BECKHOFF New Automation Technology

Documentation | EN

EL252x

EtherCAT Terminals, pulse train output, incr. enc. simulation



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1 Foreword

1.1 Product overview Pulse Train Output Terminals

This documentation covers the following products:

EL2521 [▶ 10]	EtherCAT Terminal, 1 channel pulse train output, incremental encoder simulation, RS422, 50 mA
EL2521-0024 [▶ 13]	EtherCAT Terminal, 1 channel pulse train output, incremental encoder simulation, 24 V DC, 1 A
EL2521-0025 [▶ 13]	EtherCAT Terminal, 1 channel pulse train output, incremental encoder simulation, 24 V DC, 1 A, ground switching
EL2521-0124 [▶ 16]	EtherCAT Terminal, 1 channel pulse train output, incremental encoder simulation, 24 V DC, 1 A, with capture/compare inputs and outputs
EL2522 [▶ 19]	EtherCAT Terminal, 2 channel pulse train output, incremental encoder simulation, RS422, 50 mA

Use the tabular product overview or the product finder to find the right product for your application (https://www.beckhoff.com/IO).

1.2 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.
The qualified personnel is obliged to always use the currently valid documentation.

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.

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1.3 Guide through documentation

NOTICE



Further components of documentation

This documentation describes device-specific content. It is part of the modular documentation concept for Beckhoff I/O components. For the use and safe operation of the devices described in this documentation, additional cross-product descriptions are required, which can be found in the following table.

Title	Description
EtherCAT System Documentation (PDF)	• System overview • EtherCAT basics • Cable redundancy • Hot Connect • EtherCAT devices configuration
Explosion Protection for Terminal Systems (PDF)	Notes on the use of the Beckhoff terminal systems in hazardous areas according to ATEX and IECEx
Control Drawing I/O, CX, CPX (PDF)	Connection diagrams and Ex markings (conform to cFMus)
Infrastructure for EtherCAT/Ethernet (PDF)	Technical recommendations and notes for design, implementation and testing
Software Declarations I/O (PDF)	Open source software declarations for Beckhoff I/O components

The documentations can be viewed at and downloaded from the Beckhoff website (www.beckhoff.com) via:

- the “Documentation and Download” area of the respective product page,
- the Download finder,
- the Beckhoff Information System.

If you have any suggestions or proposals for our documentation, please send us an e-mail stating the documentation title and version number to: documentation@beckhoff.com

1.4 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.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

⚠ DANGER
Hazard with high risk of death or serious injury.

⚠ WARNING
Hazard with medium risk of death or serious injury.

⚠ CAUTION
There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE
The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example:
recommendations for action, assistance or further information on the product.

1.5 Documentation issue status

Version	Comment
4.4.0	• Update chapter “Foreword” • Update chapter “Product description” • Update Technical data • Chapter “IECEx Special conditions” and “cFMus – Special conditions” added • Update chapter “Connection” • Update chapter “Basic function principles” • Update revision status • Structural update
4.3	• Update chapter “Technical data” • Update chapter “Installation and wiring” • Update chapter “EL2522 – LEDs and connection” • Structural update
4.2	• Update chapter “Basic function principles” • Structural update • Update revision status
4.1	• New title page • Update chapter “Technical data” • Structural update • Update revision status
4.0	• Update chapter “Technical data” • Structural update
0.1–3.9	• archived

2 EL2521 - Product description

2.1 Introduction

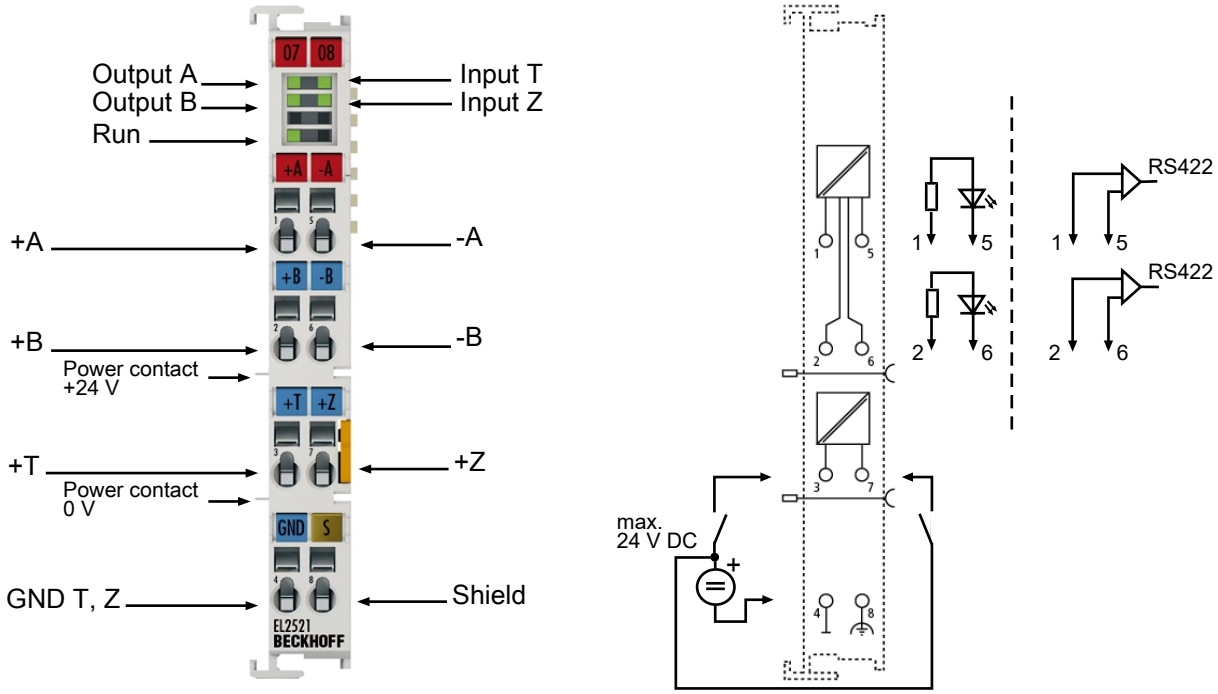


Fig. 1: EL2521

EtherCAT Terminal, 1 channel pulse train output, incremental encoder simulation, RS422, 50 mA

The EL2521 output terminal sends a pulse train to downstream receiving devices, such as motor output stages. For this purpose, it has 2 output channels A and B on the hardware side, the relationship between which can be set, e.g. as a direction-dependent encoder characteristic. The EL2521 supports two functions

- Pulse output with variable frequency
- Travel mode: pulse output with variable frequency and number of pulses

The EtherCAT Terminals indicate their signal state by means of light-emitting diodes. The LEDs are clocked with the outputs and each displays an active output.

The EL2521 has two RS422 outputs and two digital inputs, +T and +Z. The inputs can be used, for example, to read the “Ready”, “In target”, or “At speed” signals from a variable frequency drive and process them in the control. The signals are not given any pre-processing.

Pulse width modulation is not possible

Pulse width modulation is not possible with the EL2521-xxxx series EtherCAT devices.

Quick links

- EtherCAT basic function principles (see the EtherCAT system manual, chapter “Basic I/O configuration”)
- Commissioning [▶ 53]
- CoE description EL2521-00xx:
  normal mode (Legacy MDP252) [▶ 78],
  extended mode (Standard MDP253/511) [▶ 86]
- Process data and operation modes [▶ 74]

2.2 Technical data

Technical data	EL2521
Digital outputs	1 channel (2 differential outputs A, B)
Digital inputs	2 (+T, +Z)
Signal voltage	RS422 level
Load type	RS422 and optocoupler, min. 120 Ω
Max. output current (per channel)	50 mA, RS422 specification
Switching threshold, “T” and “Z” inputs	High: > 5 V (max. 24 V DC), Low: < 1 V
Base frequency	0...500 kHz (default: 50 kHz)
Resolution	max. 15 bits
Step size	10 mHz
Power supply for the electronics	via the E-bus
Current consumption via E-bus	typ. 280 mA (load-dependent)
Electrical isolation	500 V (E-bus/field voltage)
Bit width in process image	def. 16 bit data in, 16 bit data out, 16 bit control, 16 bit status
Configuration	via TwinCAT System Manager
Weight	approx. 55 g
Approved ambient temperature range during operation	0...55 °C
Approved ambient temperature range during storage	-25...+85 °C
Approved relative air humidity	95%, no condensation
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm
Installation [▶ 23]	on 35 mm DIN mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 34] for enhanced mechanical load capacity
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 rating	IP20
Installation position	variable
Approvals/markings*)	CE, EAC, UKCA, CCC ATEX [▶ 24], IECEx [▶ 26], cFMus [▶ 28] cULus [▶ 30]

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc
cFMus	Class I, Division 2, Groups A, B, C, D Class I, Zone 2, AEx/Ex ec IIC T4 Gc

2.3 Start Up

For commissioning:

- mount the EtherCAT devices EL252x as described in the chapter Mounting and wiring [▶ 23]
- Configure the EtherCAT devices EL252x as described in the following chapters:
  - “Commissioning [▶ 53]”
  - In the EtherCAT system manual in the following chapters
    “Getting started with TwinCAT”
    “Basic I/O configuration”.

3 EL2521-0024, EL2521-0025 - Product description

3.1 Introduction

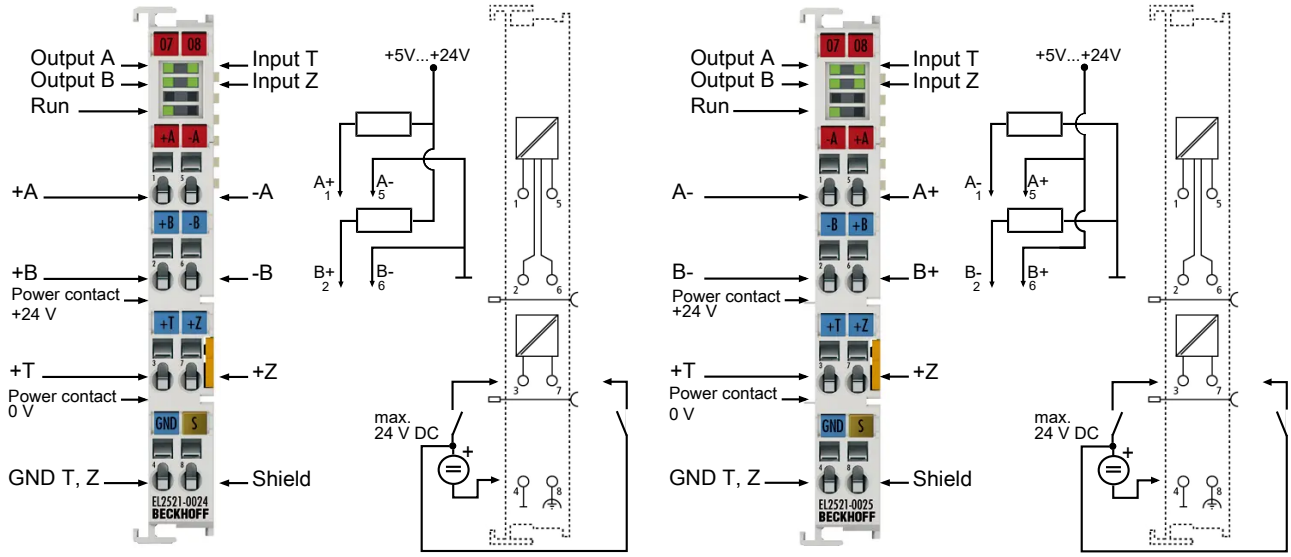


Fig. 2: EL2521-0024, EL2521-0025

EtherCAT Terminals, 1 channel pulse train output, incremental encoder simulation, 24 V DC, 1 A

The EL2521-0024 and EL2521-0025 output terminals output a pulse sequence to downstream receiving devices such as motor output stages. For this purpose, it has 2 output channels A and B on the hardware side, the relationship between which can be set, e.g. as a direction-dependent encoder characteristic. The EL2521-xxxx supports two functions

- Pulse output with variable frequency
- Travel mode: pulse output with variable frequency and number of pulses

The EtherCAT Terminals indicate their signal state by means of light-emitting diodes. The LEDs are clocked with the outputs and each displays an active output.

- In the EL2521-0024 the two output channels are designed as potential-free FET switches and can be supplied externally.
- In the EL2521-0025 the two output channels are ground switching, potential-free FET switches and can also be supplied externally. Note the logic reversal in the control.

Terminals EL2521-0024 and EL2521-0025 have two digital inputs, +T and +Z, which can be used to read the “Ready”, “In target”, or “At speed” signals from a variable frequency drive and process them in the control. The signals are not given any pre-processing.

Pulse width modulation is not possible

Pulse width modulation is not possible with the EL2521-xxxx series EtherCAT devices.

Quick links

- EtherCAT basic function principles (see the EtherCAT system manual, chapter “Basic I/O configuration”)
- Commissioning [▶ 53]
- CoE description EL2521-00xx:
  normal mode (Legacy MDP252) [▶ 78],
  extended mode (Standard MDP253/511) [▶ 86]
- Process data and operation modes [▶ 74]

3.2 Technical data

Technical data	EL2521-0024	EL2521-0025
Digital outputs	1 channel (2 potential-free FET outputs)	1 channel (2 potential-free FET outputs), ground switching
Digital inputs	2 (+T, +Z)	
Signal voltage	5…24 V DC, external supply	
Load type	variable	
Max. output current (per channel)	max. 1 A	
Switching threshold, "T" and "Z" inputs	High: > 5 V (max. 24 V DC), Low: < 1 V	
Base frequency	0...500 kHz (default: 50 kHz)	
Resolution	max. 15 bits	
Step size	10 mHz	
Power supply for the electronics	via the E-bus	
Current consumption via E-bus	typ. 280 mA (load-dependent)	
Electrical isolation	500 V (E-bus/field voltage)	
Bit width in process image	def. 16 bit data in, 16 bit data out, 16 bit control, 16 bit status	
Configuration	via TwinCAT System Manager	
Weight	approx. 55 g	
Approved ambient temperature range during operation	0...55 °C	
Approved ambient temperature range during storage	-25...+85 °C	
Approved relative air humidity	95%, no condensation	
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm	
Installation [▶ 23]	on 35 mm DIN mounting rail, conforms to EN 60715	
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 34] for enhanced mechanical load capacity	
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 rating	IP20	
Installation position	variable	
Approvals/markings*)	CE, EAC, UKCA, CCC ATEX [▶ 24], IECEx [▶ 26], cFMus [▶ 28] cULus [▶ 30]	

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc
cFMus	Class I, Division 2, Groups A, B, C, D Class I, Zone 2, AEx/Ex ec IIC T4 Gc

3.3 Start Up

For commissioning:

- mount the EtherCAT devices EL252x as described in the chapter Mounting and wiring [▶ 23]
- Configure the EtherCAT devices EL252x as described in the following chapters:
  - “Commissioning [▶ 53]”
  - In the EtherCAT system manual in the following chapters
    “Getting started with TwinCAT”
    “Basic I/O configuration”.

4 EL2521-0124 - Product description

4.1 Introduction

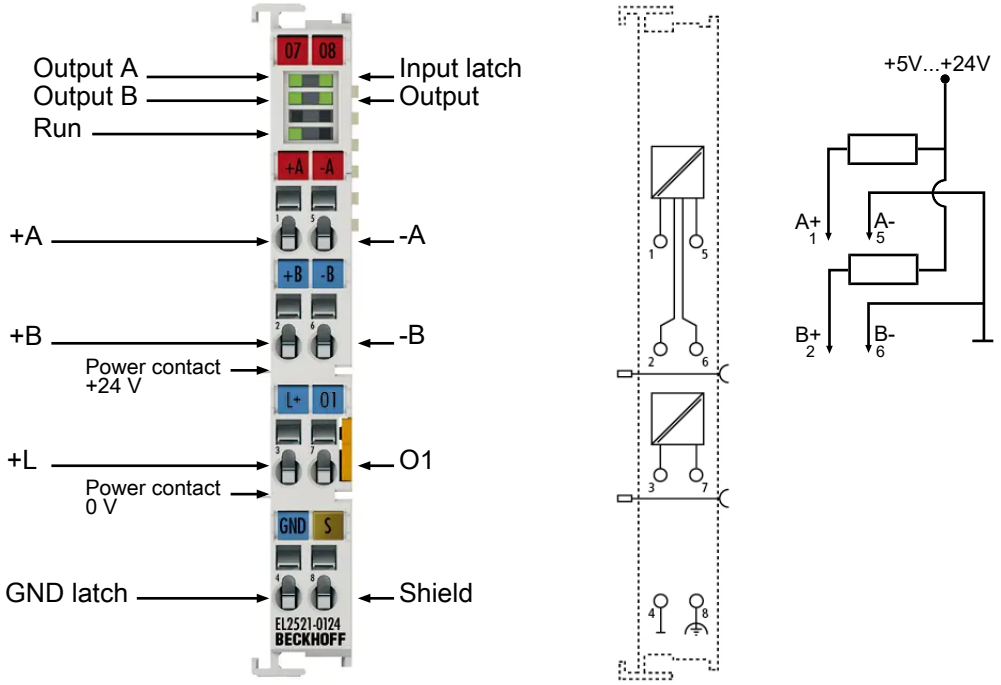


Fig. 3: EL2521-0124

EtherCAT Terminal, 1 channel pulse train output, incremental encoder simulation, 24 V DC, 1 A, with capture/compare inputs and outputs

The EL2521-0124 output terminal sends a pulse train to downstream receiving devices, such as motor output stages. For this purpose, it has 2 output channels A and B on the hardware side, the relationship between which can be set, e.g. as a direction-dependent encoder characteristic. The EL2521-0124 supports two functions

- Pulse output with variable frequency
- Travel mode: pulse output with variable frequency and number of pulses

The EtherCAT Terminals indicate their signal state by means of light-emitting diodes. The LEDs are clocked with the outputs and each displays an active output.

The EL2521-0124 also has potential-free FET switches like the EL2521-0024, but is also equipped with a latch input and a 24 V output.

Pulse width modulation is not possible

Pulse width modulation is not possible with the EL2521-xxxx series EtherCAT devices.

Quick links

- EtherCAT basic function principles (see the EtherCAT system manual, chapter “Basic I/O configuration”)
- Commissioning [▶ 53]
- CoE description EL2521-0124:
  enhanced operation mode (Standard MDP253/511) [▶ 98]
- Process data and operation modes [▶ 74]

4.2 Technical data

Technical data	EL2521-0124
Digital outputs	1 channel (2 FET outputs) 1 x 24 V output
Digital inputs	1 x Latch input, (5…24 V DC)
Signal voltage	24 V DC, external supply
Load type	variable
Max. output current (per channel)	max. 1 A
Switching threshold, +L input	High: > 5 V (max. 24 V DC), Low: < 1 V
Base frequency	0 ... 500 kHz (default: 50 kHz)
Resolution	max. 15 bits
Step size	10 mHz
Power supply for the electronics	via the E-bus
Current consumption via E-bus	typ. 280 mA (load-dependent)
Electrical isolation	500 V (E-bus/field voltage)
Bit width in process image	def. 16 bit data in, 16 bit data out, 16 bit control, 16 bit status
Configuration	via TwinCAT System Manager
Weight	approx. 55 g
Approved ambient temperature range during operation	0...55 °C
Approved ambient temperature range during storage	-25...+85 °C
Approved relative air humidity	95%, no condensation
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm
Installation [▶ 23]	on 35 mm DIN mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 34] for enhanced mechanical load capacity
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 rating	IP20
Installation position	variable
Approvals/markings*)	CE, EAC, UKCA, CCC ATEX [▶ 24], IECEx [▶ 26], cFMus [▶ 28] cULus [▶ 30]

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc
cFMus	Class I, Division 2, Groups A, B, C, D Class I, Zone 2, AEx/Ex ec IIC T4 Gc

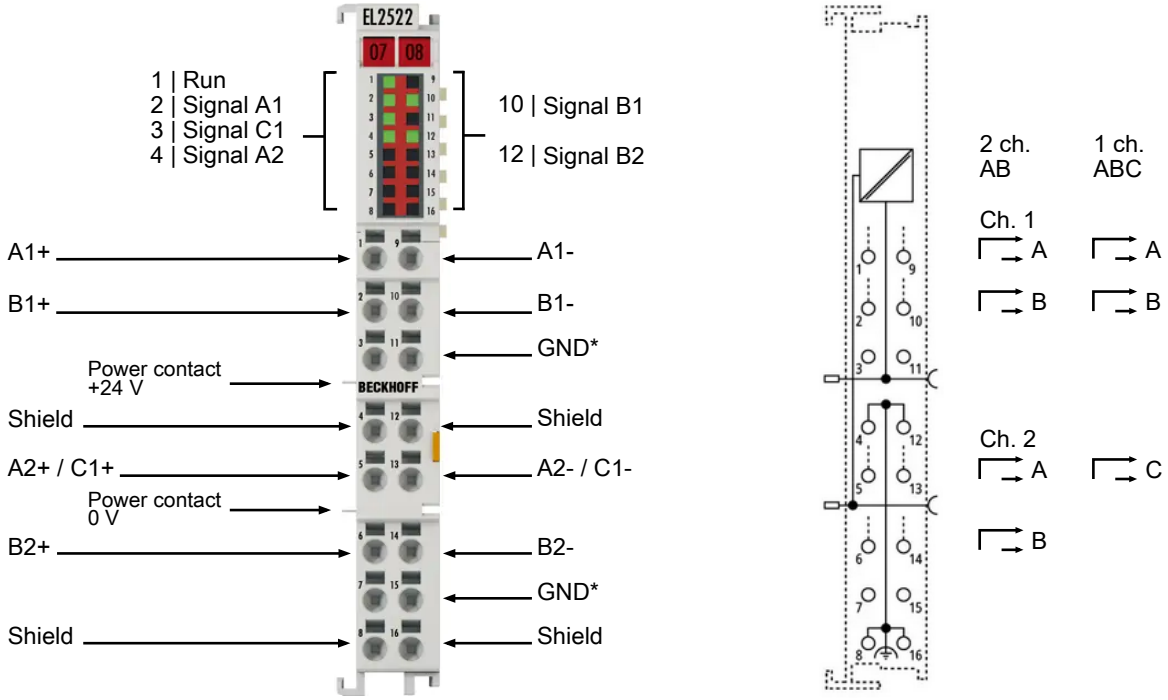
4.3 Start Up

For commissioning:

- mount the EtherCAT devices EL252x as described in the chapter Mounting and wiring [▶ 23]
- Configure the EtherCAT devices EL252x as described in the following chapters:
  - “Commissioning [▶ 53]”
  - In the EtherCAT system manual in the following chapters
    “Getting started with TwinCAT”
    “Basic I/O configuration”.

5 EL2522 - Product description

5.1 Introduction



EL2522

EtherCAT Terminal, 2 channel pulse train output, incremental encoder simulation, RS422, 50 mA

The EL2522 incremental encoder simulation terminal (pulse train) outputs a frequency-modulable signal on two channels with four outputs.

The signal can be used to control motor drivers or other signal receivers, which are controlled by single cycles. As with the EL2521 the pulse sequence and pulse number can be specified directly via the process data in the frequency. Alternatively, the integrated travel distance control can be used. For each channel the operation mode (frequency modulation, pulse direction signal and incremental encoder simulation) can be selected. In addition, the EL2522 can control three output channels in the ABC encoder simulation.

The EL2522 supports the basic operation modes of the EL2521 and has additional operation modes.

Quick links

- EtherCAT basic function principles
- Commissioning [▶ 111]
- CoE description EL2522 [▶ 126]
- Process data and operation modes [▶ 118]

5.2 Technical data

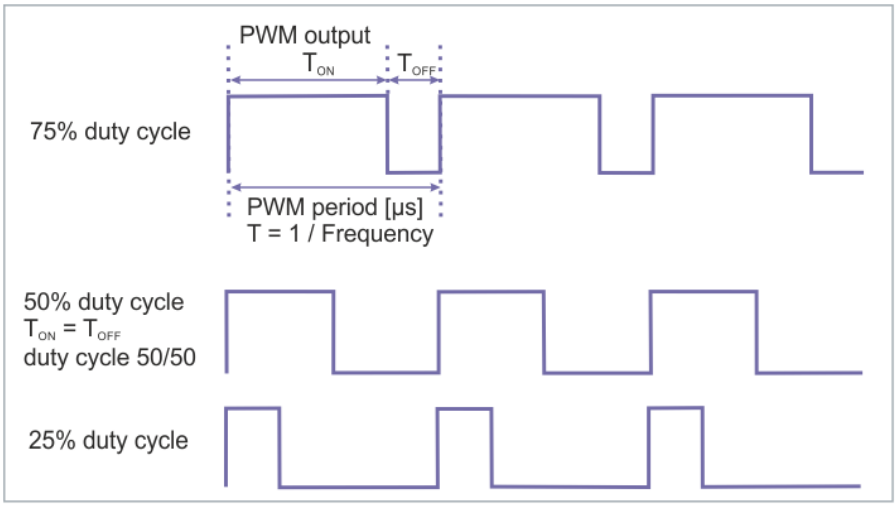
Technical data	EL2522
Digital outputs	RS422 differential outputs Optional: 2 channels (A, B) or: 1 channel (A, B, C)
Signal voltage	RS422 level (differential: min. 1 V, max. 3 V)
Load type	RS422 and optocoupler, min. 120 Ω
Max. output current (per channel)	50 mA, RS422 specification
Output frequency	0…4 million increments/s (equivalent to 1 MHz with 4-fold evaluation)
Duty cycle	50% (±10%)
Resolution	max. 15 bits
Step size	min. 10 ns (internal)
Power supply for the electronics	via the E-bus
Current consumption via E-bus	120 mA typ.
Electrical isolation	500 V (E-bus/field voltage)
Bit width in process image	default 14 bytes Data in, 28 bytes Data out
Configuration	via TwinCAT System Manager
Weight	approx. 50 g
Approved ambient temperature range during operation	-25...+60°C
Approved ambient temperature range during storage	-40...+85°C
Approved relative air humidity	95%, no condensation
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm
Installation [▶ 23]	on 35 mm DIN mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see also Installation instructions for enhanced mechanical load capacity [▶ 34]
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 rating	IP20
Installation position	variable
Approvals/markings*)	CE, EAC, UKCA cULus [▶ 30]

*) Real applicable approvals/markings see type plate on the side (product marking).

