023		OCTET-STRING[28]	RO	{0}
10F3:1D	Diagnosis Message 024		OCTET-STRING[28]	RO	{0}
10F3:1E	Diagnosis Message 025		OCTET-STRING[28]	RO	{0}
10F3:1F	Diagnosis Message 026		OCTET-STRING[28]	RO	{0}
10F3:20	Diagnosis Message 027		OCTET-STRING[28]	RO	{0}
10F3:21	Diagnosis Message 028		OCTET-STRING[28]	RO	{0}
10F3:22	Diagnosis Message 029		OCTET-STRING[28]	RO	{0}
10F3:23	Diagnosis Message 030		OCTET-STRING[28]	RO	{0}
10F3:24	Diagnosis Message 031		OCTET-STRING[28]	RO	{0}
10F3:25	Diagnosis Message 032		OCTET-STRING[28]	RO	{0}
10F3:26	Diagnosis Message 033		OCTET-STRING[28]	RO	{0}
10F3:27	Diagnosis Message 034		OCTET-STRING[28]	RO	{0}
10F3:28	Diagnosis Message 035		OCTET-STRING[28]	RO	{0}
10F3:29	Diagnosis Message 036		OCTET-STRING[28]	RO	{0}
10F3:2A	Diagnosis Message 037		OCTET-STRING[28]	RO	{0}
10F3:2B	Diagnosis Message 038		OCTET-STRING[28]	RO	{0}
10F3:2C	Diagnosis Message 039		OCTET-STRING[28]	RO	{0}
10F3:2D	Diagnosis Message 040		OCTET-STRING[28]	RO	{0}
10F3:2E	Diagnosis Message 041		OCTET-STRING[28]	RO	{0}
10F3:2F	Diagnosis Message 042		OCTET-STRING[28]	RO	{0}
10F3:30	Diagnosis Message 043		OCTET-STRING[28]	RO	{0}
10F3:31	Diagnosis Message 044		OCTET-STRING[28]	RO	{0}
10F3:32	Diagnosis Message 045		OCTET-STRING[28]	RO	{0}
10F3:33	Diagnosis Message 046		OCTET-STRING[28]	RO	{0}
10F3:34	Diagnosis Message 047		OCTET-STRING[28]	RO	{0}
10F3:35	Diagnosis Message 048		OCTET-STRING[28]	RO	{0}
10F3:36	Diagnosis Message 049		OCTET-STRING[28]	RO	{0}
10F3:37	Diagnosis Message 050		OCTET-STRING[28]	RO	{0}

Index 10F8 Actual Time Stamp

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

Index 1400 ENC RxPDO-Par Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1400:0	ENC RxPDO-Par Control compact	PDO Parameter RxPDO 1	UINT8	RO	0x06 (6_{dec})
1400:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 1	OCTET-STRING[6]	RO	01 16 00 00 00 00

Index 1401 ENC RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1401:0	ENC RxPDO-Par Control	PDO Parameter RxPDO 2	UINT8	RO	0x06 (6_{dec})
1401:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 2	OCTET-STRING[6]	RO	00 16 00 00 00 00

Index 1403 STM RxPDO-Par Position

Index (hex)	Name	Meaning	Data type	Flags	Default
1403:0	STM RxPDO-Par Position	PDO Parameter RxPDO 4	UINT8	RO	0x06 (6_{dec})
1403:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 4	OCTET-STRING[6]	RO	04 16 05 16 06 16

Index 1404 STM RxPDO-Par Velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
1404:0	STM RxPDO-Par Velocity	PDO Parameter RxPDO 5	UINT8	RO	0x06 (6_{dec})
1404:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 5	OCTET-STRING[6]	RO	03 16 05 16 06 16

Index 1405 POS RxPDO-Par Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1405:0	POS RxPDO-Par Control compact	PDO Parameter RxPDO 6	UINT8	RO	0x06 (6_{dec})
1405:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 6	OCTET-STRING[6]	RO	03 16 04 16 06 16