6 PWM basics, pulse train

PWM **Description:**

EL250x - series Changing the pulse-to-pause ratio (duty cycle) while maintaining a constant frequency



Application examples:

- As a control signal for, e.g., speed control of fans and LEDs, and power control of AC drives (inverters or variable frequency drives)
- For data transmission e.g.
  - loss-optimized control of large loads, e.g., DC loads, heating resistors,
  - greater accuracy in transmitting analog signals over longer distances

NOTICE

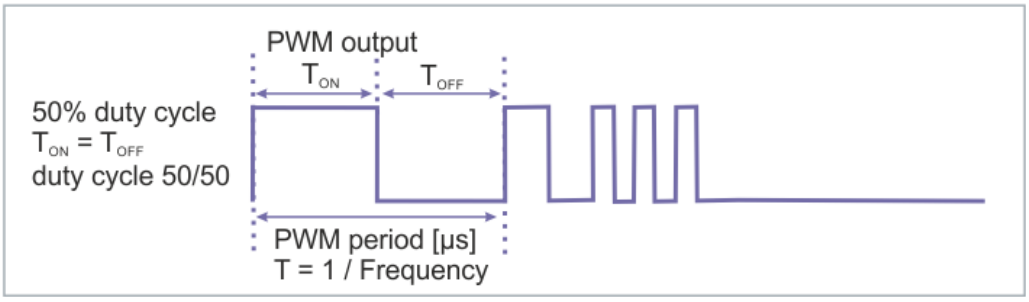
Heat generation and noise in PWM-controlled inductive loads

PWM-controlled inductive loads may cause overheating, noise, or EMC issues.

- If necessary, add capacitance or adjust the modulation frequency.

Pulse train **Description:**

EL252x - series Changing the frequency while maintaining the same pulse-to-pause ratio (duty cycle)



Application examples:

As a control signal for, e.g., motor drivers, line scan cameras

7 EL252x series overview (pulse train output)

EtherCAT Terminals, pulse train output

	EL2521	EL2521-0024 EL2521-0025	EL2521-0124	EL2522
Digital outputs	1 channel (2 differential outputs, A, B)	1 channel (2 potential-free FET outputs) EL2521-0025: ground switching	1 channel (2 potential-free FET outputs), 1 x 24 V output	2 channel (differential outputs A, B) or 1 channel (differential outputs (A, B, C)
Digital inputs	2 (+T, +Z)		1 x Latch input, (5...24 V DC)	-
Signal voltage	RS422 level	5...24 V DC (external supply)	24 V DC (external supply)	RS422 level (differential min. 1 V, max. 3 V)
Load type	RS422 and optocoupler, min. 120 Ω	variable		RS422 and optocoupler, min. 120 Ω
Max. output current per channel	50 mA, RS422 specification	max. 1 A		50 mA, RS422 specification
Output frequency	0...500 kHz			0…4 million increments/s (equivalent to 1 MHz with 4-fold evaluation)
Step size	10 mHz			Min. 10 ns (internal)
Distributed clocks	Is supported			
Timestamp	no			
Current consumption of power contacts	-	-	-	50 mA typ. (load-dependent)
Basic operation modes	Frequency modulation (Input: driving frequency), travel distance control (Input: driving frequency, target position)			
Output operation mode	Frequency modulation, pulsed direction control incremental encoder			
Predefined PDO	In 1 channel mode • Legacy (MDP252) • Standard 16 bit (MDP253/501) • Standard 32 bit (MDP253/501)		In 1 channel mode • Standard 16 bit (MDP253/501) • Standard 32 bit (MDP253/501)	In 1 channel or 2 channel mode • Standard 16 bit (MDP253/501) • Standard 32 bit (MDP253/501) • Standard 32 Bit (MDP253/511), continues position • Standard 32 Bit (MDP253/511), continues position with arrival time

8 Mounting and Wiring

8.1 Notes on ESD protection

NOTICE

Devices can be destroyed by electrostatic charging!

The devices contain electrostatically sensitive components which can be damaged by improper handling.

- When handling the components, take care to avoid electrostatic discharge; also, prevent direct contact with the spring-loaded contacts (see illustration).
- Contact with highly insulating materials (synthetic fibers, plastic films, etc.) should be avoided when simultaneously handling components.
- When handling the components, ensure proper earthing of the environment (workplace, packaging, and persons).
- Each bus station must be terminated with the EL9011 or EL9012 end cap on its right side to guarantee the protection rating and ESD protection.

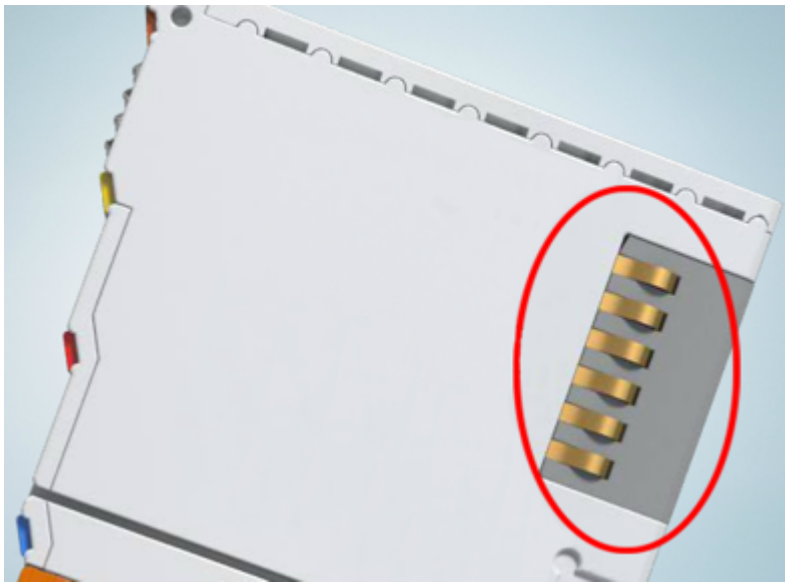


Fig. 4: Spring contacts of Beckhoff I/O components

8.2 Explosion protection

8.2.1 ATEX - Special conditions (standard temperature range)

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components with standard temperature range in potentially explosive areas!

- The certified components are to be installed in a suitable housing that guarantees a protection class of at least IP54 in accordance with EN 60079-7! The environmental conditions during use are thereby to be taken into account!
- 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!
- Observe the permissible ambient temperature range of 0 to 55°C for the use of Beckhoff fieldbus components standard temperature range 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 individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- 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!
- The fuses of the KL92xx/EL92xx power feed terminals may only be exchanged if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted 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 IEC 60079-0:2018
- EN 60079-7:2015+A1:2018

Marking

The Beckhoff fieldbus components with standard temperature range certified according to regulations for potentially explosive areas bear the following marking:



II 3 G Ex ec IIC T4 Gc
KEMA 10 ATEX0075 X
DEKRA 22UKEX6024X
Ta: 0 ... + 55°C

8.2.2 ATEX - Special conditions (extended temperature range)

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components with extended temperature range (ET) in potentially explosive areas!

- The certified components are to be installed in a suitable housing that guarantees a protection class of at least IP54 in accordance with EN 60079-7! The environmental conditions during use are thereby to be taken into account!
- 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!
- Observe the permissible ambient temperature range of -25 to 60°C for the use of Beckhoff fieldbus components with extended temperature range (ET) 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 individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- 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!
- The fuses of the KL92xx/EL92xx power feed terminals may only be exchanged if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted 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 IEC 60079-0:2018
- EN 60079-7:2015+A1:2018

Marking

The Beckhoff fieldbus components with extended temperature range (ET) certified according to regulations for potentially explosive areas bear the following marking:



II 3 G Ex ec IIC T4 Gc
KEMA 10 ATEX0075 X
DEKRA 22UKEX6024X
Ta: -25 ... + 60°C

8.2.3 IECEx - Special conditions

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components in potentially explosive areas!

- For gas: The equipment shall be installed in a suitable enclosure providing a degree of protection of IP54 according to IEC 60079-7, taking into account the environmental conditions under which the equipment is used!
- The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1!
- Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 119 V!
- 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!
- Observe the permissible ambient temperature range for the use of Beckhoff fieldbus components in potentially explosive areas!
- The individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- 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!
- Address selectors and ID switches may only be adjusted if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The front hatch of certified units may only be opened if the supply voltage has been switched off or a non-explosive atmosphere is ensured!

Standards

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

- IEC 60079-0:2017 (Edition 7.0)
- IEC 60079-7:2017 (Edition 5.1)

Marking

Beckhoff fieldbus components that are certified in accordance with IECEx for use in areas subject to an explosion hazard bear the following marking:

IECEx DEK 16.0078 X

Ex ec IIC T4 Gc

8.2.4 Continuative documentation for ATEX and IECEx

NOTICE	
	**Continuative documentation about explosion protection according to ATEX and IECEx** Pay also attention to the continuative documentation **Ex. Protection for Terminal Systems** Notes on the use of the Beckhoff terminal systems in hazardous areas according to ATEX and IECEx, that is available for download within the download area of your product on the Beckhoff homepage www.beckhoff.com!

8.2.5 cFMus - Special conditions

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components in potentially explosive areas!

- The equipment shall be installed within an enclosure that provides a minimum ingress protection of IP54 in accordance with ANSI/UL 60079-0 (US) or CSA C22.2 No. 60079-0 (Canada).
- The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1.
- Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.
- The circuits shall be limited to overvoltage Category II as defined in IEC 60664-1.
- The Fieldbus Components may only be removed or inserted when the system supply and the field supply are switched off, or when the location is known to be non-hazardous.
- The Fieldbus Components may only be disconnected or connected when the system supply is switched off, or when the location is known to be non-hazardous.

Standards

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

M20US0111X (US):

- FM Class 3600:2018
- FM Class 3611:2018
- FM Class 3810:2018
- ANSI/UL 121201:2019
- ANSI/ISA 61010-1:2012
- ANSI/UL 60079-0:2020
- ANSI/UL 60079-7:2017

FM20CA0053X (Canada):

- CAN/CSA C22.2 No. 213-17:2017
- CSA C22.2 No. 60079-0:2019
- CAN/CSA C22.2 No. 60079-7:2016
- CAN/CSA C22.2 No.61010-1:2012

Marking

Beckhoff fieldbus components that are certified in accordance with cFMus for use in areas subject to an explosion hazard bear the following markings:

FM20US0111X (US):	**Class I, Division 2, Groups A, B, C, D** **Class I, Zone 2, AEx ec IIC T4 Gc**
FM20CA0053X (Canada):	**Class I, Division 2, Groups A, B, C, D** **Ex ec T4 Gc**

8.2.6 Continuative documentation for cFMus

NOTICE	
	**Continuative documentation about explosion protection according to cFMus** Pay also attention to the continuative documentation **Control Drawing I/O, CX, CPX** Connection diagrams and Ex markings, that is available for download within the download area of your product on the Beckhoff homepage www.beckhoff.com!

8.3 UL notice

⚠ CAUTION	
	Application Beckhoff EtherCAT modules are intended for use with Beckhoff's UL Listed EtherCAT System only.

⚠ CAUTION	
	Examination For cULus examination, the Beckhoff I/O System has only been investigated for risk of fire and electrical shock (in accordance with UL508 and CSA C22.2 No. 142).

⚠ CAUTION	
	For devices with Ethernet connectors Not for connection to telecommunication circuits.

Basic principles

UL certification according to UL508. Devices with this kind of certification are marked by this sign:



8.4 Mounting rail installation

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before beginning to mount, disassemble, or wire the bus terminals!

The bus terminal system is designed for installation in a control cabinet or junction box.

Installation

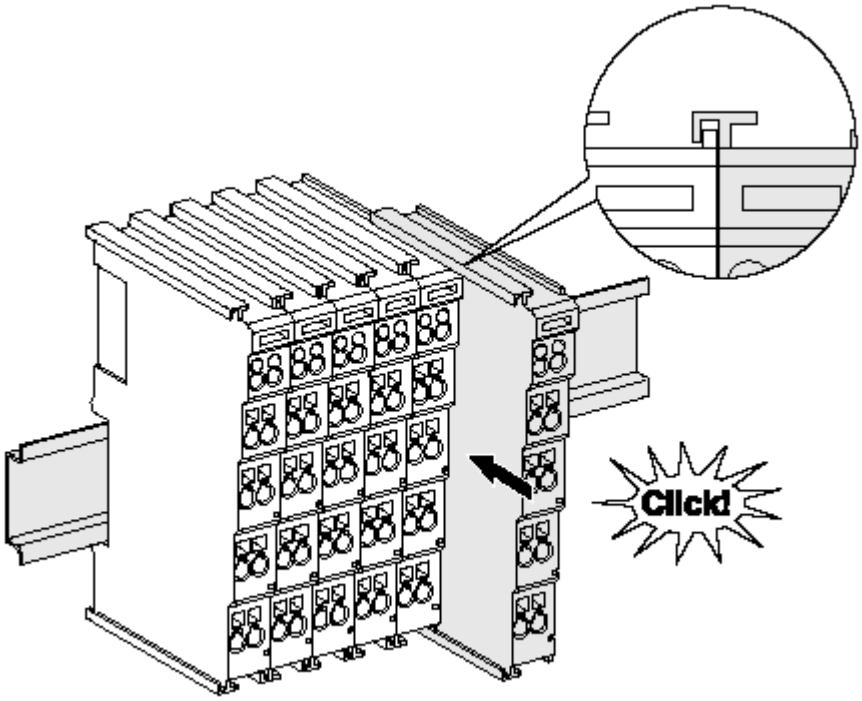


Fig. 5: Installation on the mounting rail

The bus couplers and bus terminals are attached to commercially available 35 mm mounting rails (DIN rail according to EN 60715) by applying slight pressure:

1. First attach the fieldbus coupler to the mounting rail.
2. The bus terminals are now attached on the right-hand side of the fieldbus coupler. To do this, connect the components with the slot and key and push the terminals against the mounting rail until the latch audibly engages on the mounting rail.
   If you snap the terminals onto the mounting rail first and then push them next to each other without the slot and key engaging, no functional connection will be established! When correctly assembled, no significant gap should be visible between the housing units.

Fastening the mounting rails

The locking mechanism of the terminals and couplers protrudes into the profile of the mounting rail. When installing the components, make sure that the locking mechanism doesn't come into conflict with the fixing bolts of the mounting rail. When fastening mounting rails with a height of 7.5 mm under the terminals and couplers, use flat fastening components such as countersunk head screws or blind rivets.

NOTICE

Earth the mounting rail!

Make sure the mounting rail is properly earthed.

Connections within a bus terminal block

The electric connections between the bus coupler and the bus terminals are made automatically by joining the components:

- The six spring-loaded contacts of the E-bus/K-bus deal with the data transfer and the supply of the bus terminal electronics.
- The power contacts deal with the supply for the field electronics and thus represent a supply rail within the bus terminal block. The power contacts are supplied via terminal points on the bus coupler (up to 24 V) or via power supply terminals for higher voltages.

Power contacts

When configuring a bus terminal block, note the contact assignments of the individual bus terminals, as some types

- do not loop through the power contacts or do not loop them through completely (e. g. analog bus terminals or digital 4-channel bus terminals),
- the power contacts are disconnected, thus marking the start of a new supply rail (power supply terminals).

Power contact ⏚

The power contact marked ⏚ (ground connection in accordance with IEC 60417-5017) can be used as a ground. For safety reasons this contact mates first when plugging together, and can ground short-circuit currents of up to 125 A.

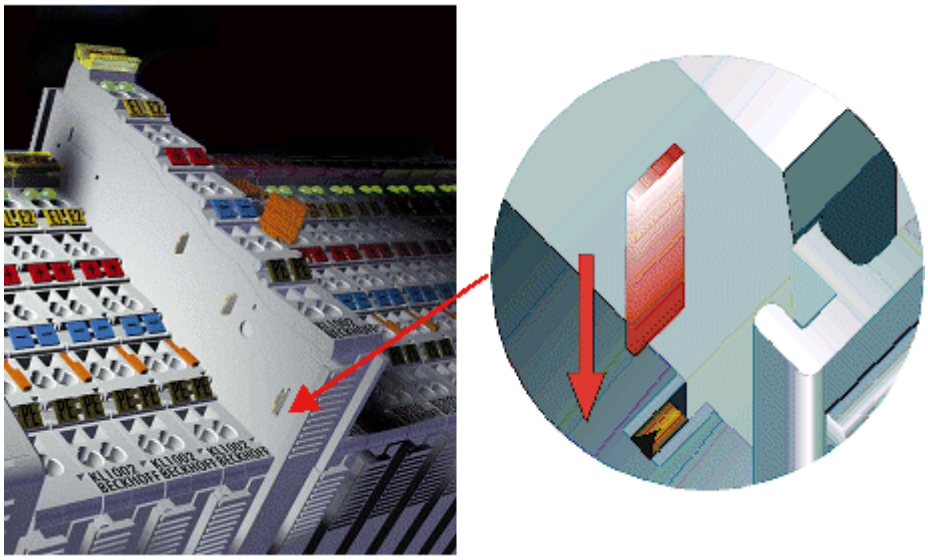


Fig. 6: Power contact on the left

⚠ WARNING

Risk of injury from electric shock!

The power contact marked ⏚ may not be used for other potentials!

NOTICE

Risk of damage to the device

Note that, for electromagnetic compatibility, the earth contacts are capacitatively coupled to the mounting rail. This may lead to incorrect results during insulation testing or to damage to the terminal (e.g. disruptive discharge to the earth line during insulation testing of a consumer with a rated voltage of 230 V). For insulation testing, disconnect the earth supply line at the bus coupler or the power supply terminal! In order to decouple further supply points for testing, these power supply terminals can be released and pulled at least 10 mm from the group of terminals.

Disassembly

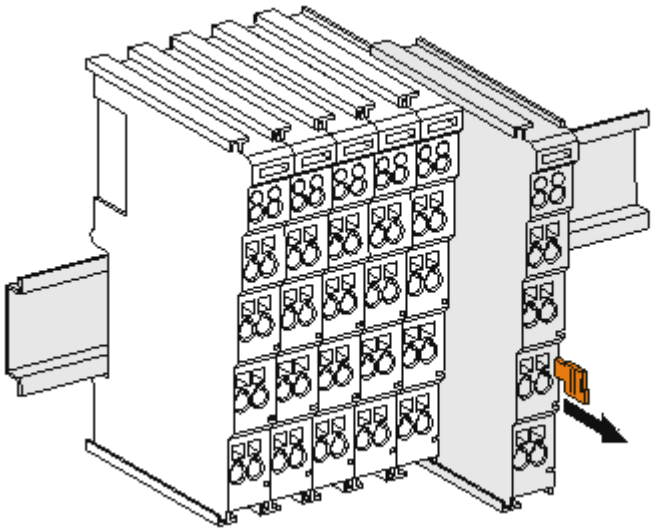


Fig. 7: Removal from mounting rail

Each terminal is secured by a lock on the mounting rail, which must be released for disassembly:

1. Pull down the terminal at its orange-colored straps from the mounting rail by approx. 1 cm. The rail locking of this terminal is automatically released, and you can now pull the terminal out of the bus terminal block with little effort.
2. To do this, grasp the unlocked terminal simultaneously at the top and bottom of the housing surfaces with your thumb and index finger and pull it out of the bus terminal block.

8.5 Installation instructions for enhanced mechanical load capacity

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the Bus Terminal system into a safe, de-energized state before starting mounting, disassembly or wiring of the Bus Terminals!

Additional checks

The terminals have undergone the following additional tests:

Verification	Explanation
Vibration	10 frequency runs in 3 axes
	6 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 *g*, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	25 *g*, 6 ms

Additional installation instructions and notes

For terminals with enhanced mechanical load capacity, the following additional installation instructions and notes apply:

- The enhanced mechanical load capacity is valid for all permissible installation positions.
- Use a mounting rail according to EN 60715 TH35-15.
- Fix the terminal segment on both sides of the mounting rail with a mechanical fixture, e.g. an earth terminal or reinforced end clamp.
- The maximum total extension of the terminal segment (without coupler) is:
  64 terminals (12 mm mounting width) or 32 terminals (24 mm mounting width)
- Avoid deformation, twisting, crushing and bending of the mounting rail during edging and installation of the rail.
- The mounting points of the mounting rail must be set at 5 cm intervals.
- Use countersunk head screws to fasten the mounting rail.
- The free length between the strain relief and the wire connection should be kept as short as possible. A distance of approx. 10 cm should be maintained to the cable duct.

8.6 Connection

8.6.1 Connection system

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before beginning to mount, disassemble, or wire the bus terminals!

Overview

The bus terminal system offers different connection options for optimum adaptation to the respective application:

- The terminals of ELxxxx and KLxxxx series with standard wiring include electronics and connection level in a single enclosure.
- The terminals of ESxxxx and KSxxxx series feature a pluggable connection level and enable steady wiring while replacing.
- The High Density Terminals (HD Terminals) include electronics and connection level in a single enclosure and have advanced packaging density.

Standard wiring (ELxxxx / KLxxxx)

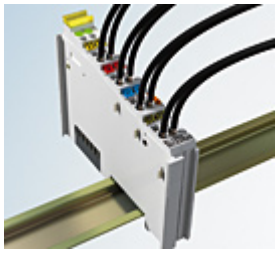


Fig. 8: Standard wiring

The terminals of the ELxxxx and KLxxxx series integrate screwless spring-cage technology for quick and easy wiring.

Pluggable wiring (ESxxxx / KSxxxx)

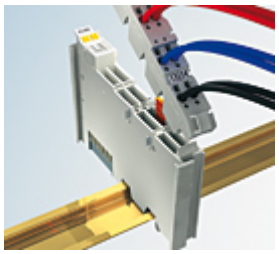


Fig. 9: Pluggable wiring

The terminals of ESxxxx and KSxxxx series feature a pluggable connection level.
The assembly and wiring procedure is the same as for the ELxxxx and KLxxxx series.
The pluggable connection level enables the complete wiring to be removed as a plug connector from the top of the housing for servicing.
The lower section can be removed from the terminal block by pulling the unlocking tab.
Insert the new component and plug in the connector with the wiring. This reduces the installation time and eliminates the risk of wires being mixed up.

The familiar dimensions of the terminal only had to be changed slightly. The new connector adds about 3 mm. The maximum height of the terminal remains unchanged.

A tab for strain relief of the cable simplifies assembly in many applications and prevents tangling of individual connection wires when the connector is removed.

Conductor cross sections between 0.08 mm^2 and 2.5 mm^2 can continue to be used with the proven spring force technology.

The overview and nomenclature of the product names for ESxxxx and KSxxxx series has been retained as known from ELxxxx and KLxxxx series.

High Density Terminals (HD Terminals)



Fig. 10: High Density Terminals

The terminals from these series with 16/32 terminal points are distinguished by a particularly compact design, as the packaging density is twice as large as that of the standard 12 mm bus terminals. Massive conductors and conductors with a wire end sleeve can be inserted directly into the spring loaded terminal point without tools.

Wiring HD Terminals

The High Density Terminals of the ELx8xx and KLx8xx series doesn't support pluggable wiring.

Ultrasonically compacted (ultrasonically welded) strands

Ultrasonically compacted (ultrasonically welded) strands

Ultrasonically compacted (ultrasonically welded) strands can also be connected to the standard and high-density terminals. In this case, please note the tables concerning the wire-size width [▶ 38]!

8.6.2 Wiring

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before beginning to mount, disassemble, or wire the bus terminals!