Index 1406 POS RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1406:0	POS RxPDO-Par Control	PDO Parameter RxPDO 7	UINT8	RO	0x06 (6_{dec})
1406:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 7	OCTET-STRING[6]	RO	03 16 04 16 05 16

Index 1600 ENC RxPDO-Map Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	ENC RxPDO-Map Control compact	PDO Mapping RxPDO 1	UINT8	RO	0x07 (7_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x01 (Enable latch C))	UINT32	RO	0x7000:01, 1
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x02 (Enable latch extern on positive edge))	UINT32	RO	0x7000:02, 1
1600:03	SubIndex 003	3. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x03 (Set counter))	UINT32	RO	0x7000:03, 1
1600:04	SubIndex 004	4. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x04 (Enable latch extern on negative edge))	UINT32	RO	0x7000:04, 1
1600:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1600:06	SubIndex 006	6. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1600:07	SubIndex 007	7. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x11 (Set counter value))	UINT32	RO	0x7000:11, 16

Index 1601 ENC RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	ENC RxPDO-Map Control	PDO Mapping RxPDO 2	UINT8	RO	0x07 (7_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x01 (Enable latch C))	UINT32	RO	0x7000:01, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x02 (Enable latch extern on positive edge))	UINT32	RO	0x7000:02, 1
1601:03	SubIndex 003	3. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x03 (Set counter))	UINT32	RO	0x7000:03, 1
1601:04	SubIndex 004	4. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x04 (Enable latch extern on negative edge))	UINT32	RO	0x7000:04, 1
1601:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1601:06	SubIndex 006	6. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1601:07	SubIndex 007	7. PDO Mapping entry (object 0x7000 (ENC Outputs Ch.1), entry 0x11 (Set counter value))	UINT32	RO	0x7000:11, 32

Index 1602 STM RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	STM RxPDO-Map Control	PDO Mapping RxPDO 3	UINT8	RO	0x07 (7_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x01 (Enable))	UINT32	RO	0x7010:01, 1
1602:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x02 (Reset))	UINT32	RO	0x7010:02, 1
1602:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x03 (Reduce torque))	UINT32	RO	0x7010:03, 1
1602:04	SubIndex 004	4. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1602:05	SubIndex 005	5. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1602:06	SubIndex 006	6. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x0C (Digital output 1))	UINT32	RO	0x7010:0C, 1
1602:07	SubIndex 007	7. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4

Index 1603 STM RxPDO-Map Position

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	STM RxPDO-Map Position	PDO Mapping RxPDO 4	UINT8	RO	0x01 (1_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x11 (Position))	UINT32	RO	0x7010:11, 32

Index 1604 STM RxPDO-Map Velocity

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	STM RxPDO-Map Velocity	PDO Mapping RxPDO 5	UINT8	RO	0x01 (1_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (STM Outputs Ch.1), entry 0x21 (Velocity))	UINT32	RO	0x7010:21, 16

Index 1605 POS RxPDO-Map Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	POS RxPDO-Map Control compact	PDO Mapping RxPDO 6	UINT8	RO	0x05 (5_{dec})
1605:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x01 (Execute))	UINT32	RO	0x7020:01, 1
1605:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x02 (Emergency stop))	UINT32	RO	0x7020:02, 1
1605:03	SubIndex 003	3. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1605:04	SubIndex 004	4. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1605:05	SubIndex 005	5. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x11 (Target position))	UINT32	RO	0x7020:11, 32

Index 1606 POS RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1606:0	POS RxPDO-Map Control	PDO Mapping RxPDO 7	UINT8	RO	0x09 (9_{dec})
1606:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x01 (Execute))	UINT32	RO	0x7020:01, 1
1606:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x02 (Emergency stop))	UINT32	RO	0x7020:02, 1
1606:03	SubIndex 003	3. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1606:04	SubIndex 004	4. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1606:05	SubIndex 005	5. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x11 (Target position))	UINT32	RO	0x7020:11, 32
1606:06	SubIndex 006	6. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x21 (Velocity))	UINT32	RO	0x7020:21, 16
1606:07	SubIndex 007	7. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x22 (Start type))	UINT32	RO	0x7020:22, 16
1606:08	SubIndex 008	8. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x23 (Acceleration))	UINT32	RO	0x7020:23, 16
1606:09	SubIndex 009	9. PDO Mapping entry (object 0x7020 (POS Outputs Ch.1), entry 0x24 (Deceleration))	UINT32	RO	0x7020:24, 16