Terminals for standard wiring ELxxxx/KLxxxx and for pluggable wiring ESxxxx/KSxxxx

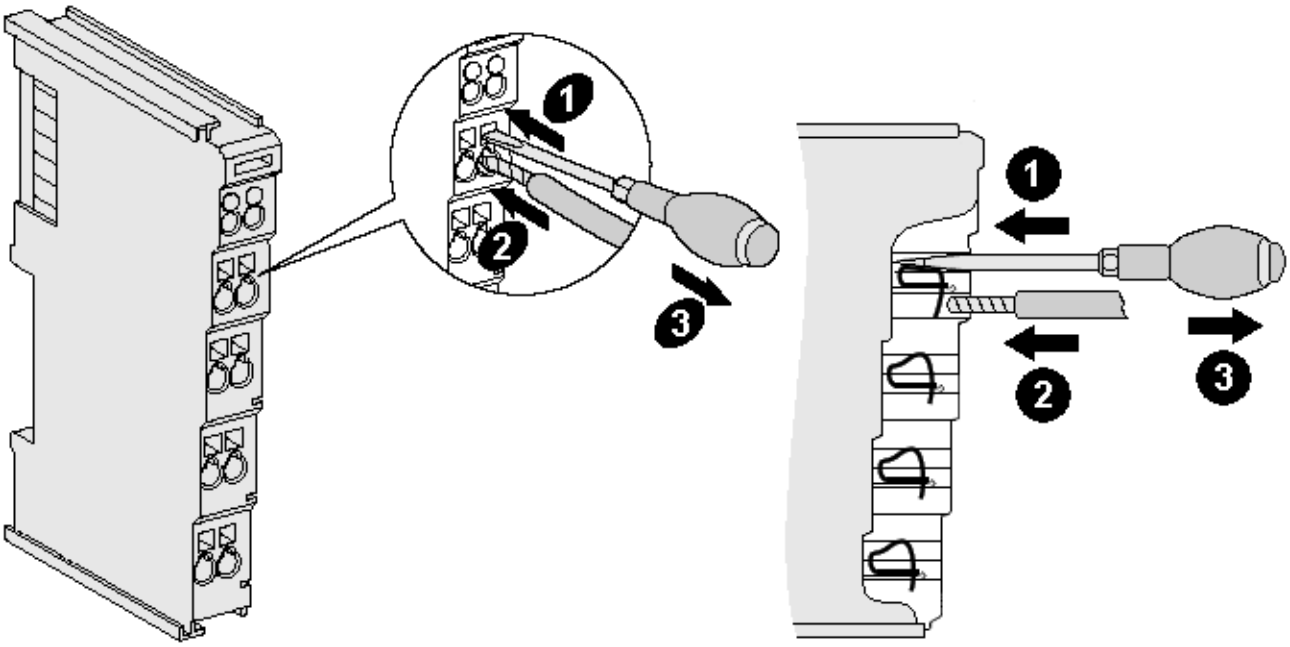


Fig. 11: Connecting a cable on a terminal point

Up to eight terminal points enable the connection of solid or finely stranded cables to the bus terminal. The terminal points are implemented in spring force technology. Connect the cables as follows (see fig. “Connecting a cable on a terminal point”:

1. Open a terminal point by pushing a screwdriver straight against the stop into the square opening above the terminal point. Do not turn the screwdriver or move it alternately (don't toggle).
2. The wire can now be inserted into the round terminal opening without any force.
3. When the screwdriver is removed, the terminal point closes automatically and holds the wire securely and permanently in place

See the following table for the suitable wire size width:

Terminal housing	ELxxxx, KLxxxx	ESxxxx, KSxxxx
Wire size width (single core wires)	0.08 ... 2.5 mm²	0.08 ... 2.5 mm²
Wire size width (fine-wire conductors)	0.08 ... 2.5 mm²	0.08 ... 2.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 1.5 mm²	0.14 ... 1.5 mm²
Wire stripping length	8 ... 9 mm	9 ... 10 mm

High Density Terminals (HD Terminals [▶ 36]) with 16/32 terminal points

The conductors of the HD Terminals are connected without tools for single-wire conductors using the direct plug-in technique, i.e. after stripping the wire is simply plugged into the terminal point. The cables are released, as usual, using the contact release with the aid of a screwdriver. See the following table for the suitable wire size width.

Terminal housing	High Density Housing
Wire size width (single core wires)	0.08 ... 1.5 mm²
Wire size width (fine-wire conductors)	0.25 ... 1.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 0.75 mm²
Wire size width (ultrasonically compacted [ultrasonically welded] strands)	only 1.5 mm² (see notice [▶ 36])
Wire stripping length	8 ... 9 mm

8.6.3 Shielding

Shielding

Encoders, analog sensors, and actuators should always be connected with shielded, pair-wise twisted cables.

8.7 Note on power supply

⚠ WARNING

Power supply from SELV / PELV power supply unit!

SELV / PELV circuits (safety extra-low voltage / protective extra-low voltage) according to IEC 61010-2-201 must be used to supply this device.

Notes:

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

8.8 EL2521-xxxx - LEDs and connection

8.8.1 EL2521

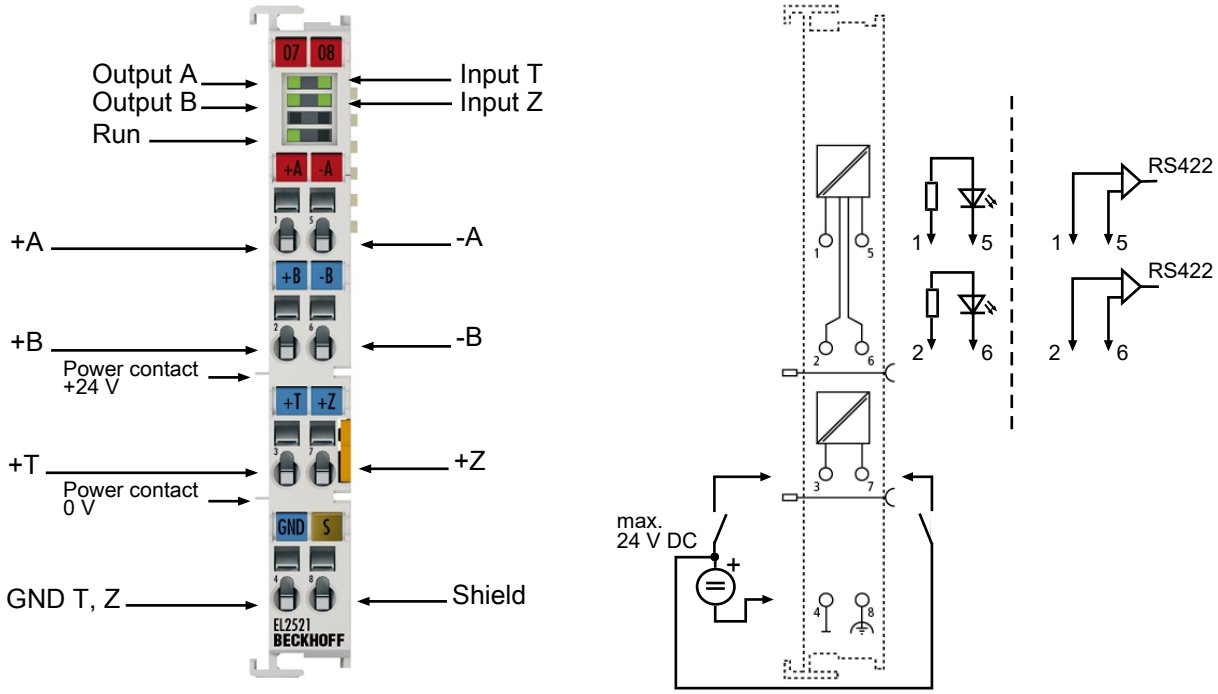


Fig. 12: EL2521 pin assignment and sample connection

EL2521 connection

Terminal point		Description
Name	No.	
+A	1	Output +A
+B	2	Output +B
+T	3	Input T
GND T, Z	4	Signal ground for the outputs
-A	5	Output -A
-B	6	Output -B
+Z	7	Input Z
Shield	8	Shield

EL2521 LEDs

LED	Color	Meaning	
Output A, B	green	The illumination of the LEDs for the active frequency outputs A or B at higher frequencies can only be perceived as a glow at half brightness	
Input T, Z	green	Lights up when a signal is present	
RUN	green	This LED indicates the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		flashing	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Single flash	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync manager channels Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operation state; mailbox and process data communication is possible
		flickering/ rapidly flashing	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates

8.8.2 EL2521-0024

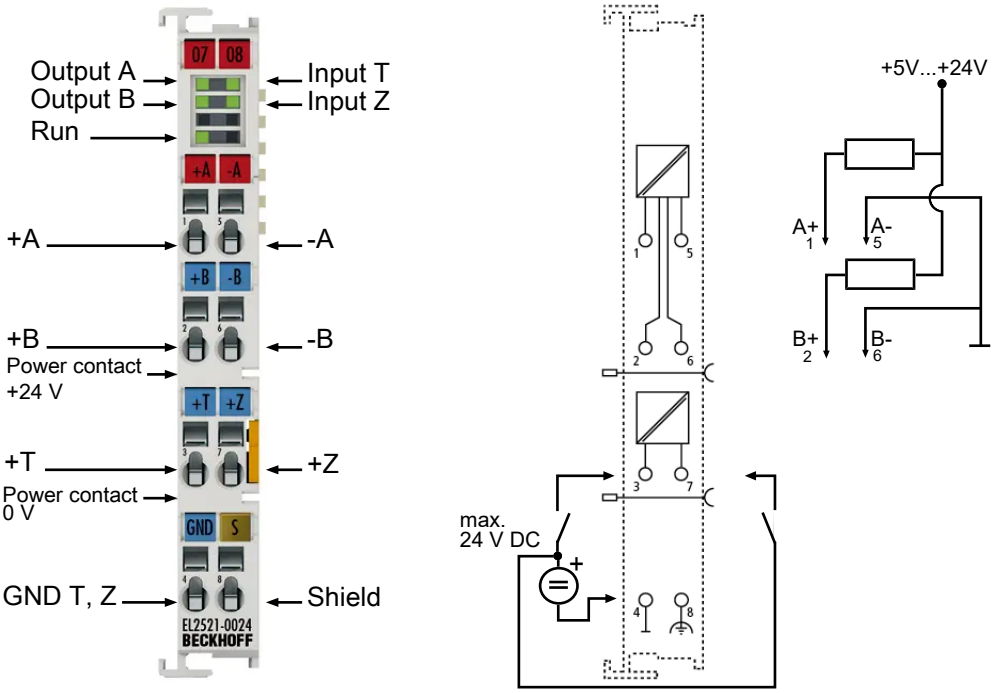


Fig. 13: EL2521-0024 pin assignment and sample connection

EL2521-0024 connection

Terminal point		Description
Name	No.	
+A	1	Output +A
+B	2	Output +B
+T	3	Input T
GND T, Z	4	Signal ground for the outputs
-A	5	Output -A
-B	6	Output -B
+Z	7	Input Z
Shield	8	Shield

EL2521-0024 LEDs

LED	Color	Meaning	
Output A, B	green	The illumination of the LEDs for the active frequency outputs A or B at higher frequencies can only be perceived as a glow at half brightness	
Input T, Z	green	Lights up when a signal is present	
RUN	green	This LED indicates the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		flashing	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Single flash	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync manager channels Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operation state; mailbox and process data communication is possible
		flickering/ rapidly flashing	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates

8.8.3 EL2521-0025

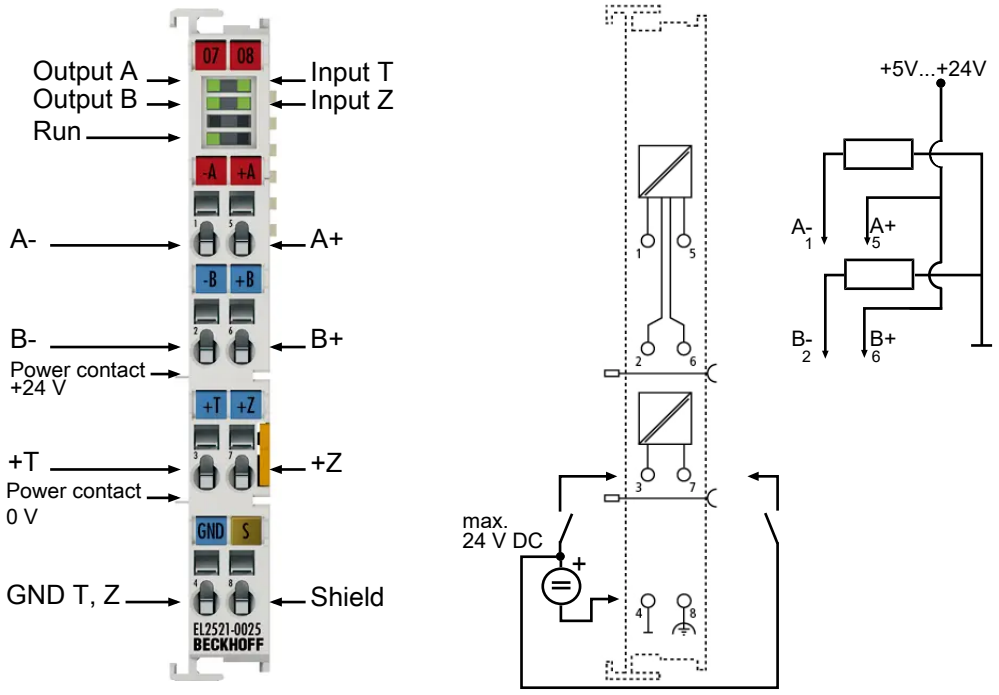


Fig. 14: EL2521-0025 pin assignment and sample connection

EL2521-0025 connection

Terminal point		Description
Name	No.	
-A	1	Output -A
-B	2	Output -B
+T	3	Input T
GND T, Z	4	Signal ground for the outputs
+A	5	Output +A
+B	6	Output +B
+Z	7	Input Z
Shield	8	Shield

EL2521-0025 LEDs

LED	Color	Meaning	
Output A, B	green	The illumination of the LEDs for the active frequency outputs A or B at higher frequencies can only be perceived as a glow at half brightness	
Input T, Z	green	Lights up when a signal is present	
RUN	green	This LED indicates the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		flashing	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Single flash	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync manager channels Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operation state; mailbox and process data communication is possible
		flickering/ rapidly flashing	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates

8.8.4 EL2521-0124

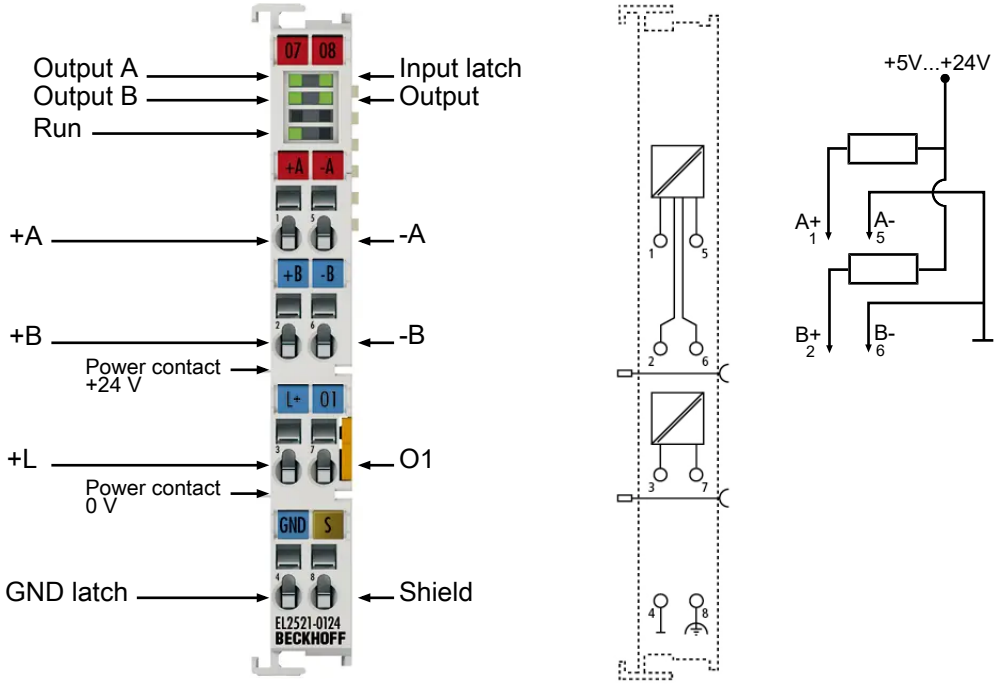


Fig. 15: EL2521-0124 pin assignment and sample connection

EL2521-0124 connection

Terminal point		Description
Name	No.	
+A	1	Output +A
+B	2	Output +B
+L	3	24 V latch input
GND latch	4	Signal ground for the outputs and for the latch input
-A	5	Output -A
-B	6	Output -B
O1	7	24 V output
Shield	8	Shield

EL2521-0124 LEDs

LED	Color	Meaning	
Output A, B	green	The illumination of the LEDs for the active frequency outputs A or B at higher frequencies can only be perceived as a glow at half brightness	
Input latch/ Output	green	Lights up when latch/output signal is present	
RUN	green	This LED indicates the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		flashing	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Single flash	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync manager channels Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operation state; mailbox and process data communication is possible
		flickering/ rapidly flashing	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates

8.8.5 EL2521-xxxx - Connecting the inputs

The optically isolated inputs are protected from overload by a current limitation. Without further external circuit the operating voltage may lie between 5 and 24 V DC. The GND connection is the common ground of the two inputs T and Z. The circuit diagram shows the internal circuit of the two inputs:

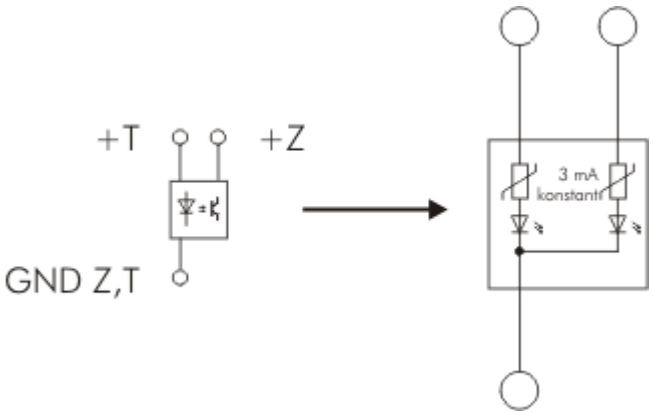


Fig. 16: Internal circuit of the inputs T and Z

8.8.6 EL2521 - Connection of the outputs

Circuit examples for output to A. The same principles apply to output B.

The outputs A and B of the EL2521 can be used in different connection modes. An integrated DC/DC converter supplies the output stage of the two channels, A and B, with an electrically isolated (5 V) voltage.

Connection to RS422 receiver

The output can be operated as an RS422 output. The circuit generates the necessary differential signals.



Fig. 17: EL2521 on the RS422 receiver

Connection to optocoupler (without external supply voltage)

The outputs can be used for direct connection of an optocoupler. The output stage supplies the necessary output current using an internal 5 V supply voltage.



Fig. 18: EL2521, direct connection to an optocoupler

8.8.7 EL2521-0024, EL2521-0124 - Connection of the outputs

Circuit examples for output to A. The same principles apply to output B.

The operation with an external supply voltage depends on the hardware version of the terminal:

Connection to optocoupler (with external supply voltage)

For connection to inputs with a large input resistance, an external supply voltage (up to 24 V) can be used with the EL2521-0024 in order to create the necessary current.



Fig. 19: EL2521-0x24, wiring with external power source

NOTICE

EL2521-0124 ground potential

In the case of the EL2521-0124 the outputs -A and -B must be connected to the signal ground (pin 4) in order to avoid damage to the terminal (see fig. Connection and wiring example for EL2521-0124 [▶ 43])!

8.8.8 EL2521-0025 - Connection of the outputs

Circuit examples for output to A. The same principles apply to output B.

NOTICE

Logic reversal with the EL2521-0025

When connecting the EL2521-0025, observe the logic reversal with the wiring (see fig. Connection and wiring example for EL2521-0025 [▶ 42])!

Connection to optocoupler (with external supply voltage)

For connection to inputs with a large input resistance, an external supply voltage (up to 24 V) can be used with the EL2521-0025 in order to create the necessary current. Due to the logic reversal, the positive voltage for driving the output current is to be connected to pin 5 or pin 6.



Fig. 20: EL2521-0025, wiring with external power source, logic reversal

8.9 EL2522 - LEDs and connection

EL2522 connection

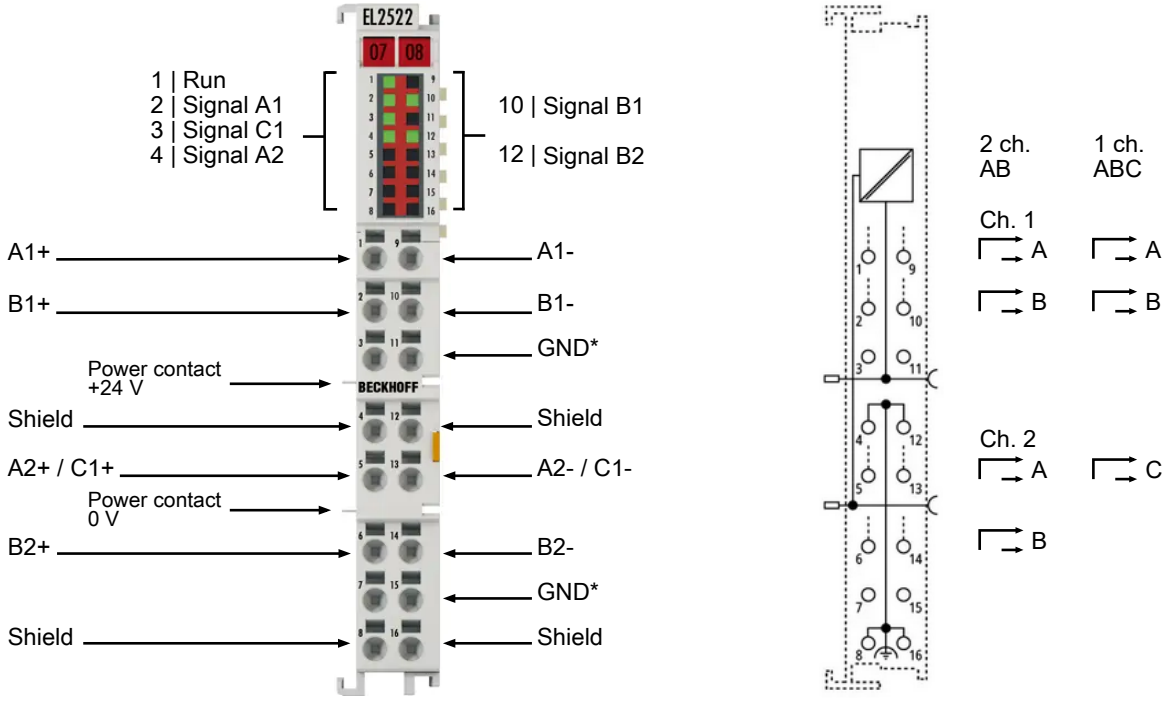


Fig. 21: EL2522 pin assignment and sample connection

Terminal point		Description
Name	No.	
A1+	1	Output A1+
B1+	2	Output B1+
not connected	3	not connected
Shield	4	Shield, internally connected to pins 8, 12, 16
A2+/ C1+	5	Output A2+, C1+
B2+	6	Output B2+
not connected	7	not connected
Shield	8	Shield, internally connected to pins 4, 12, 16
A1-	9	Output A1-
B1-	10	Output B1-
GND	11	*) Starting with hardware version 04 [▶ 150]: Connect the GND of the outputs to the appropriate potential equalization point
Shield	12	Shield, internally connected to pins 4, 8, 16
A2-/ C1-	13	Output A2-, C1-
B2-	14	Output B2-
GND	15	*) Starting with hardware version 04 [▶ 150]: Connect the GND of the outputs to the appropriate potential equalization point
Shield	16	Shield, internally connected to pins 4, 8, 12

EL2522 LEDs

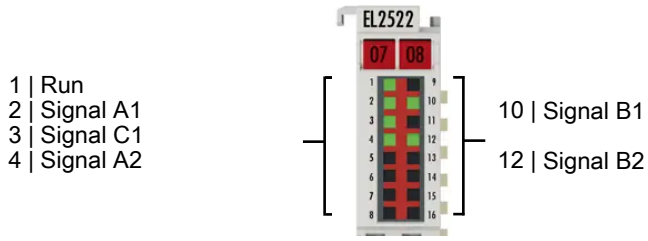


Fig. 22: EL2522 - LEDs

LED	Color	Meaning	
Signal A1, A2, B1, B2, C1	green	The LED for the active frequency output A1, A2, B1, B2 or C1; can only be perceived as a glow at half brightness at higher frequencies. The five LEDs (A1, A2, B1, B2, C1) flash green when U_P (power supply to the power contacts) is not present.	
RUN	green	This LED indicates the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		flashing	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Single flash	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync manager channels Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operation state; mailbox and process data communication is possible
		flickering/ rapidly flashing	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates

8.10 Installation positions

NOTICE

Constraints regarding installation position and operating temperature range

- Please refer to the technical data of the device to ascertain whether any restrictions regarding the installation position and/or the operating temperature range have been specified.
- When installing devices with increased heat dissipation, ensure that there is sufficient space above and below the devices during operation to guarantee adequate ventilation!

The installation positions and their names for mounting devices on mounting rails are specified below. The illustration of the devices in the following figures is an example.
The following applies to all installation positions: the reference direction “down” (see arrow) is the direction of the earth's gravitational force.

Horizontal installation (standard installation)

The mounting rail is mounted horizontally on a vertical mounting plate.
The connection level of the devices points to the front.

The devices are ventilated from below, which enables optimum cooling of the electronics through convection. This is therefore also the recommended installation position.

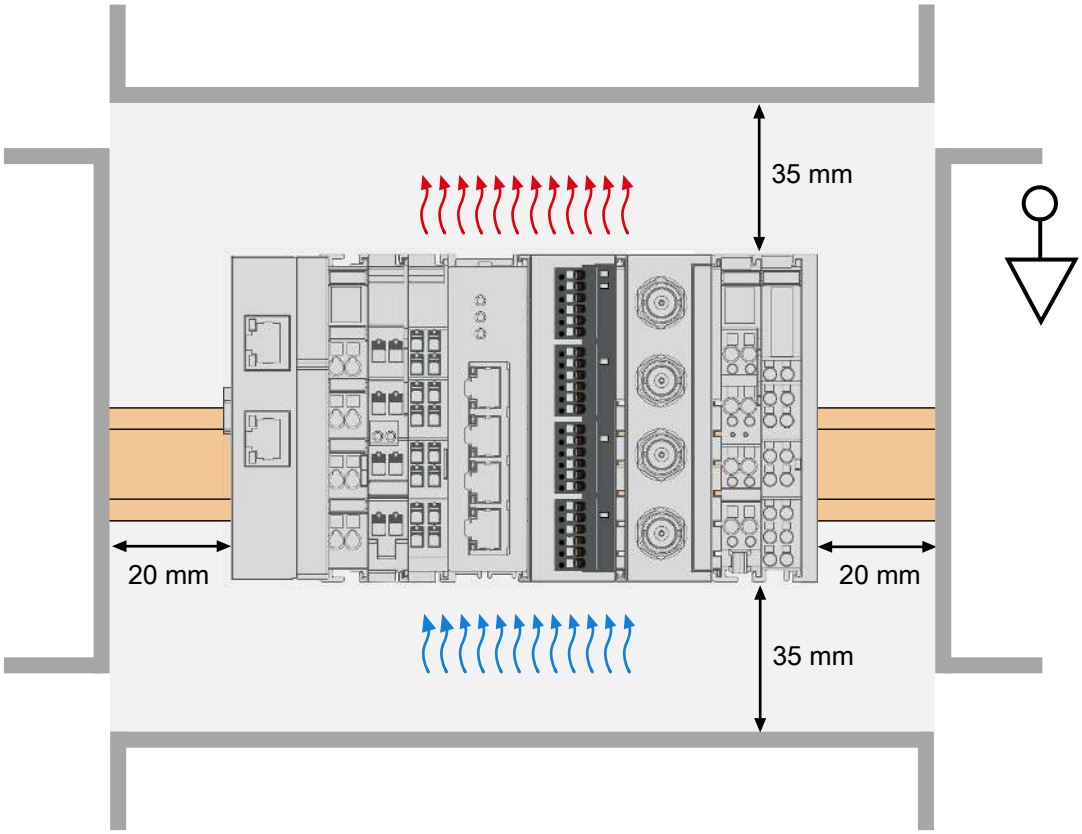


Fig. 23: Recommended minimum distances for standard installation position

NOTICE

Compliance with the minimum distances

Compliance with the minimum distances shown in the figure “Recommended minimum distances for standard installation position” is strongly recommended in all installation positions.

Vertical installation

The mounting rail is mounted vertically on a vertical mounting plate.
The connection level of the devices faces the front.
The devices can be arranged as follows:

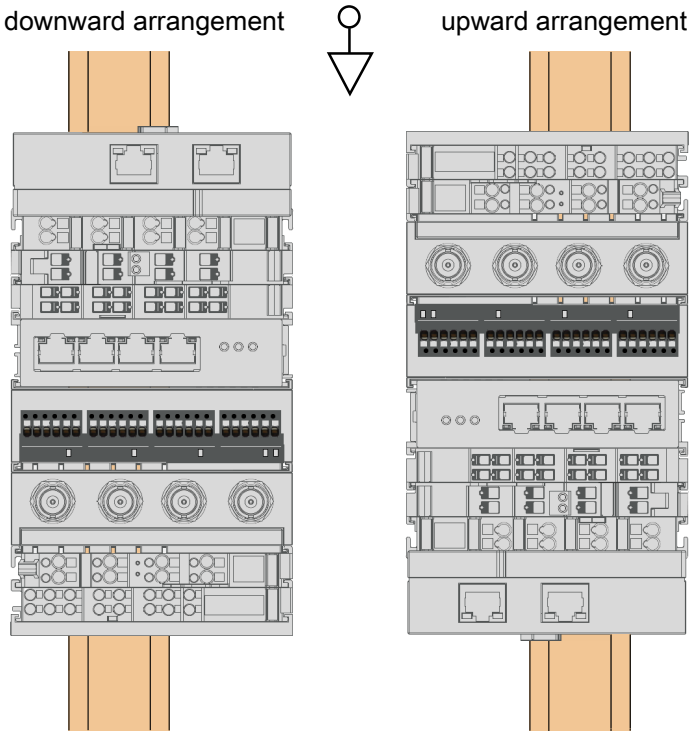


Fig. 24: Installation position: Vertical, downward arrangement (left)/upward arrangement (right)

Flat installation

The mounting rail is mounted on a horizontal mounting plate.
The connection level of the devices points upwards.

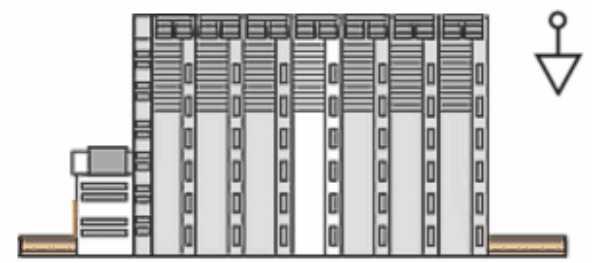


Fig. 25: Flat installation

NOTICE

Danger of sliding off the mounting rail

Particularly in the “vertical” installation position, but also in other installation positions under corresponding mechanical load, the terminal segment may move on the mounting rail. These can lead to undesirable malfunctions.

- If this risk exists, secure the terminal segment with appropriate locking devices, e.g. by clamping it to the mounting rail.

NOTICE

Compliance with the minimum distances

Compliance with the minimum distances shown in the figure “Recommended minimum distances for standard installation position” is strongly recommended in all installation positions.

Installation positions with ZB8610 fan cartridge

If the cooling should or must be increased for the intended application, the ZB8610 fan cartridge can be mounted on the underside of the device. In the horizontal installation position, the devices are ventilated from bottom to top by the fan cartridge. This optimum cooling is further enhanced by convection ventilation (see following figure).

The fan cartridge can be used in any installation position.

Further information on operation with and without a fan can be found in the technical data for the device (e.g. derating, information on installation positions, etc.).

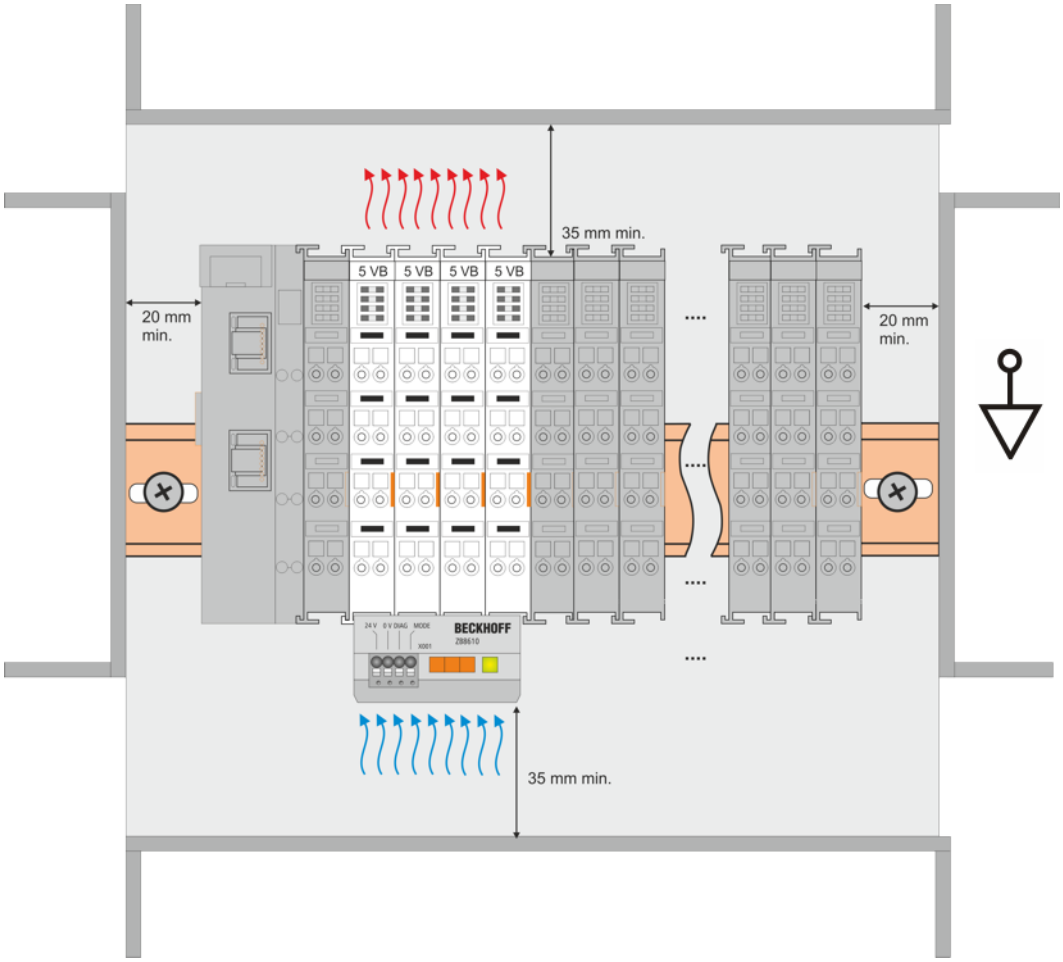


Fig. 26: Recommended minimum distances for operation with fan, using horizontal installation position as an example

NOTICE

Compliance with the minimum distances

Compliance with the minimum distances as shown in the figure “Recommended minimum distances for operation with fan” is strongly recommended.

8.11 Positioning of passive terminals

Note on the placement of passive terminals in the bus terminal block

EtherCAT Terminals that do not take part in active data exchange within the bus terminal block are referred to as passive terminals. These terminals can be recognized because they do not consume power from the E-bus. To ensure optimal data exchange, no more than two passive terminals may be connected directly to each other!

Examples of the placement of passive terminals (highlighted in light color)

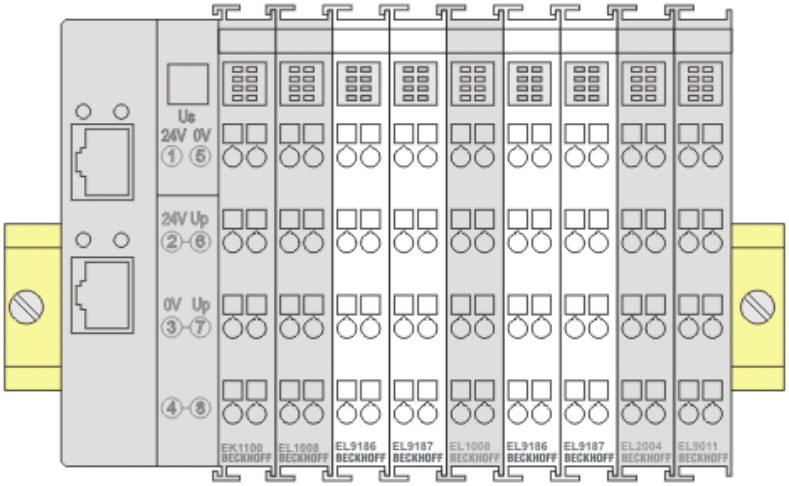


Fig. 27: Proper positioning

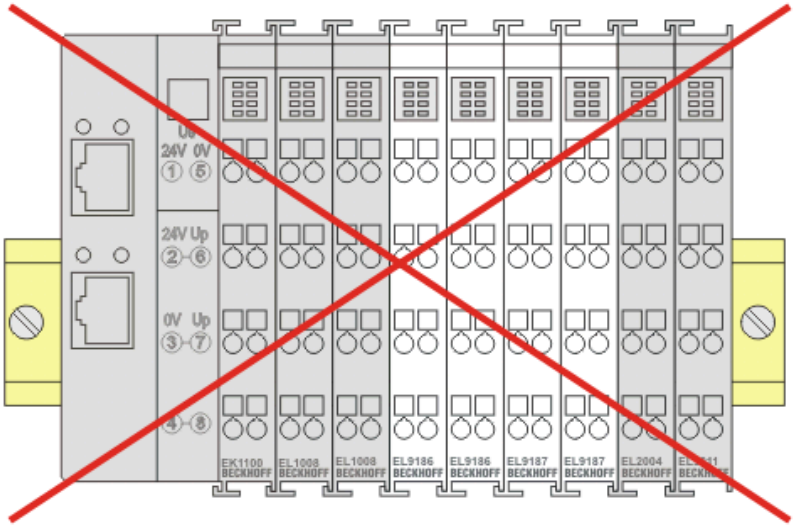


Fig. 28: Incorrect positioning

8.12 Disposal



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

9 Commissioning

NOTICE

Further information

For information on commissioning with TwinCAT and EtherCAT basics, please refer to the "EtherCAT system manual".

⚠ CAUTION

Watchdog settings

Changes to the watchdog settings can lead to unwanted system behavior or damage to devices.

- Observe the information in the chapter "Notes on watchdog settings" in the EtherCAT system documentation before making any changes to the watchdog settings!

9.1 Integration into the NC configuration

(Master: TwinCAT 2.11)

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.

Required firmware (FW) version and TwinCAT version

At least the firmware version 07 is required for the integration of the EL2522 in the NC;

TwinCAT versions:

- from TwinCAT version 2.11 R3 Build 2250
- from TwinCAT version 3.1 Build 4018.16 (recommended)

1. The terminal must already have been inserted manually under I/O devices or have been scanned in by the system (see EtherCAT – System Manual section "online/offline configuration creation").
2. Add a new task.
   - To do this, click with the right mouse button on NC Configuration and
   - select "Append Task..." (see "Append Task…" figure).
   - Rename the task if required and confirm with "OK".

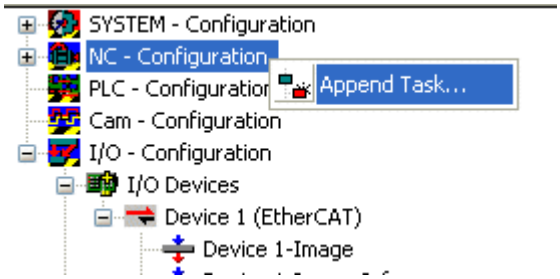


Fig. 29: "Append task…"

3. Select the operation mode of the terminal in the selection box "Predefined PDO Assignment" on the register tab "Process data".

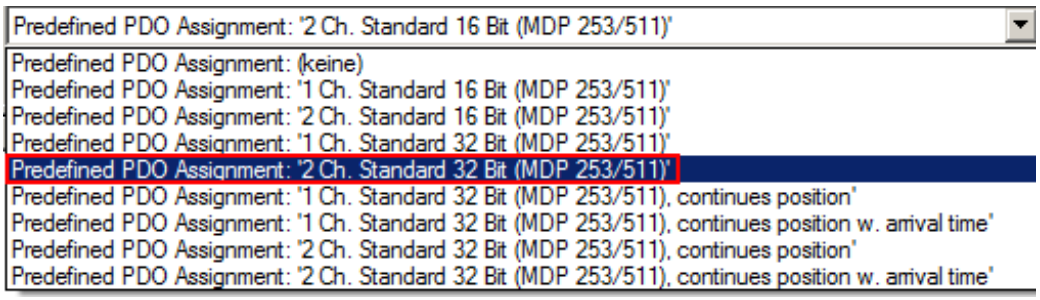


Fig. 30: EL2522 - selection of the operation mode (default)

4. Adding an NC axis
   - Right-click on “Axes”, then add a new axis (see Fig. “Adding an NC axis”).

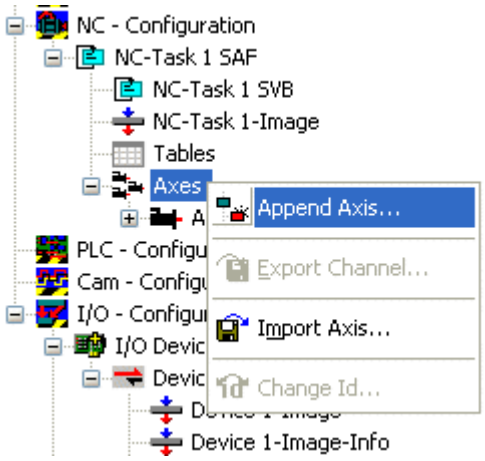


Fig. 31: Adding an NC axis

5. Adding a new axis
   - “Name”: Change the axis name if necessary
   - “Multiple”: Enter the number of channels here in case of multi-channel operation. The corresponding number of axes will then be inserted.
   - “Type”: Select continuous axis type and confirm with “OK” (see fig. “Selecting and confirming the axis type”).

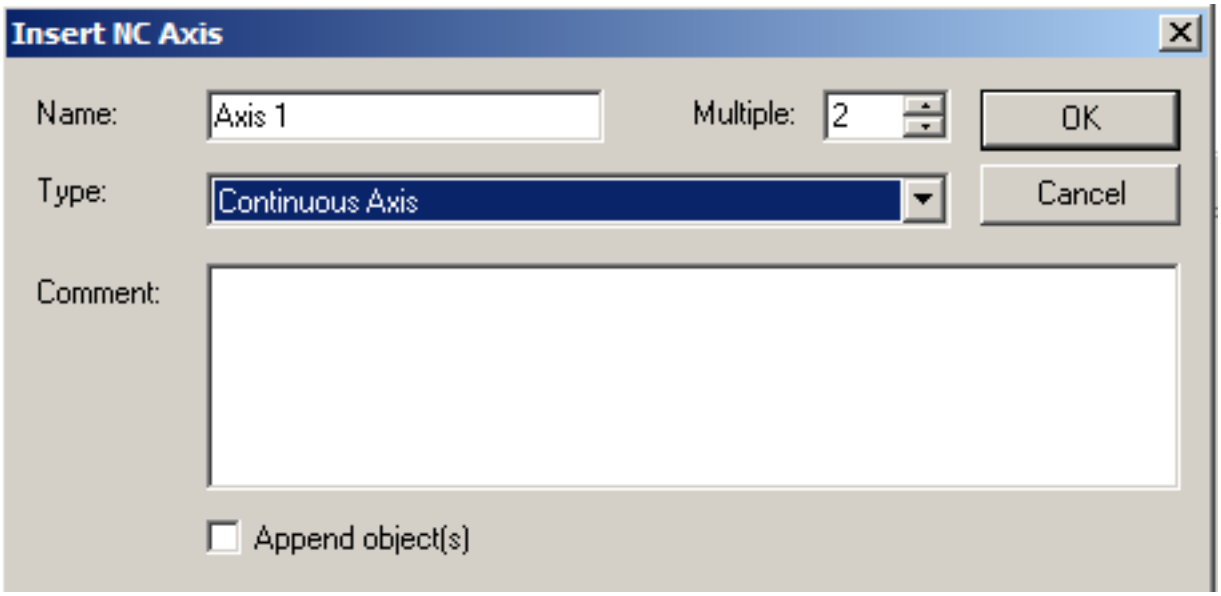


Fig. 32: Selecting and confirming the axis type

6. Linking the non-referenced axes to the terminal

- Left-click your axis to select it.
- Under the “Settings” tab select “Linked To...” (see fig. “Linking the axis with the terminal”).
- In the dialog “Select I/O Box/Terminal”, select the desired terminal (e.g. terminal 3 (EL2522) #Ch.1 and confirm with “OK”.

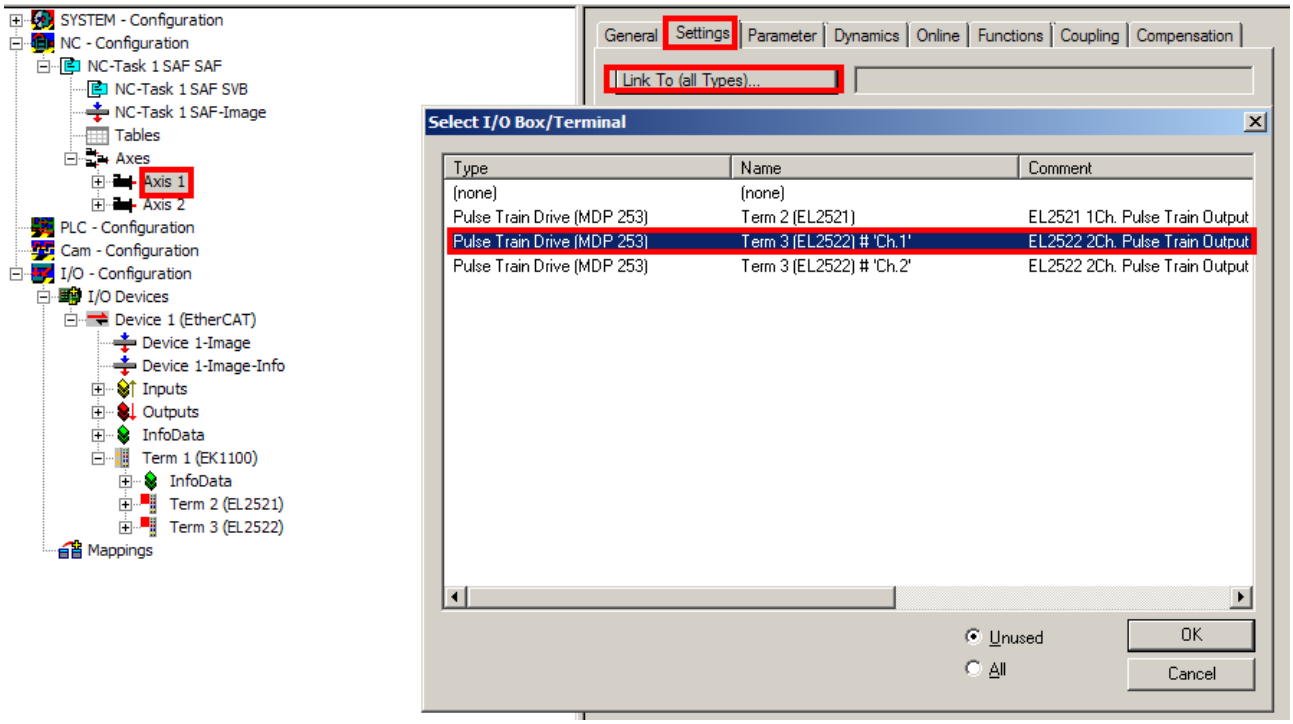


Fig. 33: Linking the axis with the terminal

7. In the case of 2-channel operation, also link the second axis with channel 2 of the EL2522.
8. All important links between the NC configuration and the terminal are thus carried out automatically for the selected channels. The links are illustrated in the tree (**A**) and in the online view (**B** and **C**) (see fig. “Automatic linking of all main variables”).

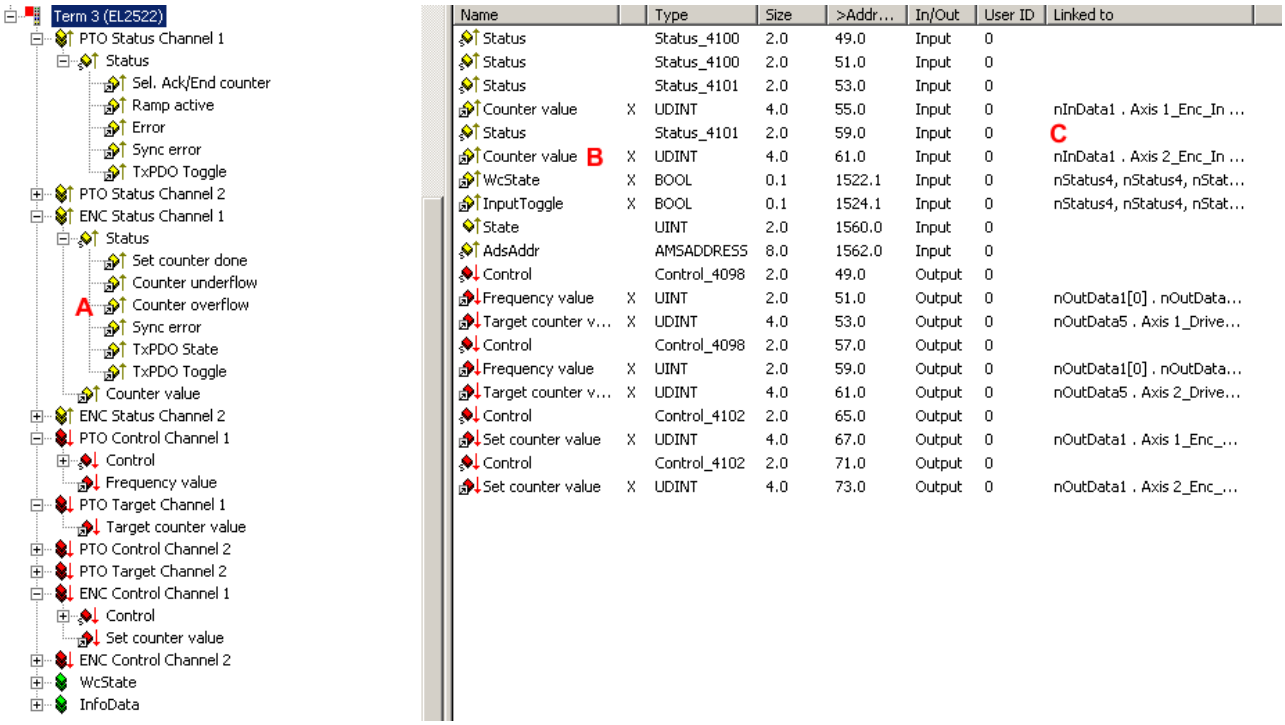


Fig. 34: Automatic linking of all main variables

9. “Target counter value”, “Automatic direction” and **“**Target arrival time” are not automatically linked under the following conditions. Observe the following chapters here:
   - EL252x - when using the predefined PDO Assignments “n Ch Standard 16 Bit (MDP 253/511)” [▶ 57]
   - EL2522 - when using the predefined PDO Assignments “n Ch Standard 32 Bit (MDP 253/511) continues position w. arrival time” [▶ 58]
   - EL2522 - when using older firmware or older TwinCAT versions with “Continues Position” mode [▶ 58]
10. **Distributed Clocks Settings:** “DC-Synchron” under the “DC” tab

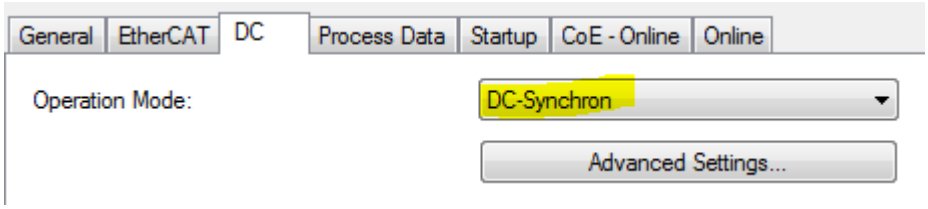


Fig. 35: Setting “DC-Synchron”

11. Set the frequency of the terminal in order to achieve the required velocity
    - Channel 1: Index 0x8000:12
    - Channel 2: Index 0x8010:12

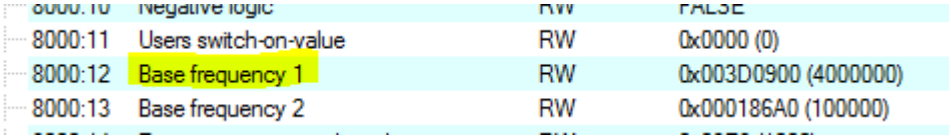


Fig. 36: Setting of “Base frequency 1” in Index 0x8000:12

9.1.1 EL252x - For Predefined PDOs “n Ch Standard 16-bit (MDP 253/511)”

In the “n Ch Standard 16-bit” operation modes, the connection from Axis/Drive/nOutData5 to the terminal's “Target counter value” is not created automatically.
Create the connection from Axis/Drive/nOutData5 to the “Target counter value” of the terminal.