Index 1800 ENC TxPDO-Par Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1800:0	ENC TxPDO-Par Status compact	PDO Parameter TxPDO 1	UINT8	RO	0x06 (6_{dec})
1800:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 1	OCTET-STRING[2]	RO	01 1A

Index 1801 ENC TxPDO-Par Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1801:0	ENC TxPDO-Par Status	PDO Parameter TxPDO 2	UINT8	RO	0x06 (6_{dec})
1801:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 2	OCTET-STRING[2]	RO	00 1A

Index 1806 POS TxPDO-Par Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1806:0	POS TxPDO-Par Status compact	PDO Parameter TxPDO 7	UINT8	RO	0x06 (6_{dec})
1806:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 7	OCTET-STRING[2]	RO	07 1A

Index 1807 POS TxPDO-Par Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1807:0	POS TxPDO-Par Status	PDO Parameter TxPDO 8	UINT8	RO	0x06 (6_{dec})
1807:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 8	OCTET-STRING[2]	RO	06 1A

Index 1A00 ENC TxPDO-Map Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	ENC TxPDO-Map Status compact	PDO Mapping TxPDO 1	UINT8	RO	0x11 (17_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x01 (Latch C valid))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x02 (Latch extern valid))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x03 (Set counter done))	UINT32	RO	0x6000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x04 (Counter underflow))	UINT32	RO	0x6000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x05 (Counter overflow))	UINT32	RO	0x6000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x08 (Extrapolation stall))	UINT32	RO	0x6000:08, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x09 (Status of input A))	UINT32	RO	0x6000:09, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0A (Status of input B))	UINT32	RO	0x6000:0A, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0B (Status of input C))	UINT32	RO	0x6000:0B, 1
1A00:0B	SubIndex 011	11. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A00:0C	SubIndex 012	12. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0D (Status of extern latch))	UINT32	RO	0x6000:0D, 1
1A00:0D	SubIndex 013	13. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A00:0E	SubIndex 014	14. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A00:0F	SubIndex 015	15. PDO Mapping entry (object 0x1800 (ENC TxPDO-Par Status compact), entry 0x09)	UINT32	RO	0x1800:09, 1
1A00:10	SubIndex 016	16. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x11 (Counter value))	UINT32	RO	0x6000:11, 16
1A00:11	SubIndex 017	17. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x12 (Latch value))	UINT32	RO	0x6000:12, 16

Index 1A01 ENC TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	ENC TxPDO-Map Status	PDO Mapping TxPDO 2	UINT8	RO	0x11 (17_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x01 (Latch C valid))	UINT32	RO	0x6000:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x02 (Latch extern valid))	UINT32	RO	0x6000:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x03 (Set counter done))	UINT32	RO	0x6000:03, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x04 (Counter underflow))	UINT32	RO	0x6000:04, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x05 (Counter overflow))	UINT32	RO	0x6000:05, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A01:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x08 (Extrapolation stall))	UINT32	RO	0x6000:08, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x09 (Status of input A))	UINT32	RO	0x6000:09, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0A (Status of input B))	UINT32	RO	0x6000:0A, 1
1A01:0A	SubIndex 010	10. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0B (Status of input C))	UINT32	RO	0x6000:0B, 1
1A01:0B	SubIndex 011	11. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A01:0C	SubIndex 012	12. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x0D (Status of extern latch))	UINT32	RO	0x6000:0D, 1
1A01:0D	SubIndex 013	13. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A01:0E	SubIndex 014	14. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A01:0F	SubIndex 015	15. PDO Mapping entry (object 0x1801 (ENC TxPDO-Par Status), entry 0x09)	UINT32	RO	0x1801:09, 1
1A01:10	SubIndex 016	16. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x11 (Counter value))	UINT32	RO	0x6000:11, 32
1A01:11	SubIndex 017	17. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x12 (Latch value))	UINT32	RO	0x6000:12, 32