1. To do this, right-click on “Target counter value” and
2. select “Change Link...” from (see the following figure).

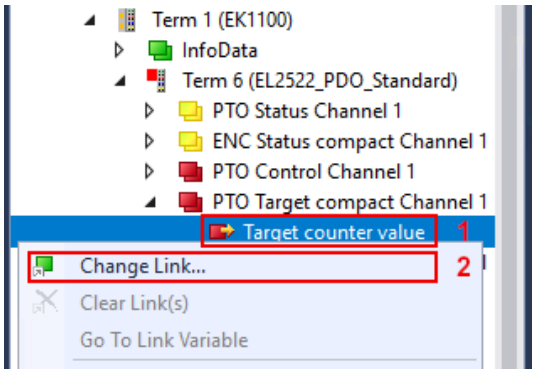


Fig. 37: Change Link “Change Link…”

3. In the “Attach Variable Target counter value (Output)” dialog box, select the variable Axis/Drive/nOutData5 and click “OK” (see **A** and **B** in the figure below).
4. The following “Variable Size Mismatch” dialog confirms the 16-bit overlap. Confirm by clicking “OK” (see **C** in the figure below).

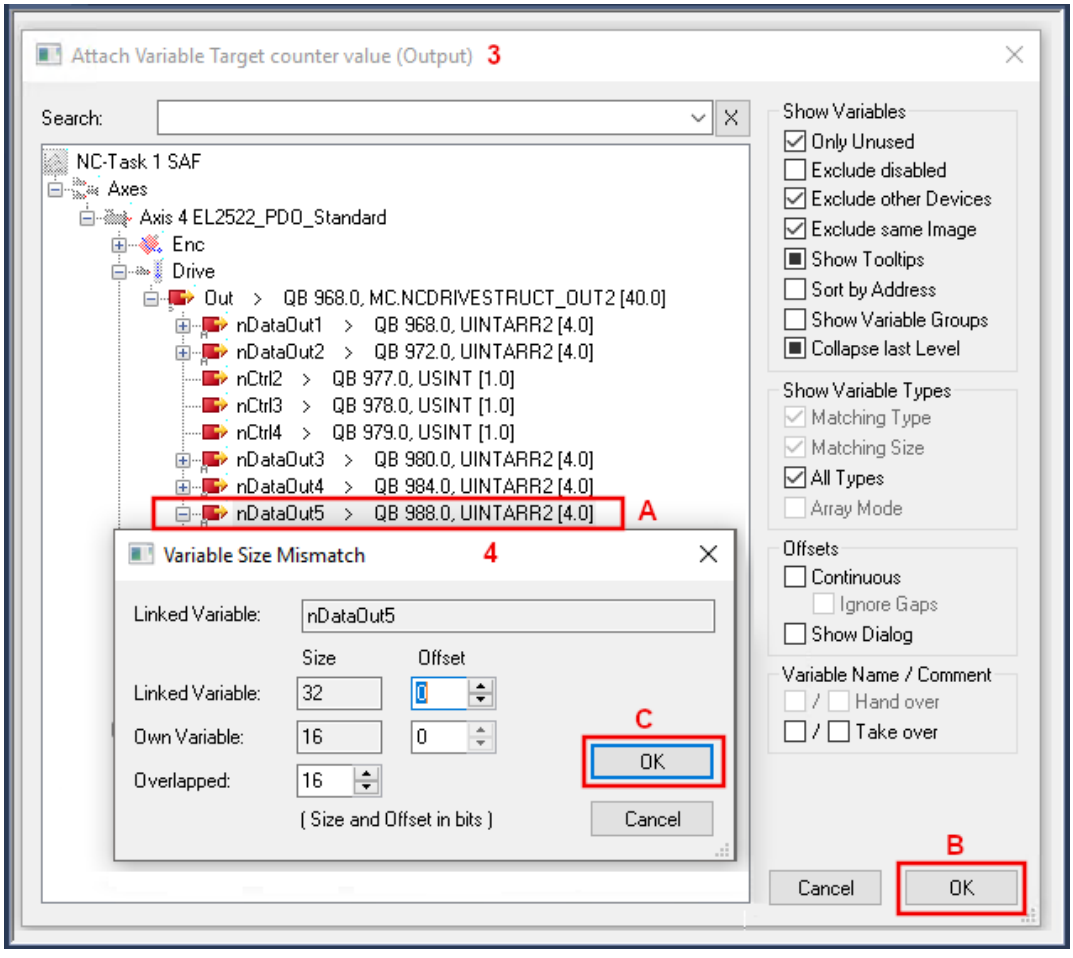


Fig. 38: Creating a link from Axis/Drive/nOutData5 to “Target counter value”

9.1.2 EL2522 - For predefined PDOs "n Ch Standard 32 Bit (MDP 253/511), continues position w. arrival time"

The “Target arrival time” process data object is not automatically linked because the UINT64 data type is not currently supported by the TwinCAT PLC (see the TwinCAT 2 documentation, chapter “Comparison of Data Types”).

9.1.3 EL2522 - For predefined PDOs with “Continues position” when using older firmware- or older TwinCAT versions

Note on use with older firmware and TwinCAT versions

If you are using older versions of the firmware and TwinCAT versions, you may need to perform the following steps in “Continuous Position Mode.”

- Update of the NC driver
- Add axes to the NC

The link from Axis/Drive/nOutData5 to the terminal's “Target counter value” was not created automatically. Create a link:

1. Click with the right mouse button on “nDataOut5” and
2. select “Change Link” (see the figure below).
3. In the “Attach Variable nDataOut5 (Output)” dialog box , select the “Target counter value” variable and click “OK” (see **A** and **B** in the figure below).

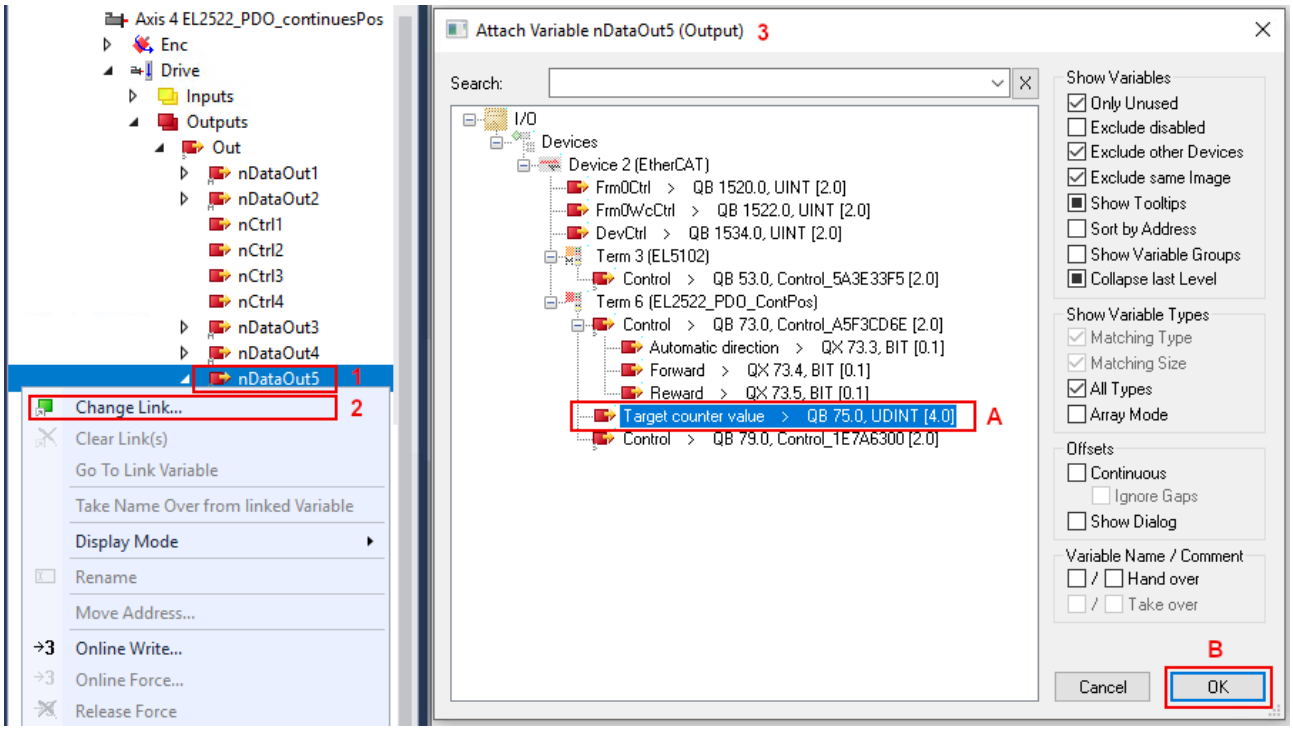


Fig. 39: Linking “Axis/Drive/nOutData5” to the “Target counter value” of the terminal

The link from Axis/Drive/nCtrl1 to the terminal's “Automatic direction” was not created automatically. Create a link:

1. Click with the right mouse button on “nCtrl1” and
2. select “Change Link” (see 2 in the figure below).
3. In the “Attach Variable nCtrl1 (Output)” dialog box , select the “Automatic direction” variable and click “OK” (see **A** and **B** in the figure below).
4. The following “Variable Size Mismatch” dialog box displays the 1-bit overlap. Set an offset of 3 bits.
   ⇨ Confirm by clicking “OK” (see **C** in the figure below.)

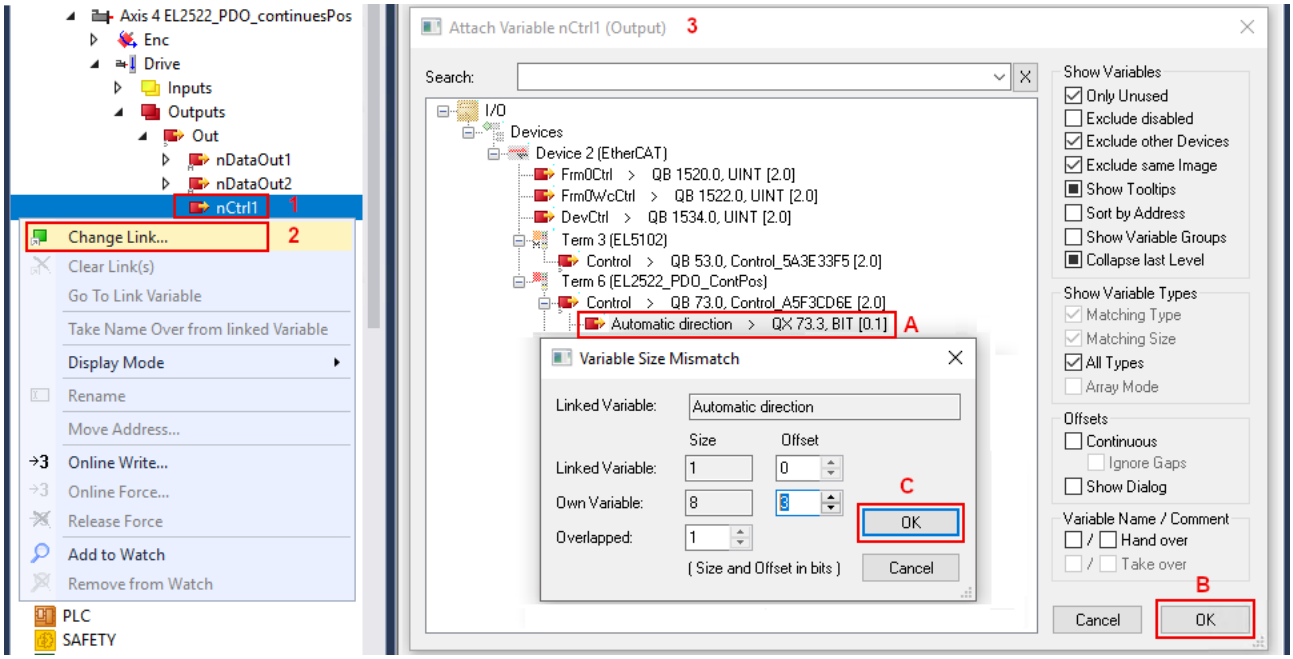


Fig. 40: Link Axis/Drive/nCtrl1 to the terminal's “Automatic direction”

9.2 EL2521-xxxx

9.2.1 Basic function principles

9.2.1.1 Operation modes of the EL2521-xxxx

The terminals basically work as follows:

- Basic function
  - Frequency setting, also: frequency modulation (setting: driving frequency)
    (the number of pulses to be output is then usually monitored by the higher-level controller)
  - or travel distance control (default: max. driving frequency, target position)
    (the terminal automatically moves to a target position and continuously calculates the necessary output frequency)
- Output operation mode selection
  - Frequency modulation or
  - Pulse-direction control or
  - Incremental encoder

EtherCAT devices are parameterized via PDO (real-time process data) and CoE (acyclic parameters).

1. In order to be able to map the various application requirements, three EtherCAT setups are available for selection in the first step via the so-called “Predefined PDO”:



Fig. 41: Predefined PDO selection in the TwinCAT System Manager

For new projects, the “extended operation mode” 16-bit or 32-bit is the correct PDO choice.
The 16/32-bit extended operation mode was developed as an enhancement to the EL2521. An older version of the EL2521 (see the table below) does not support this extended operation mode! A terminal prior to Firmware 03/Hardware 02 [▶ 150] will not support the configuration in enhanced operation mode, since the corresponding objects cannot be controlled.

Version	normal operation mode	enhanced operation mode	
		16-bit (default)	32-bit
PDO settings	Legacy (MDP 252)*	Standard 16-bit (MDP 253/511)	Standard 32-bit (MDP 253/511)
Supported in Firmware/Hardware	all	from Firmware 03 / Hardware 02 [▶ 150]	
ESI Revision	from EL2521-0000-0000 EL2521-0024-0000 EL2521-0025-0000 *) no legacy mode for EL2521-0124	EL2521-xxxx-1016 and higher	
Supports distributed clocks	no	yes	
Process data	Input process data (counter value) in CoE object 0x6000 [▶ 84] Output process data (Frequency value) in CoE object 0x7000 [▶ 84] PDO assignment in 0x1A00, 0x1600	Inputs/outputs in CoE object 0x6010 [▶ 96]/0x7010 [▶ 97] PDO assignment in 0x1A01, 0x1A02, 0x1601, 0x1602, 0x1604	Inputs/outputs in CoE object 0x6020 [▶ 96]/0x7020 [▶ 97] PDO assignment in 0x1A01, 0x1A05 0x1601, 0x1605, 0x1607
CoE parameters	Feature bits and settings in CoE objects 0x8000 [▶ 81], 0x8001 [▶ 82], 0x8800 [▶ 82]	Feature bits and settings in CoE object 0x8010 [▶ 87]	
Recommended use	In case of spare parts, not recommended for new projects	Recommended when 16 bit counters are sufficient	Recommended when 16 bit counters are **not** sufficient

2. If necessary, the travel distance control can then be activated (see the “Travel Distance Control [▶ 64]” chapter).
3. In the final step, you must specify the output operation mode (see the “output operation mode [▶ 67]” chapter).

Compatibility in the case of service

An EL2521 employed and projected in enhanced operation mode cannot be replaced by an EL2521 with an older hardware version (< 03)!

Process data monitoring

It is recommended to monitor the proper behavior of the terminal via the controller using the diagnostic values:

- **WcState**: Must be 0, if ≠ 0, this EtherCAT device does not take part in the process data traffic
- **State**: If ≠ 8, the EtherCAT device is not in OP (operational) state
- **TxPDO State, SyncError:** if ≠ 0, then no valid process data are available, e.g. caused by wire break
- **TxPDO Toggle**: if this bit toggles, a new set of process data is available

Delivery state: frequency modulation

The delivery state of the EL2521 is the operation mode frequency modulation with a base frequency of 50 kHz and 15-bit resolution.

For testing in the delivery state, PDO setting “Standard 16-bit”, the output frequency can simply be set to a value > 0, then the EL2521-xxxx starts outputting signals.

The number of pulses output is read back into a 16-bit register. The counter overflows with a message to the controller.

- An overflow is indicated by the “Overflow” bit
  (Legacy: Status Word SW.3 [▶ 79]) or (Standard 16-/32-bit: Index 0x6020:05 [▶ 96]).
- An underflow is indicated by the “Underflow” bit
  (Legacy: SW.2 [▶ 79]) or (Standard 16-/32-bit: Index 0x6020:04 [▶ 96]).

Parallel to these two bits, the general error bit “ERROR” is set
(Legacy: SW.6 [▶ 79]) or (Standard 16-/32-bit: Index 0x6010:07 [▶ 96]).
This simplifies the extension to more than 16 bits in the control software.
The overflow can also be read from diagnostic object 0xA000:01 [▶ 84] “Counter extension” (internal 32-bit extension).

In Legacy mode, the counter can be cleared by “CNT_CLR” bit 5 in the control word (CW.5 [▶ 78]). In the factory default setting, the counter is reset on a rising edge.

- Index 0x8000:05 [▶ 81] “Rising edge clears/sets counter” = TRUE
  The counter is cleared on a rising edge (default)
- Index 0x8000:05 [▶ 81] “Rising edge clears/sets counter” = FALSE
  The counter is cleared based on the level
- If index is 0x8000:0B [▶ 81] “Rising edge sets counter” = TRUE
  , the “CNT_CLR” bit 5 in the control word (CW.5 [▶ 78]) sets the counter to a specified value in “Target counter state” at index 0x8800:01 [▶ 82].

The PDOs “Go counter” (standard 16/32 bits: 0x7010:03) (Legacy: in the Control Word (CW.2)) and “Target counter value” are always visible in the process image but can only be used when travel distance control is enabled.

Relative data

The output frequency depends on the set base frequency in the objects:

Legacy: 0x8001:02 [▶ 82] “Base frequency 1”, 0x8001:03 [▶ 82] “Base frequency 2”, or
Standard 16-/32-bit: 0x8010:12 [▶ 87] “Base frequency 1”, 0x8010:13 [▶ 87] “Base frequency 2”, and

the process date “Frequency value” (see table).

Example:

Output frequency = base frequency x process data / 32767
highest resolution = 125 mHz

Base frequency = 100,000 Hz (maximum selected output frequency)
Process data = 0x00FF (255_{dec})
Output frequency = 778.22 Hz

Process date		Output value
	0x0000 (0_{dec})	0% DC
	0x3FFF (16383_{dec})	50% of the base frequency, rotation to the right
	0x7FFF (32767_{dec})	100% of the base frequency, rotation to the right
Two's complement	0xC000 (-16384_{dec})	50% of the base frequency, rotation to the left
	0x8000 (-32768_{dec})	100% of the base frequency, rotation to the left
Signed amount representation	0xBFFF (-16383_{dec})	50% of the base frequency, rotation to the left
	0xFFFF (-32767_{dec})	100% of the base frequency, rotation to the left

Direct data

There is a possibility to directly input the frequency (object 0x8000:08 [▶ 81] or 0x8010:08 [▶ 87]). Here, the process data are multiplied by the factor from object 0x8001:06 [▶ 82] or 0x8010:16 [▶ 87] and written directly to the synthesis chip.

Example:

Output frequency = frequency factor x process data x 10 mHz
highest resolution = 10 mHz

Frequency factor = 100
process data = 0x00FF (255_{dec})
output frequency = 255 Hz

Ramp function

An internal ramp function increases/lowers the current frequency to the preset maximum frequency with the pre-set parameters in index 0x8800:02 [▶ 82] “Maximum frequency”, it is activated by index 0x8000:06 [▶ 81] or 0x8010:06 [▶ 87] “Ramp function active”.

CoE parameters

The parameters should be used depending on the operation mode:

- “normal” from the objects 0x8000, 0x8001, 0x8800, or
- “extended” from object 0x8010.

The base frequency of the ramp can be selected by index 0x8000:07 [▶ 81] or 0x8010:07 [▶ 87] “Ramp base frequency”. Bit 1 of the status word (SW.1 [▶ 79]) or index 0x6010:02 [▶ 96] “Ramp active” is set when a ramp is traversed.

The deactivation of this function, which can also take place during service operation via CW.1 [▶ 78] or index 0x7010:02 [▶ 97] “Disable Ramp”, results in the enabling of CW.0 [▶ 78] or index 0x7010:01 [▶ 97] “Frequency select”. This allows the user to quickly change the base frequency during operation;

if CW.0 [▶ 78] or index 0x7010:01 [▶ 97] = 1 (confirmation by SW.0 [▶ 79] or index 0x6010:01 [▶ 96]), then “Base frequency 2” in object 0x8001:03 [▶ 82] or 0x8010:13 [▶ 87] is used instead of “Base frequency 1” in object 0x8001:02 [▶ 82] or 0x8010:12 [▶ 87] (CW.0 [▶ 78] or index 0x7010:01 [▶ 97] = 0).

The EL2521-00xx terminals feature digital input signals T and Z. These can be used, for example, to read the “Ready”, “In target”, or “At speed” signals from a variable frequency drive and transmit them directly to the control. The signals are not given any internal pre-processing. The input signals T and Z are read into status word SW.4 [▶ 79]/SW.5 [▶ 79] (Legacy) or index 0x6010:05 [▶ 96]/0x6010:06 [▶ 96] (Standard).

The terminal offers a facility for soft starting and stopping. Using index 0x8001:04 [▶ 82] or 0x8010:14 [▶ 87] “Ramp time constant rising”, the ramp gradient for starting can be set with an accuracy of 10 or 1000 Hz/sec (index 0x8000:07 [▶ 81] or 0x8010:07 [▶ 87]). Index 0x8001:05 [▶ 82] or 0x8010:15 [▶ 87] “Ramp time constant falling” has the same function for stopping. The process date can be modified during transit of the ramp (CW.2 [▶ 78] or index 0x7010:03 [▶ 97] “Go counter”). The terminal then takes the new value as its target frequency.

Resolution

The base frequencies are specified with their resolution of 1 Hz per bit

Base frequency 1: Index 0x8001:02 [▶ 82] or 0x8010:12 [▶ 87] or

Base frequency 2: Index 0x8001:03 [▶ 82] or 0x8010:13 [▶ 87]).

The terminal operates internally at 16 MHz with a resolution of 32 bits. This corresponds to a theoretical minimum step size of 0.0037 Hz/step over the entire frequency range. The output stage allows a maximum frequency of 500 kHz to be output.

9.2.1.2 Travel distance control

The travel distance control function can be activated in the CoE. Starting from the current counter value, a target counter value is automatically approached via ramps, taking into account a maximum driving frequency, and the corresponding pulses are output at the outputs. The output frequency thereby changes in accordance with the current counter value.
When the preset counter value is reached, the terminal switches the frequency to zero. The output of an accurate number of pulses is only possible with this “travel distance control” function.

The sequence is determined by several factors, see figure [▶ 64]. Before parameterizing the travel distance control, it is recommended to carry out a CoE reset see EtherCAT system manual chapter “Restoring the delivery state” in order to rule out side effects.

The sequence and the associated parameters are listed in following table; in “enhanced operation mode” some parameters are no longer in the CoE, but can be linked as process data.

Phase	Normal operation mode	Enhanced operation mode
Parameterization		
Activate travel distance control	0x8000:0A = TRUE	0x8010:0A = TRUE
Basic ramp frequency (10 Hz/1 kHz)	0x8000:07 = ?	0x8010:07 = ?
Ramp time constant “rising” t1 [Δ/sec]	0x8001:04 = ?	0x8010:14 = ?
maximum driving frequency f1	0x8800:02 = ?	---
Ramp time constant “falling” t3 [Δ/sec] (> 1.1 * Ramp time constant “rising” t1 see note [▶ 64] !)	0x8001:05 = ?	0x8010:15 = ?
Output frequency f2	0x8001:07 = ?	0x8010:17 = ?
Trip		
Specify target position	0x8800:01 = ?	PDO: TargetCounterValue = ?
Trip start	CW.2 = TRUE	PDO: Control.GoCounter = TRUE
maximum driving frequency f1	---	PDO: FrequencyValue <> 0
Reset		
	CW.2 = FALSE	PDO: FrequencyValue = 0
		PDO: Control.GoCounter = FALSE

Setting “Go Counter” in Advanced Operation Mode

In the case of travel distance control in enhanced operation mode, the “Go counter” bit must be set at the same time or before specifying the “Frequency value”.

If the “Go counter” bit is not set and the “Frequency value” is not equal to 0, then travel distance control is **not** active and clock pulses are already output!

Ramp time constant

The “real” ramp time results from the multiplication of the basic ramp frequency with that of the rising/falling ramp time constant.

Steepness of the falling ramp

In order to travel to a destination with precision, it is necessary that the time constant for the falling ramp is greater than that of the rising ramp by a certain factor. This is necessary so that the slowing down frequency is reached before the final counter state, so that the terminal does not drive up to the end point at full speed.