Index 1A02 ENC TxPDO-Map Timest. compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	ENC TxPDO-Map Timest. compact	PDO Mapping TxPDO 3	UINT8	RO	0x01 (1_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (ENC Inputs Ch.1), entry 0x16 (Timestamp))	UINT32	RO	0x6000:16, 32

Index 1A03 STM TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	STM TxPDO-Map Status	PDO Mapping TxPDO 4	UINT8	RO	0x0E (14_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x01 (Ready to enable))	UINT32	RO	0x6010:01, 1
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x02 (Ready))	UINT32	RO	0x6010:02, 1
1A03:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x03 (Warning))	UINT32	RO	0x6010:03, 1
1A03:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x04 (Error))	UINT32	RO	0x6010:04, 1
1A03:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x05 (Moving positive))	UINT32	RO	0x6010:05, 1
1A03:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x06 (Moving negative))	UINT32	RO	0x6010:06, 1
1A03:07	SubIndex 007	7. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x07 (Torque reduced))	UINT32	RO	0x6010:07, 1
1A03:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x6010:08, 1
1A03:09	SubIndex 009	9. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1A03:0A	SubIndex 010	10. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x0C (Digital input 1))	UINT32	RO	0x6010:0C, 1
1A03:0B	SubIndex 011	11. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x0D (Digital input 2))	UINT32	RO	0x6010:0D, 1
1A03:0C	SubIndex 012	12. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x6010:0E, 1
1A03:0D	SubIndex 013	13. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A03:0E	SubIndex 014	14. PDO Mapping entry (object 0x1803, entry 0x09)	UINT32	RO	0x6010:10, 1

Index 1A04 STM TxPDO-Map Synchron info data

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	STM TxPDO-Map Synchron info data	PDO Mapping TxPDO 5	UINT8	RO	0x02 (2_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x11 (Info data 1))	UINT32	RO	0x6010:11, 16
1A04:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (STM Inputs Ch.1), entry 0x12 (Info data 2))	UINT32	RO	0x6010:12, 16

Index 1A05 STM TxPDO-Map Motor load

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	STM TxPDO-Map Motor load	PDO Mapping TxPDO 6	UINT8	RO	0x01 (1_{dec})
1A05:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x01 (Busy))	UINT32	RO	0x6010:13, 16

Index 1A06 POS TxPDO-Map Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A06:0	POS TxPDO-Map Status compact	PDO Mapping TxPDO 7	UINT8	RO	0x09 (9_{dec})
1A06:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x01 (Busy))	UINT32	RO	0x6020:01, 1
1A06:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x02 (In-Target))	UINT32	RO	0x6020:02, 1
1A06:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x03 (Warning))	UINT32	RO	0x6020:03, 1
1A06:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x04 (Error))	UINT32	RO	0x6020:04, 1
1A06:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x05 (Calibrated))	UINT32	RO	0x6020:05, 1
1A06:06	SubIndex 006	6. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x06 (Accelerate))	UINT32	RO	0x6020:06, 1
1A06:07	SubIndex 007	7. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x07 (Decelerate))	UINT32	RO	0x6020:07, 1
1A06:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A06:09	SubIndex 009	9. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8