To explain in more detail:
The EL2521 calculates the number of steps that are still to be taken in time t2 from time t1 and from the number of steps that have been taken. The calculation for stopping assumes the same number of steps as that found for starting up.
The downward ramp must be a little steeper, approx. 10%, so that it is possible to reach the destination exactly in the remaining time t3 + t4 + t5. This relationship changes with the maximum frequency.

Example of a travel distance ramp

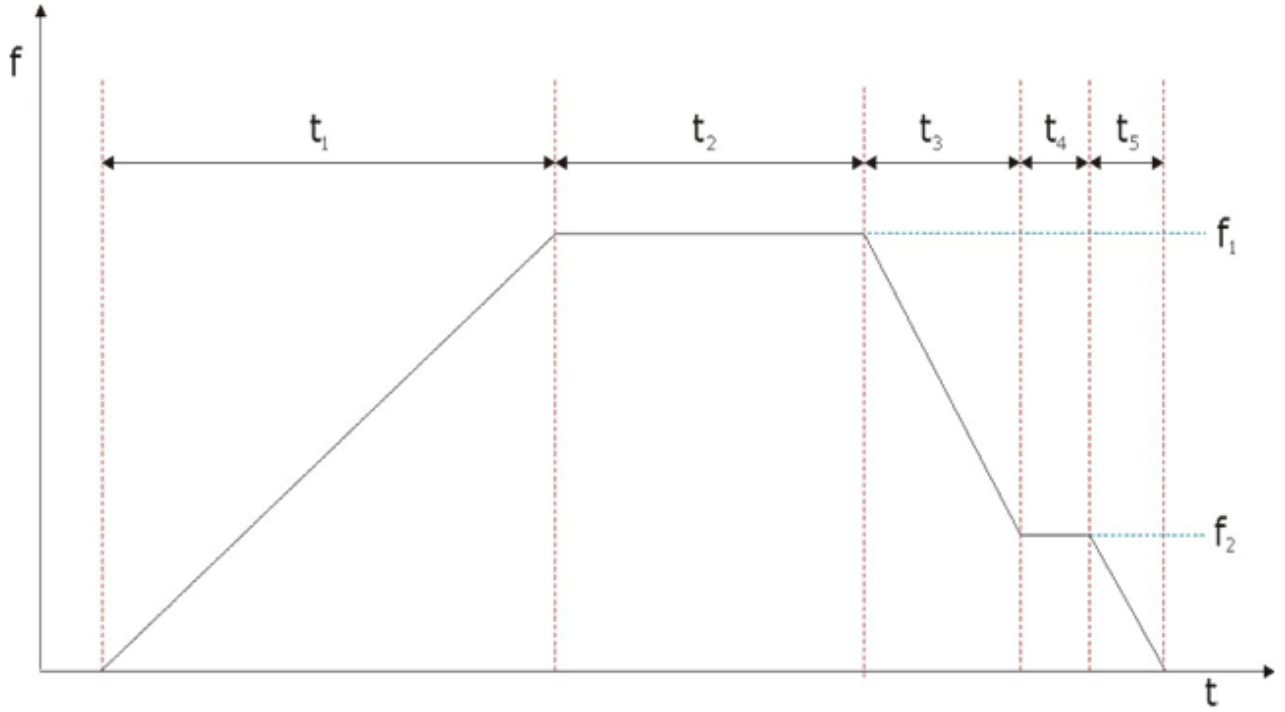


Fig. 42: Phases of the travel distance control

By way of example, the recording of a short real travel distance ramp is shown here together with the sample program used for it:

https://infosys.beckhoff.com/content/1033/el252x/Resources/1850209803.zip

The short step sequence resets the current counter value to 0 and then drives to the target position 65. In the System Manager file the EL2521-xxxx is set to the appropriate CoE values for this example via the StartUp parameters.

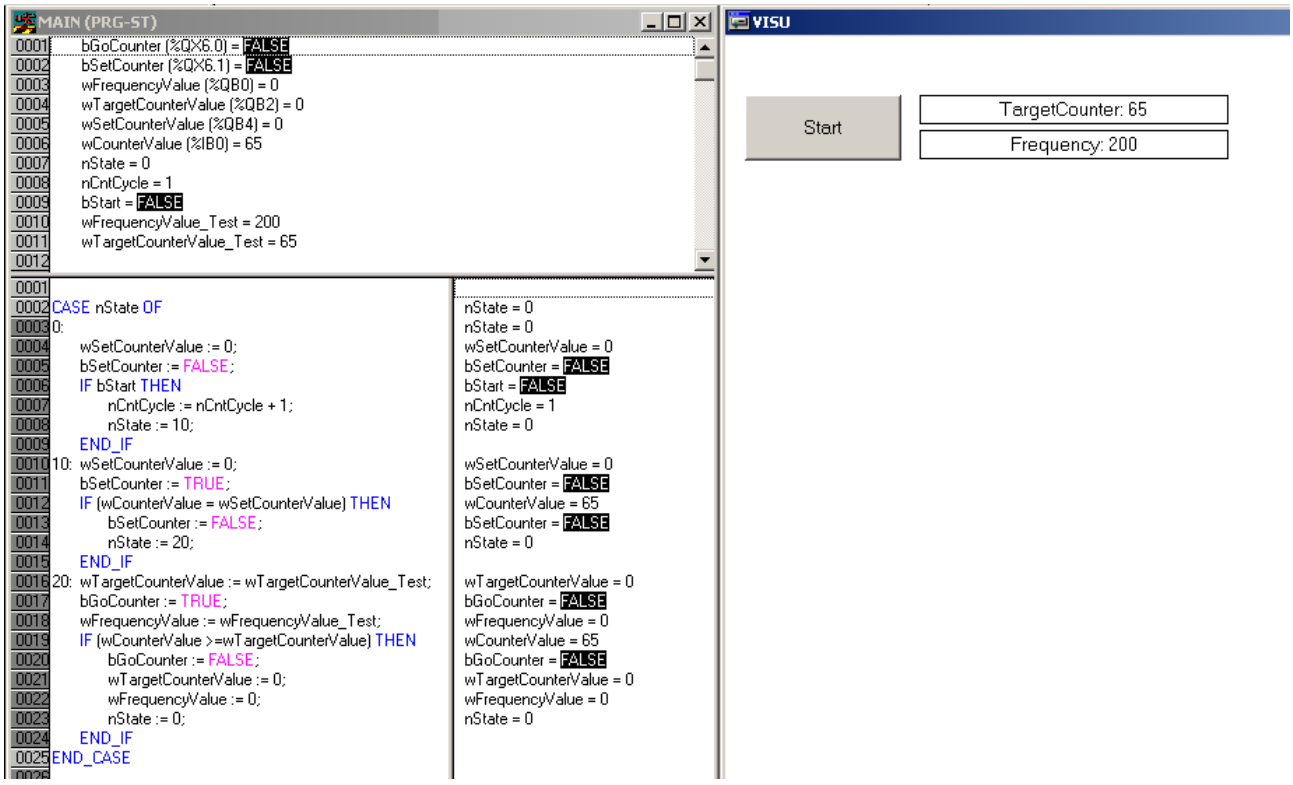


Fig. 43: Sample travel distance control program

The result is the output of a variable frequency up to the target position 65.

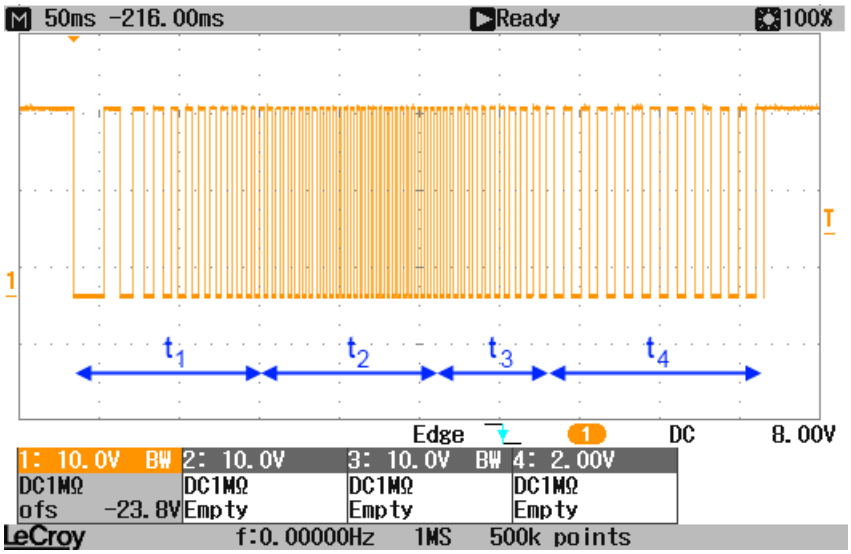


Fig. 44: Oscilloscope recording of the pulse sequence

9.2.1.3 Output mode

Operation mode selection and output pattern

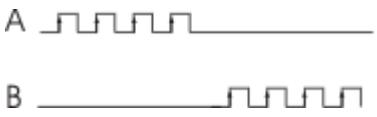
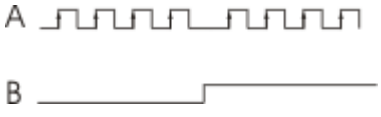
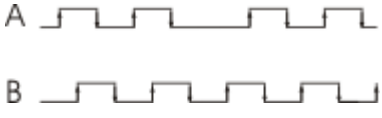
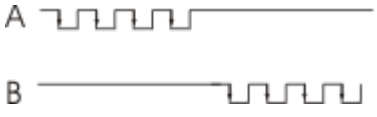
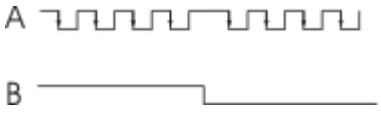
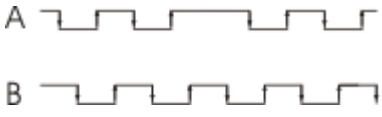
Apart from the operating mode FM (**F**requency **M**odulation, index “Operation mode” 0x8000:0E [▶ 81] or 0x8010:0E [▶ 87] = 0_{dec}), the EL2521 can also be used for stepper motor control with pulse-direction control (Frq-Cnt pulse mode, index 0x8000:0E [▶ 81] or 0x8010:0E [▶ 87] = 1_{dec}).

A further operation mode is incremental encoder simulation (index 0x8000:0E [▶ 81] or 0x8010:0E [▶ 87] = 2_{dec}). It is possible to connect the terminal output directly to an incremental encoder input, with which many servo drives and frequency converters are equipped. The pulse pattern is output through channels A and B. The necessary operation mode can be configured via the feature object 0x8000:0E [▶ 81] or 0x8010:0E [▶ 87].

The operation modes differ primarily between the

- positive logic mode 0, 1, 2 and
- negative logic mode 4, 5, 6.
  The negative logic can be activated with index “Negative logic” 0x8000:0F [▶ 81] or 0x8010:10 [▶ 87].

Operation modes 2 and 6 simulate an incremental encoder, and permit direct connection to an evaluation unit such as a servo drive or frequency converter with an incremental encoder input.

Operating mode	Parameterization normal/enhanced operation mode	Function	
		Clockwise rotation	Counter clockwise rotation
Frequency modulation positive logic (BA0)	“Operation mode” 0x8000:0E / 0x8010:0E = 0_{dec} “Negative logic” 0x8000:0F / 0x8010:10 = FALSE		
Pulse-direction control positive logic (BA1)	“Operation mode” 0x8000:0E / 0x8010:0E = 1_{dec} “Negative logic” 0x8000:0F / 0x8010:10 = FALSE		
Incremental encoder positive logic (BA2)	“Operation mode” 0x8000:0E / 0x8010:0E = 2_{dec} “Negative logic” 0x8000:0F / 0x8010:10 = FALSE		
Frequency modulation negative logic (BA4)	“Operation mode” 0x8000:0E / 0x8010:0E = 0_{dec} “Negative logic” 0x8000:0F / 0x8010:10 = TRUE		
Pulse-direction control negative logic (BA5)	“Operation mode” 0x8000:0E / 0x8010:0E = 1_{dec} “Negative logic” 0x8000:0F / 0x8010:10 = TRUE		
Incremental encoder negative logic (BA6)	“Operation mode” 0x8000:0E / 0x8010:0E = 2_{dec} “Negative logic” 0x8000:0F / 0x8010:10 = TRUE		

9.2.1.4 Device synchronization (Sync manager, distributed clocks)

The EL2521-xxxx can be synchronized via

- the EtherCAT cycle, so-called “SM-Synchron” (Sync Manager)
- Distributed clocks (for availability see table Operation Modes)

Distributed clocks (DC)

EtherCAT and distributed clocks

You can download a basic introduction to EtherCAT and distributed clocks from the Beckhoff website (see the EtherCAT system manual, chapter “I/O Synchronization via Distributed Clocks”).

The EL2521 supports the distributed clocks functionality. In order for the EL2521 to be able to make the current process data available in time before the arrival of the querying EtherCAT datagram, a suitable signal must be generated cyclically within the terminal. This signal can be triggered in the EL2521 by two events: the SyncManager (SM) and the Distributed Clocks (DC). Under operation mode selection the following options are available (see Fig. “DC tab”):

- FreeRun/SM-Synchron
  The SyncManager event occurs when an EtherCAT frame successfully exchanges process data with the EL2521. Frame-triggered, the current process data are thus processed cyclically, but with the low temporal jitter of the Ethernet frame.
- DC-Synchron
  In the DC operation mode, process data processing is constantly triggered cyclically by the integrated DC unit, synchronous with the bus cycle as standard. More uniform polling offers higher-quality data for a higher-level control algorithm, for example. In the EL2521 the SYNC0 signal acts as trigger.

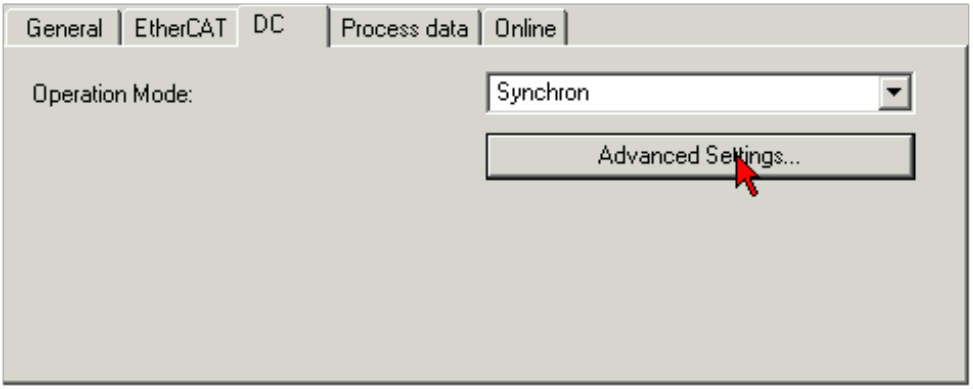


Fig. 45: DC tab (Distributed Clocks)

When “DC-Synchron” operation mode is activated TwinCAT selects settings that ensure reliable operation of the EL2521 with current data. This means that the processing of the current process data is started by the SYNC0 signal at highly constant intervals and in good time – i.e. with an adequate safety buffer – before the retrieving EtherCAT datagram.

If necessary, the SYNC0 signal can be shifted along the time axis to the right/later or left/earlier in associated dialogs by specifying a “User defined Shift Time”, see Fig. “Advanced settings distributed clocks (DC) settings, EL2521 Terminal”.

- Through a shift to the right (positive shift value), the processing of the process data takes place later – regarded relatively from the PLC the degree of currentness is thus increased. However, this increases the risk that the provision may not be finished in time before the arrival of EtherCAT frame, so that no current value is available in this cycle.
- Through a shift to the left (negative shift value) the processing of the process data takes place earlier – the degree of currentness is thus decreased; however, the safety buffer is increased before the arrival of the EtherCAT datagram. This setting may be useful in systems with high real-time jitter, if no industrial PCs from Beckhoff are used for control purposes, for example.

NOTICE

Attention! Risk of device damage!

The mentioned notes and information should be used advisedly! The SYNC0 and SYNC1 settings are automatically configured by the EtherCAT master with values that support reliable and timely process data acquisition. User intervention at this point may lead to undesired behavior! If these settings are changed in the System Manager, no plausibility checks are carried out on the software side! Correct function of the terminal with all conceivable setting options cannot be guaranteed!

EL2521 DC settings

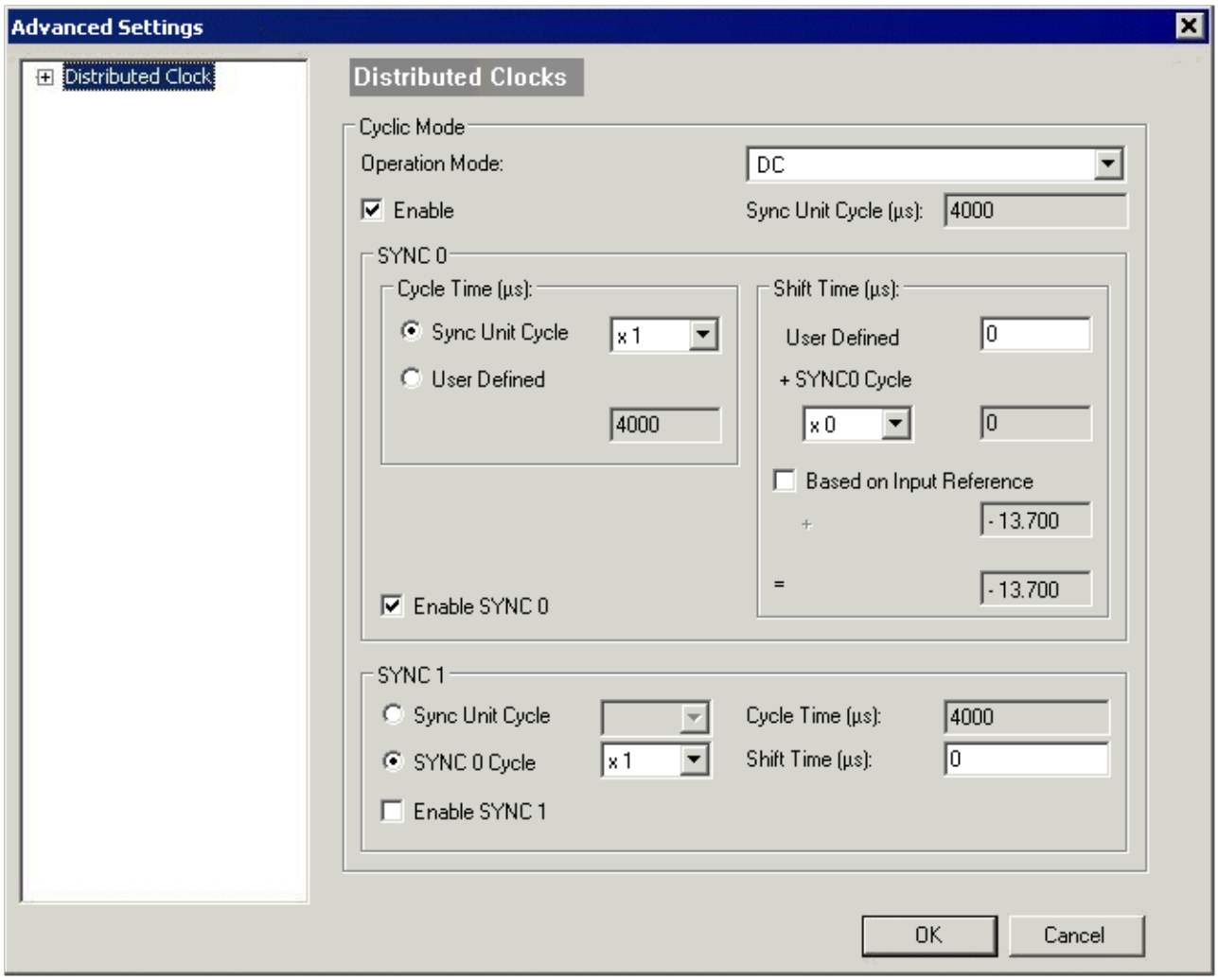


Fig. 46: Advanced settings for distributed clocks (DC), EL2521 Terminal

- “SYNC0”
  Sync Unit Cycle: Multiple of the bus cycle time. The process data are periodically processed at this interval (in µs).
- “User defined”
  Arbitrary number up to 2^{32} ns ≈ 4.3 s. Decimal point values are possible.
- “Shift Time”
  The Shift Time can be used to shift the SYNC0 pulse for this EL2521 relative to other terminals and the global SYNC pulse in nanosecond steps. If the outputs of multiple EL2521 Terminals are to be written at the same time, the same value must be entered here.
- “Based on Input Reference”
  If this option is activated an additional “Input Shift” is added to the configurable terminal-specific SYNC0 shift (“User defined”). This value is calculated and made available by the EtherCAT master (SysMan/Solution Explorer → device (EtherCAT): EtherCAT tab → advanced settings → distributed

clocks → Input Shift Time, see corresponding figures). As a result, *all* the input terminals in the system (EL1xxx, EL3xxx) read their inputs as close as possible to the time of the EtherCAT frame that will fetch them, thereby supplying the most recent possible input data to the controller.

- “Enable SYNC0”
  Automatically activated in “DC-Synchron” operation mode.
- “SYNC1”
  Additional SYNC pulse, derived from SYNC0 or from the DC itself. Not required for the EL2521.

Default setting

The cyclic writing of the outputs is triggered by the SYNC0 pulse (interrupt) from the DC in the EL2521. The EtherCAT master sets the “Sync Unit Cycle” time value to the PLC cycle time and therefore the EtherCAT cycle time as standard. According to figure “Advanced settings distributed”: 4000 µs = 4 ms because TwinCAT is in Config mode.

DC settings for EtherCAT master

Higher-level distributed clocks parameters can be modified under advanced settings for the EtherCAT master. See also basic introduction into EtherCAT and downloading distributed clocks: “Distributed clocks system description”.

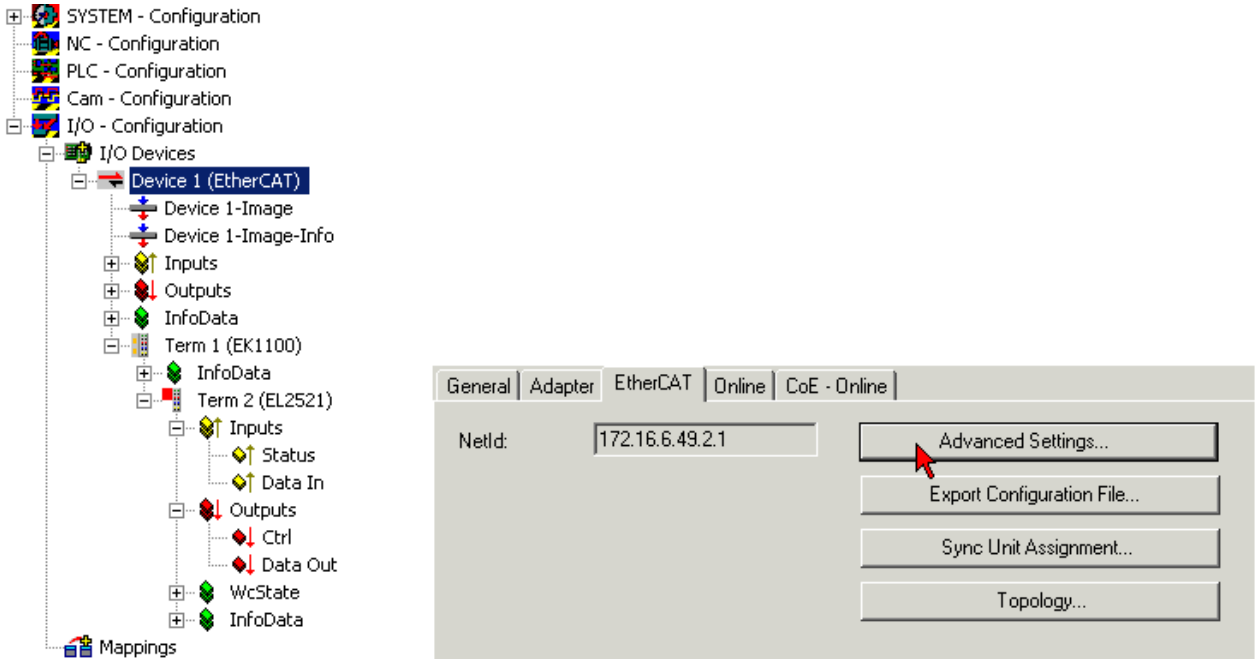


Fig. 47: EtherCAT Master, EtherCAT tab, Advanced Settings

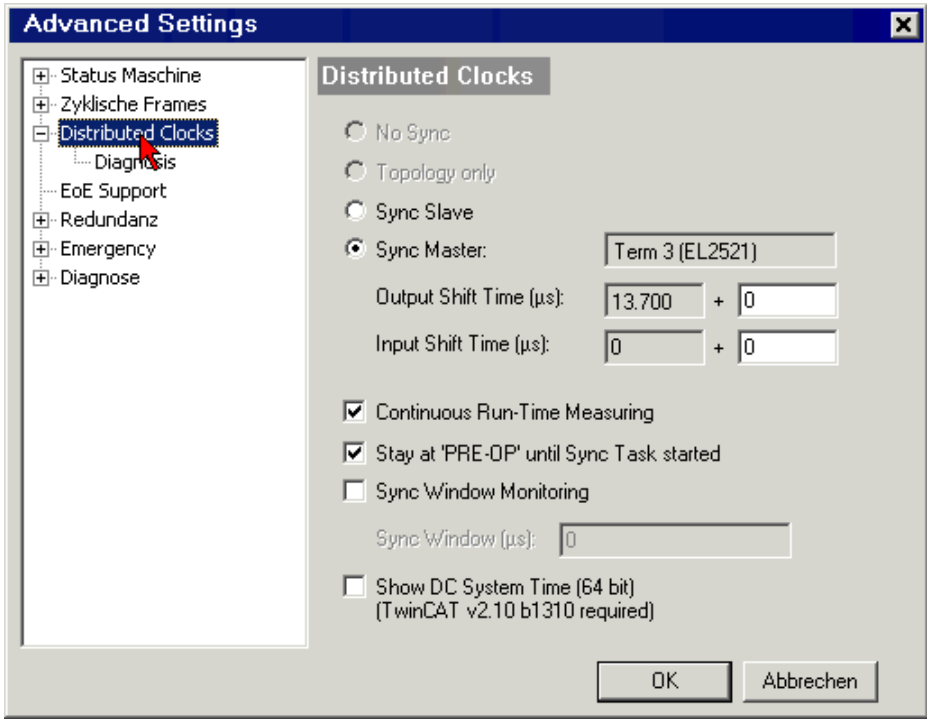


Fig. 48: EtherCAT Master, Advanced Settings, Distributed Clocks

9.2.1.5 Additional Notes EL2521

Code Word

Code Word

The vendor reserves the right to adjust the terminals according to the vendor's specifications. The code word is therefore at present reserved.