Index 1A07 POS TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A07:0	POS TxPDO-Map Status	PDO Mapping TxPDO 8	UINT8	RO	0x0C (12_{dec})
1A07:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x01 (Busy))	UINT32	RO	0x6020:01, 1
1A07:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x02 (In-Target))	UINT32	RO	0x6020:02, 1
1A07:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x03 (Warning))	UINT32	RO	0x6020:03, 1
1A07:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x04 (Error))	UINT32	RO	0x6020:04, 1
1A07:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x05 (Calibrated))	UINT32	RO	0x6020:05, 1
1A07:06	SubIndex 006	6. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x06 (Accelerate))	UINT32	RO	0x6020:06, 1
1A07:07	SubIndex 007	7. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x07 (Decelerate))	UINT32	RO	0x6020:07, 1
1A07:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A07:09	SubIndex 009	9. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1A07:0A	SubIndex 010	10. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x11 (Actual position))	UINT32	RO	0x6020:11, 32
1A07:0B	SubIndex 011	11. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x21 (Actual velocity))	UINT32	RO	0x6020:21, 16
1A07:0C	SubIndex 012	12. PDO Mapping entry (object 0x6020 (POS Inputs Ch.1), entry 0x22 (Actual drive time))	UINT32	RO	0x6020:22, 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	0x03 (3_{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	0x1602 (5634_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1604 (5636_{dec})

Index 1C13 TxPDO assign

Index (hex)	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	0x1A03 (6659_{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})

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: • 0: Free Run • 1: Synchron with SM 2 Event • 2: DC-Mode - Synchron with SYNC0 Event • 3: DC-Mode - Synchron with SYNC1 Event	UINT16	RW	0x0001 (1_{dec})
1C32:02	Cycle time	Cycle time (in ns): • Free Run: Cycle time of the local timer • Synchron with SM 2 Event: Master cycle time • DC-Mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x000F4240 (1000000_{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 [▶ 134])	UINT16	RO	0xC007 (49159_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x0003D090 (250000_{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 [▶ 134], 0x1C32:05 [▶ 134], 0x1C32:06 [▶ 134], 0x1C32:09 [▶ 134], 0x1C33:03 [▶ 135], 0x1C33:06 [▶ 134], 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: • 0: Free Run • 1: Synchronous with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchronous with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 134]	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{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 [▶ 135])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 134]	UINT32	RO	0x0003D090 (250000_{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	0x00000000 (0_{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	0x00000000 (0_{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})

4.3.2.3 Profile-specific objects (0x6000-0xFFFF)

The profile-specific objects have the same meaning for all EtherCAT slaves that support the profile 5001.

Index 6000 ENC Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	ENC Inputs Ch.1	Maximum subindex	UINT8	RO	0x16 (22_{dec})
6000:01	Latch C valid		BOOLEAN	RO	0x00 (0_{dec})
6000:02	Latch extern valid		BOOLEAN	RO	0x00 (0_{dec})
6000:03	Set counter done		BOOLEAN	RO	0x00 (0_{dec})
6000:04	Counter underflow		BOOLEAN	RO	0x00 (0_{dec})
6000:05	Counter overflow		BOOLEAN	RO	0x00 (0_{dec})
6000:08	Extrapolation stall		BOOLEAN	RO	0x00 (0_{dec})
6000:09	Status of input A		BOOLEAN	RO	0x00 (0_{dec})
6000:0A	Status of input B		BOOLEAN	RO	0x00 (0_{dec})
6000:0B	Status of input C		BOOLEAN	RO	0x00 (0_{dec})
6000:0D	Status of extern latch		BOOLEAN	RO	0x00 (0_{dec})
6000:0E	Sync error		BOOLEAN	RO	0x00 (0_{dec})
6000:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6000:11	Counter value		UINT32	RO	0x00000000 (0_{dec})
6000:12	Latch value		UINT32	RO	0x00000000 (0_{dec})
6000:16	Timestamp		UINT32	RO	0x00000000 (0_{dec})