Input impedance

The input impedance of the selected target circuit must not overload the EL2521, otherwise the voltage levels according to RS422 can no longer be reached.

9.2.1.6 Notes on EL2521-0124

The EL2521-0124 has a latch input and a 24 V compare output, which both operate in connection with the position value.

Explanation on the basis of the associated process data:

Latch input, identical function as for EL encoder terminals

- PDO ENC Status (input)
  - External latch valid
  - Status of extern latch (current state of the latch input)
  - Latch value
- PDO ENC Control (output)
  - Enable latch extern on positive edge
  - Enable latch extern on negative edge

Compare output “PLS” (Programmable Limit Switch)

- PLS Control:
  - “Enable PLS”:
    = 0 Output can be switched manually via “Output”
    = 1 Automatic switching function has control over the output
  - Output
    Switches the output (no function if “Enable PLS” =1)
  - Switch on value
    Switch-on value (the output is switched on when the counter reaches this value)
  - Switch off value
    Switch-off value (the output is switched off when the counter reaches this value)

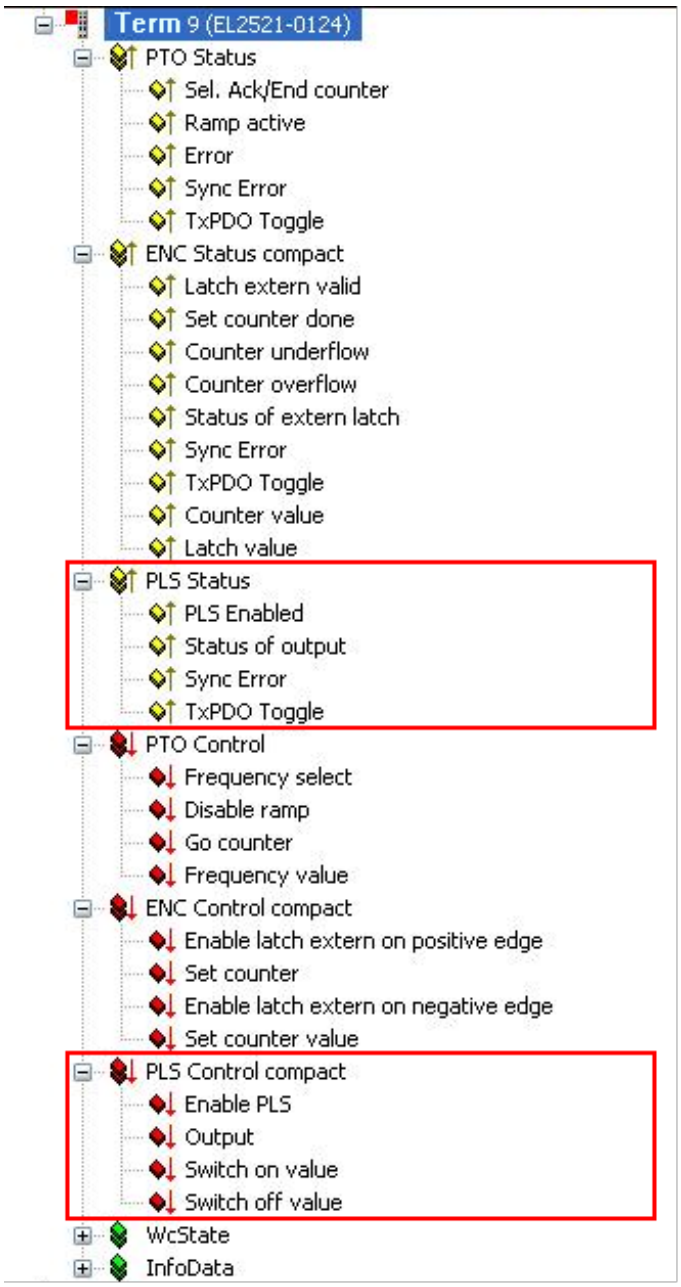


Fig. 49: Process data EL2521-0124

9.2.2 Process data

The process data selection in the System Manager specifies the operation mode of the EL2521-xxxx. The process data can be set according to the tables below for inputs and outputs either individually by hand or via the predefined PDO selection with a single click.



Fig. 50: Predefined PDO selection in the TwinCAT System Manager

Three process data sets are available for the EL2521-xxxx and are listed in following table.

Sync Manager (SM)

PDO assignment of the SyncManager

SM3, PDO Assignment 0x1C13, inputs					
Index	**assigned to PDO setting**	**Index of excluded PDOs**	**Size (byte.bit)**	**Name**	**PDO content Index - Name**
0x1A00 (default)	Legacy (MDP 252)	0x1A01 0x1A02 0x1A05	4.0	Inputs	0x6000:01 [▶ 84] - Status 0x6000:02 [▶ 84] - Data in
0x1A01	Standard 16 bit (MDP 253/511) Standard 32 bit (MDP 253/511)	0x1A00	2.0	PTO Status	0x6010:01 [▶ 96] - Sel. Ack./End counter 0x6010:02 [▶ 96] - Ramp active 0x6010:05 [▶ 96] - Status of input target 0x6010:06 [▶ 96] - Status of input zero 0x6010:07 [▶ 96] - Error 0x1C32:20 – Sync error 0x1801:09 [▶ 91] - TxPDO Toggle
0x1A02	Standard 16 bit (MDP 253/511)	0x1A00 0x1A05	4.0	ENC Status compact	0x6020:03 [▶ 96] - Set counter done 0x6020:04 [▶ 96] - Counter underflow 0x6020:05 [▶ 96] - Counter overflow 0x1C32:20 – Sync error 0x1802:09 [▶ 91] - TxPDO Toggle 0x6020:11 [▶ 96] - Counter value
0x1A05	Standard 32 bit (MDP 253/511)	0x1A00 0x1A02	6.0	ENC Status	0x6020:03 [▶ 96] - Set counter done 0x6020:04 [▶ 96] - Counter underflow 0x6020:05 [▶ 96] - Counter overflow 0x1C32:20 – Sync error 0x1805:09 [▶ 91] - TxPDO Toggle 0x6020:11 [▶ 96] - Counter value

SM2, PDO assignment 0x1C12, outputs					
Index	**assigned to PDO setting**	**Index of excluded PDOs**	**Size (byte.bit)**	**Name**	**PDO content Index - hex**
0x1600 (default)	Legacy (MDP 252)	0x1601 0x1604 0x1607 0x1602 0x1605	4.0	Inputs	0x7000:01 [▶ 84] - Ctrl 0x7000:02 [▶ 84] - Data out
0x1601	Standard 16 bit (MDP 253/511) Standard 32 bit (MDP 253/511)	0x1600	4.0	PTO Control	0x7010:01 [▶ 97] - Frequency select 0x7010:02 [▶ 97] - Disable ramp 0x7010:03 [▶ 97] - Go counter 0x7010:11 [▶ 97] - Frequency value
0x1604	Standard 16 bit (MDP 253/511)	0x1600 0x1607 0x1605	2.0	PTO Target compact	0x7010:12 [▶ 97] - Target counter value
0x1607	Standard 32 bit (MDP 253/511)	0x1600 0x1604 0x1602	4.0	PTO Target	0x7010:12 [▶ 97] - Target counter value
0x1602	Standard 16 bit (MDP 253/511)	0x1600 0x1607 0x1605	4.0	ENC Control compact	0x7020:03 [▶ 97] - Set counter 0x7020:11 [▶ 97] - Set counter value
0x1605	Standard 32 bit (MDP 253/511)	0x1600 0x1604 0x1602	6.0	ENC Control	0x7020:03 [▶ 97] - Set counter 0x7020:11 [▶ 97] - Set counter value

Process data setting options

The extent of process data can be set via the Process Data tab as described below.

PDO setting 1: Legacy (MDP 252)

- preset standard configuration in TwinCAT 2.10 (see note below for more up-to-date TwinCAT versions)
- to be used only in *normal operation mode*
- compatible with terminals up to and including FW02

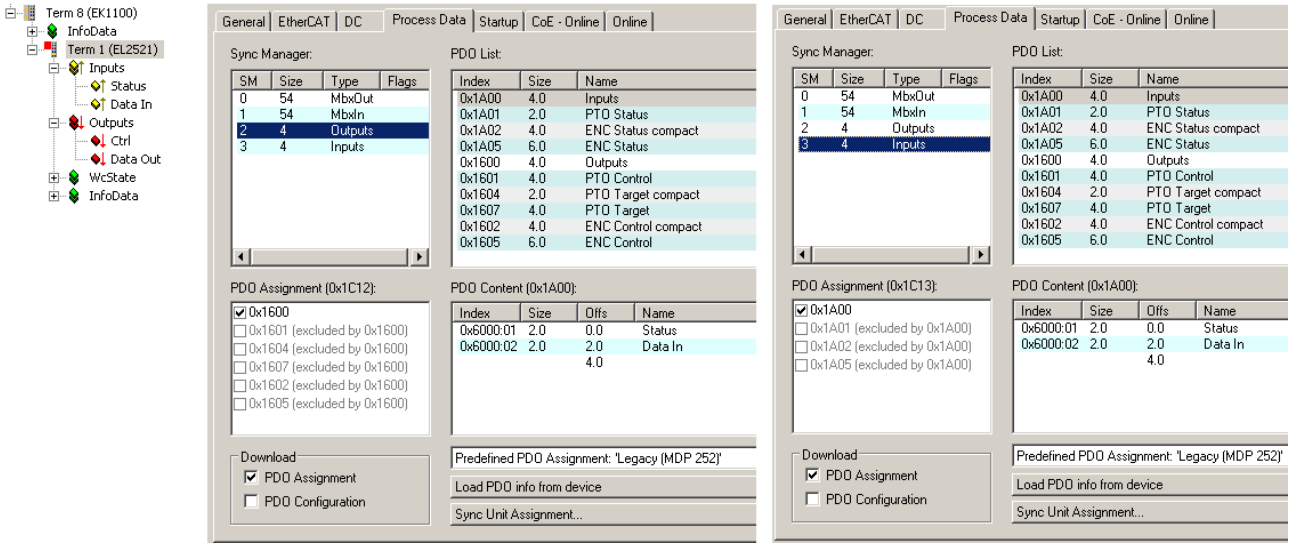


Fig. 51: Process data and PDO assignment “Legacy (MDP 252)”

Standard configuration in TwinCAT

The further development of the EL2521-xxxx from FW03 also necessitates a new process image, which is to be used preferentially in new systems. Therefore the standard configuration from TwinCAT 2.11 onwards is normally PDO setting 2 (see below), with which an EL2521-xxxx inserted manually or by scanning appears in the configuration. For reasons of compatibility with existing software, however, some customers require PDO setting 1 “Legacy MDP253” to appear as the standard configuration, even for newly created configurations. In this case the so-called compatibility flag is to be set in the System Manager. Legacy is then selected as the standard PDO configuration. Nevertheless the PDO can, of course, be converted/changed after inserting the terminal into the configuration.

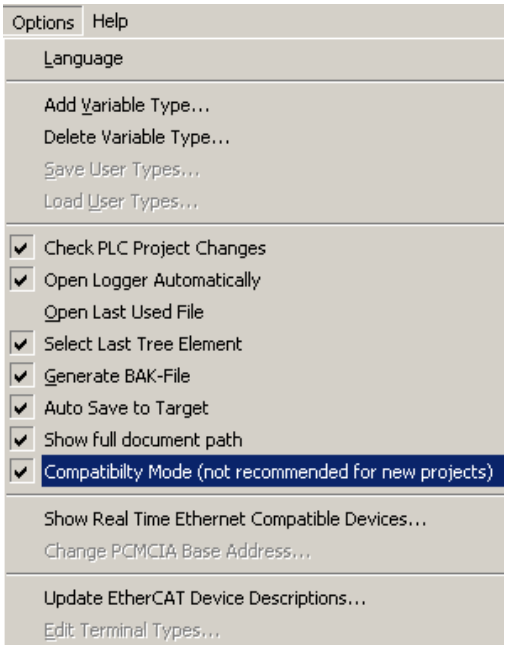


Fig.: Compatibility Mode in the System Manager from TwinCAT 2.11

PDO setting 2: Standard 16 bit (MDP 253/511)

- preset standard configuration in TwinCAT 2.11, TwinCAT 3
- to be used only in *enhanced operating mode*
- so-called compact process image, since it has only 16-bit-wide variables
- allows linking to NC axes according to MDP 253, subprofile 511

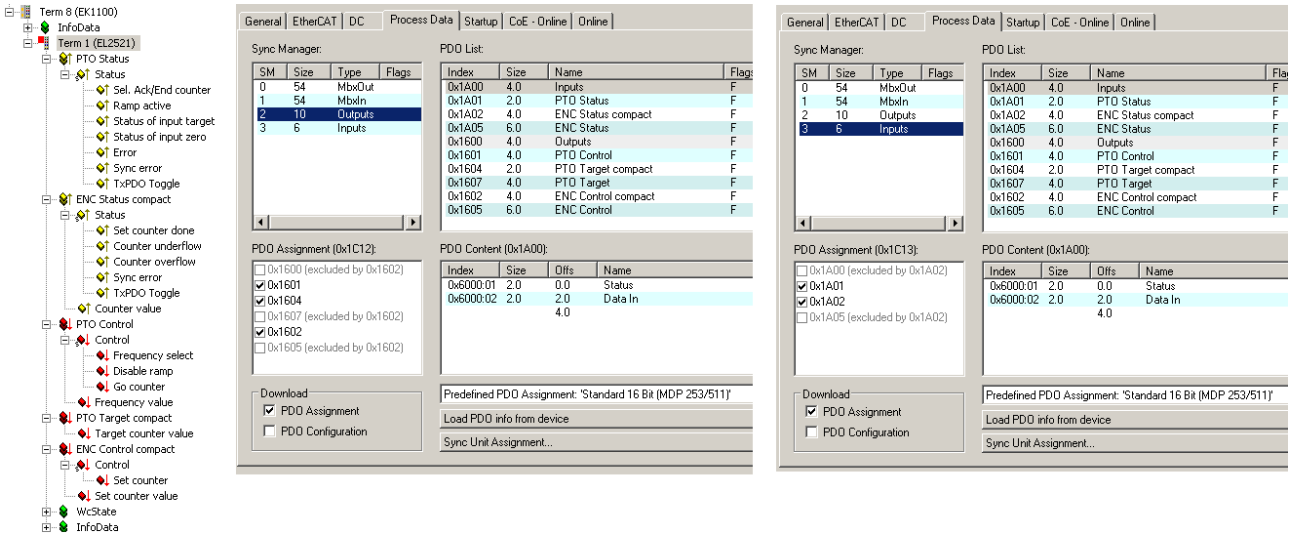


Fig. 52: Process data and PDO assignment “Standard 16-bit (MDP 253/511)”

PDO setting 3: Standard 32 bit (MDP 253/511)

- to be used only in *enhanced operating mode*
- 32-bit-wide variables
- allows linking to NC axes according to MDP 253, subprofile 511

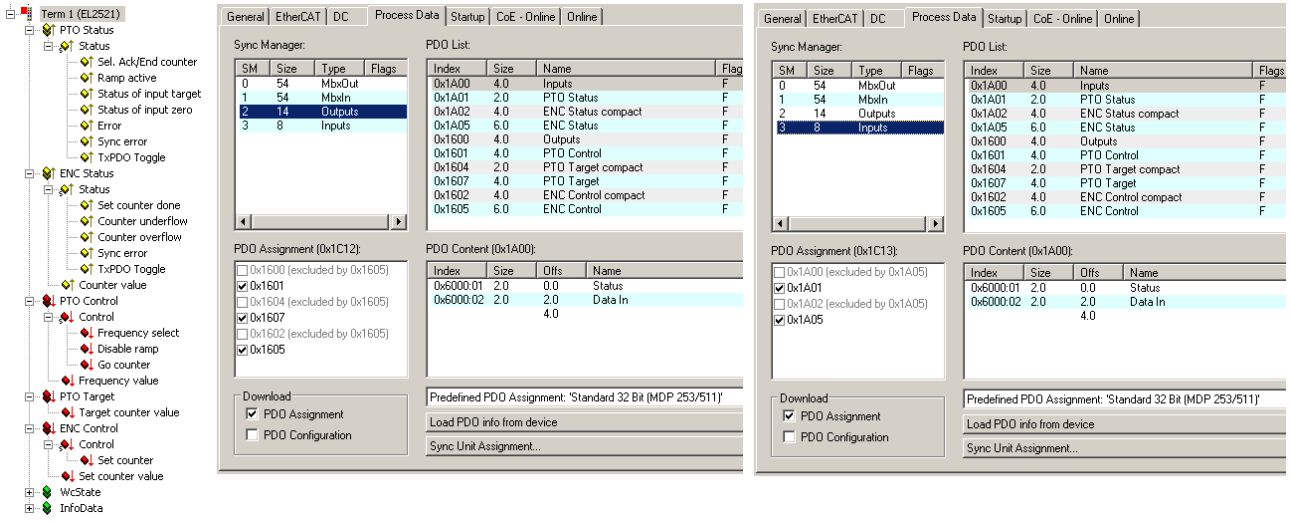


Fig. 53: Process data and PDO assignment “Standard 32-bit (MDP 253/511)”

9.2.3 Normal operation mode (Legacy MDP252)

9.2.3.1 EL2521, EL2521-0024, EL2521-0025

9.2.3.1.1 Control and status word

Control word

The control word (CW) is located in the output process image, and is transmitted from the controller to the terminal.

Bit	CW.15	CW.14	CW.13	CW.12	CW.11	CW.10	CW.9	CW.8
Name	-	-	-	-	-	-	-	-

Bit	CW.7	CW.6	CW.5	CW.4	CW.3	CW.2	CW.1	CW.0
Name	-	-	CNT_CLR	-	-	GO_COUNTER	RAMP_DIS	FREQ_SEL

Legend

Bit	Name	Description	
CW.8 - CW.15	-	-	reserved
CW.7	-	-	reserved
CW.6	-	-	reserved
CW.5	CNT_CLR	1_{bin}	The counter value is cleared or set by this bit (index 0x8000:0B [▶ 81]). Any overflow/ underflow bits that have been set are also cleared by this bit. This process can be edge-controlled or level-controlled (index 0x8000:05 [▶ 81]).
CW.4	-	-	reserved
CW.3	-	-	reserved
CW.2	GO_COUNTER	1_{bin}	If travel distance control is activated (index 0x8000:0A [▶ 81]), a specified counter value is driven to if the bit is set.
CW.1	RAMP_DIS	1_{bin}	The ramp function is disabled despite active index 0x8000:06 [▶ 81]; if the travel distance control is active it is aborted by this bit.
CW.0	FREQ_SEL	0_{bin} / 1_{bin}	Fast toggling of the base frequency (only if ramp function is deactivated) 0_{bin} = base frequency 1 (index 0x8001:02 [▶ 82]) 1_{bin} = base frequency 2 (index 0x8001:03 [▶ 82])

Status word

The status word (SW) is located in the input process image, and is transmitted from terminal to the controller.

Bit	SW.15	SW.14	SW.13	SW.12	SW.11	SW.10	SW.9	SW.8
Name	-	-	-	-	-	-	-	-

Bit	SW.7	SW.6	SW.5	SW.4	SW.3	SW.2	SW.1	SW.0
Name	-	ERROR	INPUT_Z	INPUT_T	OVERFLOW	UNDERFLOW	RAMP_ACTIVE	SEL_ACK/ END_COUNTER

Legend

Bit	Name	Description	
SW.8 - SW.15	-	-	reserved
SW.7	-	-	reserved
SW.6	ERROR	1_{bin}	General error bit, is set together with overrange and underrange
SW.5	INPUT_Z	1_{bin}	Status of the input INPUT_Z
SW.4	INPUT_T	1_{bin}	Status of the input INPUT_T
SW.3	OVERFLOW	1_{bin}	This bit is set if the 16-bit counter overflows (65535 -> 0). It is reset when the counter exceeds one third of its measuring range (21845 -> 21846) or immediately an underflow occurs.
SW.2	UNDERFLOW	1_{bin}	This bit is set if the 16-bit counter underflows (0 -> 65535). It is reset when the counter drops below two thirds of its measuring range (43690 -> 43689) or immediately an overflow occurs.
SW.1	RAMP_ACTIVE	1_{bin}	Ramp is currently being followed
SW.0	SEL_ACK/ END_COUNTER	1_{bin}	Confirms the change of base frequency. If travel distance control is activated: target counter value reached

9.2.3.1.2 Object description and parameterization

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.

NOTICE



Parameterization via the CoE list (CAN over EtherCAT)

The EtherCAT device is parameterized via the CoE - Online tab (with a double click on the respective object) or via the Process Data tab (assignment of PDOs). A detailed description can be found in the EtherCAT System-Documentation in chapter “EtherCAT subscriber configuration”

Please note the general CoE notes in the EtherCAT System Documentation in chapter “CoE-interface” when using/manipulating the CoE parameters:
- Keep a startup list if components have to be replaced
- Differentiation between online/offline dictionary,
- existence of current XML description
- use “CoE reload” for resetting changes

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization [▶ 81] during commissioning
- Objects intended for regular operation [▶ 82], e.g. through ADS access.
- Objects for indicating internal settings [▶ 82](may be fixed)

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

9.2.3.1.2.1 Restore object

Index 1011 Restore default parameters

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

9.2.3.1.2.2 Objects for commissioning

Index 0x8000 Feature bits

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	Feature bits	Max. Subindex	UINT8	RO	0x0F (15_{dec})
8000:02	Emergency ramp active	TRUE If the watchdog timer responds, the terminal ramps with the time constant set in object 0x8001:08 [▶ 82] to the value set in object 0x8001:01 [▶ 82]. FALSE The function is deactivated	BOOLEAN	RW	0x00 (0_{dec})
8000:03	Watchdog timer inactive	The SM watchdog is evaluated here. TRUE The watchdog timer is deactivated FALSE The watchdog timer is activated in the delivery state. Either the manufacturer's of the user's switch-on value is output if the watchdog overflows.	BOOLEAN	RW	0x00 (0_{dec})
8000:04	Sign/amount representation	TRUE The output value is displayed in signed amount representation: -2_{dec}= 0x8002 -1_{dec}= 0x8001 1_{dec}= 0x0001 2_{dec}= 0x0002 FALSE The output value is output as signed integer in the two's complement: -2_{dec}= 0xFFFE -1_{dec}= 0xFFFF 1_{dec}= 0x0001 2_{dec}= 0x0002	BOOLEAN	RW	0x00 (0_{dec})
8000:05	Rising edge clears/ sets counter	TRUE The counter is cleared/set on a rising edge of the Counter_Clear bit in the control word (CW.5 [▶ 78]) FALSE The counter is cleared/set on a positive level of the Counter_Clear bit in the control word (CW.5 [▶ 78])	BOOLEAN	RW	0x01 (1_{dec})
8000:06	Ramp function active	TRUE Ramp function activated FALSE Ramp function deactivated The ramp controller should only be deactivated if a higher-level controller (e.g. NC controller) takes over the control of travel distance and frequency.	BOOLEAN	RW	0x01 (1_{dec})
8000:07	Ramp base frequency	$0_{(dec)}$ Ramp base frequency: 10 Hz (pull-down menu) $1_{(dec)}$ Ramp base frequency: 1 kHz (pull-down menu)	BIT1	RW	0x00 (0_{dec})
8000:08	Direct input mode	TRUE Direct input mode FALSE Relative input mode	BOOLEAN	RW	0x00 (0_{dec})
8000:09	User switch-on value on wdt	TRUE Behavior with triggered watchdog timer: User switch-on value FALSE Behavior with triggered watchdog timer: Manufacturer's switch-on value	BOOLEAN	RW	0x00 (0_{dec})
8000:0A	Travel distance control active	TRUE Travel distance control activated FALSE Travel distance control deactivated	BOOLEAN	RW	0x00 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0B	Rising edge sets counter	TRUE Rising edge sets counter FALSE Rising edge clears counter	BOOLEAN	RW	0x00 (0_{dec})
8000:0E	Operating mode	$0_{(dec)}$ Frequency modulation operating mode (pull-down menu) $1_{(dec)}$ Pulse direction specification operating mode (pull-down menu) $2_{(dec)}$ Incremental encoder operating mode (pull-down menu)	BIT2	RW	0x00 (0_{dec})
8000:0F	Negative logic	TRUE Negative logic FALSE Positive logic	BOOLEAN	RW	0x00 (0_{dec})

Index 0x8001 User settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8001:0	User settings	Max. Subindex	UINT8	RO	0x08 (8_{dec})
8001:01	User switch-on-value	User switch-on value (frequency)	UINT16	RW	0x0000 (0_{dec})
8001:02	Base frequency 1	Base frequency 1 = 50000 Hz	UINT32	RW	0x0000C350 (50000_{dec})
8001:03	Base frequency 2	Base frequency 2 = 100000 Hz	UINT32	RW	0x000186A0 (100000_{dec})
8001:04	Ramp time constant (rising)	Ramp time constant (rising, [1/sec]) The “real” ramp time is obtained by the multiplication of the ramp base frequency by this ramp time constant.	UINT16	RW	0x03E8 (1000_{dec})
8001:05	Ramp time constant (falling)	Ramp time constant (falling, [1/sec]) The “real” ramp time is obtained by the multiplication of the ramp base frequency by this ramp time constant.	UINT16	RW	0x03E8 (1000_{dec})
8001:06	Frequency factor (digit x 10 mHz)	Frequency factor (direct input, digit x 10 mHz)	UINT16	RW	0x0064 (100_{dec})
8001:07	Slowing down frequency	Slowing down frequency, travel distance control	UINT16	RW	0x0032 (50_{dec})
8001:08	Ramp time constant (emergency)	Ramp time constant for controlled switch-off; User switch-on value is driven to (object 0x8001:01)	UINT16	RW	0x03E8 (1000_{dec})

Index 0x8800 Volatile settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8800:0	Volatile settings	Max. Subindex	UINT8	RO	0x02 (2_{dec})
8800:01	Target counter state	Target counter value	UINT32	RW	0x00000000 (0_{dec})
8800:02	Maximum frequency	Maximum frequency	UINT16	RW	0x0000 (0_{dec})

9.2.3.1.2.3 Objects for regular operation

In normal operating mode the EL2521 has no such objects.