Index 6010 STM Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	STM Inputs Ch.1	Maximum subindex	UINT8	RO	0x13 (19_{dec})
6010:01	Ready to enable		BOOLEAN	RO	0x00 (0_{dec})
6010:02	Ready		BOOLEAN	RO	0x00 (0_{dec})
6010:03	Warning		BOOLEAN	RO	0x00 (0_{dec})
6010:04	Error		BOOLEAN	RO	0x00 (0_{dec})
6010:05	Moving positive		BOOLEAN	RO	0x00 (0_{dec})
6010:06	Moving negative		BOOLEAN	RO	0x00 (0_{dec})
6010:07	Torque reduced		BOOLEAN	RO	0x00 (0_{dec})
6010:08	Motor stall		BOOLEAN	RO	0x00 (0_{dec})
6010:0C	Digital input 1		BOOLEAN	RO	0x00 (0_{dec})
6010:0D	Digital input 2		BOOLEAN	RO	0x00 (0_{dec})
6010:0E	Sync error		BOOLEAN	RO	0x00 (0_{dec})
6010:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6010:11	Info data 1		UINT16	RO	0x0000 (0_{dec})
6010:12	Info data 2		UINT16	RO	0x0000 (0_{dec})
6010:13	Moto load		UINT16	RO	0x0000 (0_{dec})

Index 6020 POS Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	POS Inputs Ch.1	Maximum subindex	UINT8	RO	0x22 (34_{dec})
6020:01	Busy		BOOLEAN	RO	0x00 (0_{dec})
6020:02	In-Target		BOOLEAN	RO	0x00 (0_{dec})
6020:03	Warning		BOOLEAN	RO	0x00 (0_{dec})
6020:04	Error		BOOLEAN	RO	0x00 (0_{dec})
6020:05	Calibrated		BOOLEAN	RO	0x00 (0_{dec})
6020:06	Accelerate		BOOLEAN	RO	0x00 (0_{dec})
6020:07	Decelerate		BOOLEAN	RO	0x00 (0_{dec})
6020:11	Actual position		UINT32	RO	0x00007FFF (32767_{dec})
6020:21	Actual velocity		INT16	RO	0x0000 (0_{dec})
6020:22	Actual drive time		UINT32	RO	0x00000000 (0_{dec})

Index 7000 ENC Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	ENC Outputs Ch.1	Maximum subindex	UINT8	RO	0x11 (17_{dec})
7000:01	Enable latch C		BOOLEAN	RO	0x00 (0_{dec})
7000:02	Enable latch extern on positive edge		BOOLEAN	RO	0x00 (0_{dec})
7000:03	Set counter		BOOLEAN	RO	0x00 (0_{dec})
7000:04	Enable latch extern on negative edge		BOOLEAN	RO	0x00 (0_{dec})
7000:11	Set counter value		UINT32	RO	0x00000000 (0_{dec})

Index 7010 STM Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	STM Outputs Ch.1	Maximum subindex	UINT8	RO	0x21 (33_{dec})
7010:01	Enable		BOOLEAN	RO	0x00 (0_{dec})
7010:02	Reset		BOOLEAN	RO	0x00 (0_{dec})
7010:03	Reduce torque		BOOLEAN	RO	0x00 (0_{dec})
7010:0C	Digital output 1		BOOLEAN	RO	0x00 (0_{dec})
7010:11	Position		UINT32	RO	0x00000000 (0_{dec})
7010:21	Velocity		INT16	RO	0x0000 (0_{dec})

Index 7020 POS Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7020:0	POS Outputs Ch.1	Maximum subindex	UINT8	RO	0x24 (36_{dec})
7020:01	Execute		BOOLEAN	RO	0x00 (0_{dec})
7020:02	Emergency stop		BOOLEAN	RO	0x00 (0_{dec})
7020:11	Target position		UINT32	RO	0x00007FFF (32767_{dec})
7020:21	Velocity		INT16	RO	0x0000 (0_{dec})
7020:22	Start type		UINT16	RO	0x0000 (0_{dec})
7020:23	Acceleration		UINT16	RO	0x0000 (0_{dec})
7020:24	Deceleration		UINT16	RO	0x0000 (0_{dec})

Index 8014 STM Motor Features Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8014:0	STM Motor Features Ch.1	Maximum subindex	UINT8	RO	0x31 (49_{dec})
8014:01	Chopper: Mode		BIT2	RW	0x00 (0_{dec})
8014:03	Chopper: Off time		BIT4	RW	0x05 (5_{dec})
8014:07	Chopper: Comparator disabled		BOOLEAN	RW	0x00 (0_{dec})
8014:08	Chopper: Fast decay time		BIT4	RW	0x03 (3_{dec})
8014:0C	Chopper: Sine wave offset		BIT4	RW	0x03 (3_{dec})
8014:11	Chopper: Hysteresis start value		BIT3	RW	0x02 (2_{dec})
8014:14	Chopper: Hysteresis end value		BIT4	RW	0x06 (6_{dec})
8014:18	Chopper: Hysteresis decrement time		BIT2	RW	0x00 (0_{dec})
8014:1A	Stall guard: Filter enable		BOOLEAN	RW	0x01 (1_{dec})
8014:1B	Stall guard: Current up step width		BIT2	RW	0x00 (0_{dec})
8014:1D	Stall guard: Current down step speed		BIT2	RW	0x00 (0_{dec})
8014:1F	Stall guard: Minimum current		BIT1	RW	0x00 (0_{dec})
8014:21	Stall guard: Minimum value		BIT4	RW	0x00 (0_{dec})
8014:25	Stall guard: Hysteresis value		BIT4	RW	0x00 (0_{dec})
8014:31	Stall guard: Threshold value		INT8	RW	0x01 (1_{dec})

Index 9010 STM Info data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
9010:0	STM Info data Ch.1	Maximum subindex	UINT8	RO	0x0C (12_{dec})
9010:01	Status word		UINT16	RO	0x0000 (0_{dec})
9010:08	Motor velocity		INT16	RO	0x0000 (0_{dec})
9010:09	Internal position		UINT32	RO	0x00000000 (0_{dec})
9010:0A	Status word 2		UINT16	RO	0x0000 (0_{dec})
9010:0B	Motor load		UINT16	RO	0x0000 (0_{dec})
9010:0C	Motor smart current		UINT8	RO	0x00 (0_{dec})

Index 9020 POS Info data Ch.1

Index (hex)	Motor smart current>Name	Meaning	UINT8>Data type	RO>Flags	0x00 (0_{dec})>default
9020:0	POS Info data Ch.1	Maximum subindex	UINT8	RO	0x03 (3_{dec})
9020:01	Status word		UINT16	RO	0x0000 (0_{dec})
9020:03	State (drive controller)		UINT16	RO	0xFFFF (65535_{dec})

Index 9020 POS Info data Ch.1

Index (hex)	State (drive controller)>Name	Meaning	UINT16>Data type	RO>Flags	0xFFFF (65535_{dec})>default
9020:0	POS Info data Ch.1	Maximum subindex	UINT8	RO	0x03 (3_{dec})
9020:01	Status word		UINT16	RO	0x0000 (0_{dec})
9020:03	State (drive controller)		UINT16	RO	0xFFFF (65535_{dec})

Index A010 STM Diag data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
A010:0	STM Diag data Ch.1	Maximum subindex	UINT8	RO	0x11 (17_{dec})
A010:01	Saturated		BOOLEAN	RO	0x00 (0_{dec})
A010:02	Over temperature		BOOLEAN	RO	0x00 (0_{dec})
A010:03	Torque overload		BOOLEAN	RO	0x00 (0_{dec})
A010:04	Under voltage		BOOLEAN	RO	0x00 (0_{dec})
A010:05	Over voltage		BOOLEAN	RO	0x00 (0_{dec})
A010:06	Short circuit		BOOLEAN	RO	0x00 (0_{dec})
A010:08	No control power		BOOLEAN	RO	0x00 (0_{dec})
A010:09	Misc error		BOOLEAN	RO	0x00 (0_{dec})
A010:0A	Configuration		BOOLEAN	RO	0x00 (0_{dec})
A010:0B	Motor stall		BOOLEAN	RO	0x00 (0_{dec})
A010:11	Actual operation mode		BIT4	RO	0x00 (0_{dec})

Index A020 POS Diag data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
A020:0	POS Diag data Ch.1	Maximum subindex	UINT8	RO	0x03 (3_{dec})
A020:01	Command rejected		BOOLEAN	RO	0x00 (0_{dec})
A020:02	Command aborted		BOOLEAN	RO	0x00 (0_{dec})
A020:03	Target overrun		BOOLEAN	RO	0x00 (0_{dec})

Index F000 Modular device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	Maximum sub-index	UINT8	RO	0x02 (2_{dec})
F000:01	Module index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0003 (3_{dec})

Index F008 Code word

Index (hex)	Name	Meaning	Data type	Flags	Default
F008:0	Code word		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	0x03 (3_{dec})
F010:01	SubIndex 001		UINT32	RW	0x000001FF (511_{dec})
F010:02	SubIndex 002		UINT32	RW	0x000002BF (703_{dec})
F010:03	SubIndex 003		UINT32	RW	0x000002C0 (704_{dec})

Index F80F STM Vendor data

Index (hex)	Name	Meaning	Data type	Flags	Default
F80F:0	STM Vendor data	Maximum subindex	UINT8	RO	0x09 (9_{dec})
F80F:04	Warning temperature		INT8	RW	0x50 (80_{dec})
F80F:05	Switch off temperature		INT8	RW	0x64 (100_{dec})
F80F:09	Maximum current		UINT16	RW	0x1DC9 (7625_{dec})

Index F81F STM Vendor data 2

Index (hex)	Name	Meaning	Data type	Flags	Default
F81F:0	STM Vendor data 2	Maximum subindex	UINT8	RO	0x0A (10_{dec})
F81F:01	Slope control low side		BIT2	RW	0x00 (0_{dec})
F81F:03	Slope control high side		BIT2	RW	0x00 (0_{dec})
F81F:05	Sense voltage		BIT1	RW	0x00 (0_{dec})
F81F:08	Blank time		BIT2	RW	0x03 (3_{dec})

Index F900 STM Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
F900:0	STM Info data	Maximum subindex	UINT8	RO	0x07 (7_{dec})
F900:01	Software version (driver)		STRING	RO	
F900:02	Internal temperature		INT8	RO	0x00 (0_{dec})
F900:04	Control voltage		UINT16	RO	0x0000 (0_{dec})
F900:05	Motor supply voltage		UINT16	RO	0x0000 (0_{dec})
F900:06	Cycle time		UINT16	RO	0x0000 (0_{dec})
F900:07	Motor supply current		UINT16	RO	0x0000 (0_{dec})

5 Appendix

5.1 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 Fieldbus/EtherCAT Box 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

5.2 EtherCAT Box- / EtherCAT P Box - Accessories

Fixing

Ordering information	Description
ZS5300-0001	Mounting rail (500 mm x 129 mm)

Marking material, plugs

Ordering information	Description
ZS5000-0000	Fieldbus Box set M8 (contact labels, plugs)
ZS5000-0002	Fieldbus Box set M12 (contact labels, plugs)
ZS5000-0010	plugs M8, IP67 (50 pieces)
ZS5000-0020	plugs M12, IP67 (50 pieces)
ZS5100-0000	marking labels, not printed, 4 stripes at 10 pieces
ZS5100-xxxx	printed marking labels, on request

Tools

Ordering information	Description
ZB8800	torque wrench for M8 cables with knurl, incl. ratchet
ZB8800-0001	M12 ratchet for torque wrench ZB8800
ZB8800-0002	M8 ratchet (field assembly) for torque wrench ZB8800
ZB8801-0000	torque wrench for hexagonal plugs, adjustable
ZB8801-0001	torque cable key, M8/wrench size 9, for torque wrench ZB8801-0000
ZB8801-0002	torque cable key, M12/wrench size 13, for torque wrench ZB8801-0000
ZB8801-0003	torque cable key, M12 field assembly/wrench size 13, for torque wrench ZB8801-0000

Further accessories

Further accessories may be found at the price list for Beckhoff fieldbus components and at the internet under https://www.beckhoff.com

5.3 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

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You will also find further documentation for Beckhoff components there.

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List of illustrations