9.2.3.1.2.4 Standard objects (0x1000-0x1FFF)

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

Index 0x1000 Device type

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

Index 0x1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EL2521

Index 1009 Hardware version

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

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	00

Index 0x1018 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	0x30520002 (810680322_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x000009D9 (2521_{dec})
1018:03	Revision	Revision number of the EtherCAT slave: • The Low Word (bit 0–15) indicates the special terminal number. • The High Word (bit 16–31) refers to the device description.	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave: • Low Word ◦ 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 0x1600 Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	RxPDO-Map	PDO Mapping RxPDO 1	UINT8	RO	0x02 (2_{dec})
1600:01	RxPDO-Mapping Element 1: Ctrl	1. PDO Mapping entry (object 0x7000 (Outputs), entry 0x01 (Ctrl))	UINT32	RO	0x7000:01, 16
1600:02	RxPDO-Mapping Element 2: Data out	2. PDO Mapping entry (object 0x7000 (Outputs), entry 0x02 (Data Out))	UINT32	RO	0x7000:02, 16

Index 0x1A00 Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	TxPDO-Map	PDO Mapping TxPDO 1	UINT8	RO	0x02 (2_{dec})
1A00:01	TxPDO-Mapping Element 1: Status	1. PDO Mapping entry (object 0x6000 (Inputs), entry 0x01 (Status))	UINT32	RO	0x6000:01, 16
1A00:02	TxPDO-Mapping Element 2: Data in	2. PDO Mapping entry (object 0x6000 (Inputs), entry 0x02 (Data In))	UINT32	RO	0x6000:02, 16

Index 1C00 Sync manager type

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

Index 0x1C01 Process data format

Index (hex)	Name	Meaning	Data type	Flags	Default
1C01:0	Process data format	Process data format	UINT16	RW	0x0100 (256_{dec})

Index 0x1C12 SM 0002 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x01 (1_{dec})
1C12:01	Assigned RxPDO	1. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})

Index 0x1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x01 (1_{dec})
1C13:01	Assigned TxPDO	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})

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

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

Index 0x6000 Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	Inputs	Max. Subindex	UINT8	RO	0x02 (2_{dec})
6000:01	Status	Status Word [▶ 78]	UINT16	RO	0x0000 (0_{dec})
6000:02	Data In	Input process data (counter value)	UINT16	RO	0x0000 (0_{dec})

Index 0x7000 Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	Outputs	Max. Subindex	UINT8	RO	0x02 (2_{dec})
7000:01	Ctrl	Control Word [▶ 78]	UINT16	RO	0x0000 (0_{dec})
7000:02	Data Out	Output process data (frequency value)	UINT16	RO	0x0000 (0_{dec})

Index 0xA000 Diagnostic parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
A000:0	Diagnostic parameter	Max. Subindex	UINT8	RO	0x01 (1_{dec})
A000:01	Counter extension	Counter extension	UINT16	RO	0x0000 (0_{dec})

Index 0xF000 Profile settings

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	0x0001 (1_{dec})

Index F008 Code word

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

9.2.4 Enhanced operation mode (Standard MDP253/511)

9.2.4.1 EL2521, EL2521-0024, EL2521-0025

9.2.4.1.1 Object description and parameterization – enhanced operation mode

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.

NOTICE



Parameterization via the CoE list (CAN over EtherCAT)

The EtherCAT device is parameterized via the CoE - Online tab (with a double click on the respective object) or via the Process Data tab (assignment of PDOs). A detailed description can be found in the EtherCAT System-Documentation in chapter "EtherCAT subscriber configuration"

Please note the general CoE notes in the EtherCAT System Documentation in chapter "CoE-interface" when using/manipulating the CoE parameters:
- Keep a startup list if components have to be replaced
- Differentiation between online/offline dictionary,
- existence of current XML description
- use "CoE reload" for resetting changes

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization [▶ 87] during commissioning
- Objects intended for regular operation [▶ 88], e.g. through ADS access.
- Objects for indicating internal settings [▶ 88](may be fixed)

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

9.2.4.1.1.1 Restore object

Index 1011 Restore default parameters

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

9.2.4.1.1.2 Objects for commissioning

Index 0x8010 PTO Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0	PTO Settings	Max. Subindex	UINT8	RO	0x18 (24_{dec})
8010:02	Emergency ramp active	TRUE If the watchdog timer responds, the terminal ramps with the time constant set in object 0x8001:08 0x8010:18 [▶ 87] to the value set in object 0x8001:01 0x8010:11 [▶ 87]. FALSE The function is deactivated	BOOLEAN	RW	0x00 (0_{dec})
8010:03	Watchdog timer inactive	The SM watchdog is evaluated here. TRUE The watchdog timer is deactivated FALSE The watchdog timer is activated in the delivery state. Either the manufacturer's of the user's switch-on value is output if the watchdog overflows	BOOLEAN	RW	0x00 (0_{dec})
8010:04	Sign/amount representation	TRUE The output value is displayed in signed amount representation: -2_{dec}= 0x8002 -1_{dec}= 0x8001 1_{dec}= 0x0001 2_{dec}= 0x0002 FALSE The output value is output as signed integer in the two's complement: -2_{dec}= 0xFFFE -1_{dec}= 0xFFFF 1_{dec}= 0x0001 2_{dec}= 0x0002	BOOLEAN	RW	0x00 (0_{dec})
8010:06	Ramp function active	TRUE Ramp function activated FALSE Ramp function deactivated The ramp controller should only be deactivated if a higher-level controller (e.g. NC controller) takes over the control of travel distance and frequency.	BOOLEAN	RW	0x01 (1_{dec})
8010:07	Ramp base frequency	$0_{(dec)}$ Ramp base frequency: 10 Hz (pull-down menu) $1_{(dec)}$ Ramp base frequency: 1 kHz (pull-down menu)	BIT1	RW	0x00 (0_{dec})
8010:08	Direct input mode	TRUE Direct input mode FALSE Relative input mode	BOOLEAN	RW	0x00 (0_{dec})
8010:09	User switch-on value on wdt	TRUE Behavior with triggered watchdog timer: User switch-on value FALSE Behavior with triggered watchdog timer: Manufacturer's switch-on value	BOOLEAN	RW	0x00 (0_{dec})
8010:0A	Travel distance control active	TRUE Travel distance control activated FALSE Travel distance control deactivated	BOOLEAN	RW	0x00 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0E	Operating mode	$0_{(dec)}$ Frequency modulation operating mode (pull-down menu) $1_{(dec)}$ Pulse direction specification operating mode (pull-down menu) $2_{(dec)}$ Incremental encoder operating mode (pull-down menu)	BIT2	RW	0x00 (0_{dec})
8010:10	Negative logic	TRUE Negative logic FALSE Positive logic	BOOLEAN	RW	0x00 (0_{dec})
8010:11	User switch-on-value	User switch-on value (frequency)	UINT16	RW	0x0000 (0_{dec})
8010:12	Base frequency 1	Base frequency 1 = 50000 Hz	UINT32	RW	0x0000C350 (50000_{dec})
8010:13	Base frequency 2	Base frequency 2 = 100000 Hz	UINT32	RW	0x000186A0 (100000_{dec})
8010:14	Ramp time constant (rising)	Ramp time constant (rising)	UINT16	RW	0x03E8 (1000_{dec})
8010:15	Ramp time constant (falling)	Ramp time constant (falling)	UINT16	RW	0x03E8 (1000_{dec})
8010:16	Frequency factor (digit x 10 mHz)	Frequency factor (direct input, digit x 10 mHz)	UINT16	RW	0x0064 (100_{dec})
8010:17	Slowing down frequency	Slowing down frequency, travel distance control	UINT16	RW	0x0032 (50_{dec})
8010:18	Ramp time constant (emergency)	Ramp time constant for controlled switch-off; User switch-on value is driven to (object 0x8001:01 0x8010:11 [▶ 87])	UINT16	RW	0x03E8 (1000_{dec})

9.2.4.1.1.3 Objects for regular operation

In enhanced operating mode the EL2521 has no such objects.

9.2.4.1.1.4 Standard objects (0x1000-0x1FFF)

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

Index 0x1000 Device type

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

Index 0x1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EL2521

Index 1009 Hardware version

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

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	00

Index 0x1018 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	0x09D93052 (165228626_{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	0x03F80000 (66584576_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave: • Low Word ◦ 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 0x1400 RxPDO-Par

Index (hex)	Name	Meaning	Data type	Flags	Default
1400:0	RxPDO-Par	PDO Parameter RxPDO 1	UINT8	RO	0x06 (6_{dec})
1400:06	Exclude RxPDOs	Specifies the RxPDOs (index (hex) of RxPDO mapping objects) that must not be transferred together with RxPDO 1.	OCTET-STRING[10]	RO	01 16 04 16 07 16 02 16 05 16

Index 0x1401 PTO RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1401:0	PTO RxPDO-Par Control	PDO Parameter RxPDO 2	UINT8	RO	0x06 (6_{dec})
1401:06	Exclude RxPDOs	Specifies the RxPDOs (index (hex) of RxPDO mapping objects) that must not be transferred together with RxPDO 2.	OCTET-STRING[10]	RO	00 16 00 00 00 00 00 00 00 00

Index 0x1402 ENC RxPDO-Par Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1402:0	ENC RxPDO-Par Control compact	PDO Parameter RxPDO 3	UINT8	RO	0x06 (6_{dec})
1402:06	Exclude RxPDOs	Specifies the RxPDOs (index (hex) of RxPDO mapping objects) that must not be transferred together with RxPDO 3.	OCTET-STRING[10]	RO	00 16 05 16 07 16 00 00 00 00

Index 0x1404 PTO RxPDO-Par Target compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1404:0	PTO RxPDO-Par Target compact	PDO Parameter RxPDO 5	UINT8	RO	0x06 (6_{dec})
1404:06	Exclude RxPDOs	Specifies the RxPDOs (index (hex) of RxPDO mapping objects) that must not be transferred together with RxPDO 5.	OCTET-STRING[10]	RO	00 16 05 16 07 16 00 00 00 00

Index 0x1405 ENC RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1405:0	ENC RxPDO-Par Control	PDO Parameter RxPDO 6	UINT8	RO	0x06 (6_{dec})
1405:06	Exclude RxPDOs	Specifies the RxPDOs (index (hex) of RxPDO mapping objects) that must not be transferred together with RxPDO 6.	OCTET-STRING[10]	RO	00 16 02 16 04 16 00 00 00 00

Index 0x1407 PTO RxPDO-Par Target

Index (hex)	Name	Meaning	Data type	Flags	Default
1407:0	PTO RxPDO-Par Target	PDO Parameter RxPDO 8	UINT8	RO	0x06 (6_{dec})
1407:06	Exclude RxPDOs	Specifies the RxPDOs (index (hex) of RxPDO mapping objects) that must not be transferred together with RxPDO 8.	OCTET-STRING[10]	RO	00 16 02 16 04 16 00 00 00 00

Index 0x1600 RxPDO-Map

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	RxPDO-Map	PDO Mapping RxPDO 1	UINT8	RO	0x02 (2_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (Outputs), entry 0x01 (Ctrl))	UINT32	RO	0x7000:01, 16
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (Outputs), entry 0x02 (Data Out))	UINT32	RO	0x7000:02, 16

Index 0x1601 PTO RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	PTO RxPDO-Map Control	PDO Mapping RxPDO 2	UINT8	RO	0x06 (6_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (PTO Outputs), entry 0x01 (Frequency select))	UINT32	RO	0x7010:01, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (PTO Outputs), entry 0x02 (Disable ramp))	UINT32	RO	0x7010:02, 1
1601:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (PTO Outputs), entry 0x03 (Go counter))	UINT32	RO	0x7010:03, 1
1601:04	SubIndex 004	4. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1601:05	SubIndex 005	5. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1601:06	SubIndex 006	6. PDO Mapping entry (object 0x7010 (PTO Outputs), entry 0x11 (Frequency value))	UINT32	RO	0x7010:11, 16

Index 0x1602 ENC RxPDO-Map Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	ENC RxPDO-Map Control compact	PDO Mapping RxPDO 3	UINT8	RO	0x05 (5_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1602:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (ENC Outputs), entry 0x03 (Set counter))	UINT32	RO	0x7020:03, 1
1602:03	SubIndex 003	3. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1602:04	SubIndex 004	4. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1602:05	SubIndex 005	5. PDO Mapping entry (object 0x7020 (ENC Outputs), entry 0x11 (Set counter value))	UINT32	RO	0x7020:11, 16

Index 0x1604 PTO RxPDO-Map Target compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	PTO RxPDO-Map Target compact	PDO Mapping RxPDO 5	UINT8	RO	0x01 (1_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (PTO Outputs), entry 0x12 (Target counter value))	UINT32	RO	0x7010:12, 16

Index 0x1605 ENC RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	ENC RxPDO-Map Control	PDO Mapping RxPDO 6	UINT8	RO	0x05 (5_{dec})
1605:01	SubIndex 001	1. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1605:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (ENC Outputs), entry 0x03 (Set counter))	UINT32	RO	0x7020:03, 1
1605:03	SubIndex 003	3. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
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 (ENC Outputs), entry 0x11 (Set counter value))	UINT32	RO	0x7020:11, 32

Index 0x1607 PTO RxPDO-Map Target

Index (hex)	Name	Meaning	Data type	Flags	Default
1607:0	PTO RxPDO-Map Target	PDO Mapping RxPDO 8	UINT8	RO	0x01 (1_{dec})
1607:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (PTO Outputs), entry 0x12 (Target counter value))	UINT32	RO	0x7010:12, 32

Index 0x1800 TxPDO-Par

Index (hex)	Name	Meaning	Data type	Flags	Default
1800:0	TxPDO-Par	PDO parameter TxPDO 1	UINT8	RO	0x06 (6_{dec})
1800:06	Exclude TxPDOs	Specifies the TxPDOs (index (hex) of TxPDO mapping objects) that must not be transferred together with TxPDO 1.	OCTET-STRING[6]	RO	01 1A 02 1A 05 1A

Index 0x1801 PTO TxPDO-Par Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1801:0	PTO TxPDO-Par Status	PDO parameter TxPDO 2	UINT8	RO	0x09 (9_{dec})
1801:06	Exclude TxPDOs	Specifies the TxPDOs (index (hex) of TxPDO mapping objects) that must not be transferred together with TxPDO 2.	OCTET-STRING[6]	RO	00 1A 00 00 00 00
1801:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data.	BOOLEAN	RO	0x00 (0_{dec})

Index 0x1802 ENC TxPDO-Par Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1802:0	ENC TxPDO-Par Status compact	PDO parameter TxPDO 3	UINT8	RO	0x09 (9_{dec})
1802:06	Exclude TxPDOs	Specifies the TxPDOs (index (hex) of TxPDO mapping objects) that must not be transferred together with TxPDO 3.	OCTET-STRING[6]	RO	05 1A 00 1A 00 00
1802:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data.	BOOLEAN	RO	0x00 (0_{dec})

Index 0x1805 ENC TxPDO-Par Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1805:0	ENC TxPDO-Par Status	PDO parameter TxPDO 6	UINT8	RO	0x09 (9_{dec})
1805:06	Exclude TxPDOs	Specifies the TxPDOs (index (hex) of TxPDO mapping objects) that must not be transferred together with TxPDO 6.	OCTET-STRING[6]	RO	02 1A 00 1A 00 00
1805:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data.	BOOLEAN	RO	0x00 (0_{dec})

Index 0x1A00 TxPDO-Map

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	TxPDO-Map	PDO Mapping TxPDO 1	UINT8	RO	0x02 (2_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (Inputs), entry 0x01 (Status))	UINT32	RO	0x6000:01, 16
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (Inputs), entry 0x02 (Data In))	UINT32	RO	0x6000:02, 16

Index 0x1A01 PTO TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	PTO TxPDO-Map Status	PDO Mapping TxPDO 2	UINT8	RO	0x0A (10_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (PTO Inputs), entry 0x01 (Sel. Ack/End counter))	UINT32	RO	0x6010:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (PTO Inputs), entry 0x02 (Ramp active))	UINT32	RO	0x6010:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (PTO Inputs), entry 0x05 (Status of input target))	UINT32	RO	0x6010:05, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (PTO Inputs), entry 0x06 (Status of input zero))	UINT32	RO	0x6010:06, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (PTO Inputs), entry 0x07 (Error))	UINT32	RO	0x6010:07, 1
1A01:07	SubIndex 007	7. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A01:0A	SubIndex 010	10. PDO Mapping entry (object 0x1801 (PTO TxPDO-Par Status), entry 0x09 (TxPDO-Toggle))	UINT32	RO	0x1801:09, 1

Index 0x1A02 ENC TxPDO-Map Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	ENC TxPDO-Map Status compact	PDO Mapping TxPDO 3	UINT8	RO	0x0A (10_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x03 (Set counter done))	UINT32	RO	0x6020:03, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x04 (Counter underflow))	UINT32	RO	0x6020:04, 1
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x05 (Counter overflow))	UINT32	RO	0x6020:05, 1
1A02:05	SubIndex 005	5. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1A02:06	SubIndex 006	6. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A02:08	SubIndex 008	8. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A02:09	SubIndex 009	9. PDO Mapping entry (object 0x1802 (ENC TxPDO-Par Status compact), entry 0x09 (TxPDO-Toggle))	UINT32	RO	0x1802:09, 1
1A02:0A	SubIndex 010	10. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6020:11, 16

Index 0x1A05 ENC TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	ENC TxPDO-Map Status	PDO Mapping TxPDO 6	UINT8	RO	0x0A (10_{dec})
1A05:01	SubIndex 001	1. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A05:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x03 (Set counter done))	UINT32	RO	0x6020:03, 1
1A05:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x04 (Counter underflow))	UINT32	RO	0x6020:04, 1
1A05:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x05 (Counter overflow))	UINT32	RO	0x6020:05, 1
1A05:05	SubIndex 005	5. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1A05:06	SubIndex 006	6. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A05:07	SubIndex 007	7. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A05:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A05:09	SubIndex 009	9. PDO Mapping entry (object 0x1805 (ENC TxPDO-Par Status), entry 0x09 (TxPDO-Toggle))	UINT32	RO	0x1805:09, 1
1A05:0A	SubIndex 010	10. PDO Mapping entry (object 0x6020 (ENC Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6020:11, 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 0x1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x01 (1_{dec})
1C12:01	SubIndex 001	1. allocated RxPDO (contains the index (hex) of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	SubIndex 002	2. allocated RxPDO (contains the index (hex) of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:03	SubIndex 003	3. allocated RxPDO (contains the index (hex) of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 0x1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x01 (1_{dec})
1C13:01	SubIndex 001	1. allocated TxPDO (contains the index (hex) of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	SubIndex 002	2. allocated TxPDO (contains the index (hex) of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 0x1C32 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: FreeRun • 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	0x001E8480 (2000000_{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: FreeRun is supported • Bit 1 = 1: Synchron with SM 2 Event is supported • Bit 2–3 = 01: DC mode is supported • Bit 4–5 = 10: Output Shift with SYNC1 event (DC mode only) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08)	UINT16	RO	0xC007 (49159_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x00000000 (0_{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, 0x1C32:05, 0x1C32:06, 0x1C32:09, 0x1C33:03 [▶ 95], 0x1C33:06 [▶ 94], 0x1C33:09 [▶ 95] 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 0x1C33 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: FreeRun • 1: Synchron with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 94]	UINT32	RW	0x001E8480 (2000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: Synchron with SM 2 Event is supported (outputs available) • Bit 1: Synchron 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 [▶ 94] or 0x1C33:08 [▶ 95])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 94]	UINT32	RO	0x00000000 (0_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:08	Command	as 0x1C32:08 [▶ 94]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Delay time	Time between SYNC1 event and reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11 [▶ 94]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12 [▶ 94]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13 [▶ 94]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32 [▶ 94]	BOOLEAN	RO	0x00 (0_{dec})

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

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

Index 0x6000 Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	Inputs	Max. Subindex	UINT8	RO	0x02 (2_{dec})
6000:01	Status	Status Word [▶ 78]	UINT16	RO	0x0000 (0_{dec})
6000:02	Data In	Input process data (counter value, index 0x6020:11 [▶ 96])	UINT16	RO	0x0000 (0_{dec})

Index 0x6010 PTO Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	PTO Inputs	Max. Subindex	UINT8	RO	0x10 (16_{dec})
6010:01	Sel. Ack/End counter	Confirms the change of the base frequency. With activated travel distance control: target counter value reached	BOOLEAN	RO	0x00 (0_{dec})
6010:02	Ramp active	Ramp is currently being followed	BOOLEAN	RO	0x00 (0_{dec})
6010:05	Status of input target	Status of the input TARGET (T)	BOOLEAN	RO	0x00 (0_{dec})
6010:06	Status of input zero	Status of the input ZERO (Z)	BOOLEAN	RO	0x00 (0_{dec})
6010:07	Error	General error bit, is set together with overrange and underrange	BOOLEAN	RO	0x00 (0_{dec})
6010:0E	Sync Error	The Sync error bit is only required for Distributed Clocks 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})

Index 0x6020 ENC Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	ENC Inputs	Max. Subindex	UINT8	RO	0x16 (22_{dec})
6020:03	Set counter done	Counter was set.	BOOLEAN	RO	0x00 (0_{dec})
6020:04	Counter underflow	This bit is set if the 16-bit counter underflows (0 -> 65535). It is reset when the counter drops below two thirds of its measuring range (43690 -> 43689) or immediately an overflow occurs.	BOOLEAN	RO	0x00 (0_{dec})
6020:05	Counter overflow	This bit is set if the 16-bit counter overflows (65535 -> 0). It is reset when the counter exceeds one third of its measuring range (21845 -> 21846) or immediately an underflow occurs.	BOOLEAN	RO	0x00 (0_{dec})
6020:0E	Sync Error	The Sync error bit is only required for Distributed Clocks mode. It indicates whether a synchronization error has occurred during the previous cycle.	BOOLEAN	RO	0x00 (0_{dec})
6020:10	TxPDO Toggle	The TxPDO Toggle is toggled by the slave when the data of the associated TxPDO is updated.	BOOLEAN	RO	0x00 (0_{dec})
6020:11	Counter value	Counter value	UINT32	RO	0x00000000 (0_{dec})

Index 0x7000 Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	Outputs	Max. Subindex	UINT8	RO	0x02 (2_{dec})
7000:01	Ctrl	Control Word [▶ 78]	UINT16	RO	0x0000 (0_{dec})
7000:02	Data Out	Output process data (frequency value, index 0x7010:11 [▶ 97])	UINT16	RO	0x0000 (0_{dec})

Index 0x7010 PTO Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	PTO Outputs	Max. Subindex	UINT8	RO	0x12 (18_{dec})
7010:01	Frequency select	Fast toggling of the base frequency (only if ramp function is deactivated) 0_{bin} = base frequency 1 (object 0x8001:02 0x8010:12 [▶ 87]) 1_{bin} = base frequency 2 (object 0x8001:03 0x8010:13 [▶ 87])	BOOLEAN	RO	0x00 (0_{dec})
7010:02	Disable ramp	The ramp function is disabled despite active object 0x8000:06 0x8010:06 [▶ 87]; if travel distance control is active, it is aborted by this bit.	BOOLEAN	RO	0x00 (0_{dec})
7010:03	Go counter	With travel distance control activated (object 0x8000:0A 0x8010:0A [▶ 87]) and bit set, a specified counter value is driven to	BOOLEAN	RO	0x00 (0_{dec})
7010:11	Frequency value	Frequency value	UINT16	RO	0x0000 (0_{dec})
7010:12	Target counter value	Target counter value	UINT32	RO	0x00000000 (0_{dec})

Index 0x7020 ENC Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7020:0	ENC Outputs	Max. Subindex	UINT8	RO	0x11 (17_{dec})
7020:03	Set counter	Set counter value	BOOLEAN	RO	0x00 (0_{dec})
7020:11	Set counter value	Counter value to be set via index 0x7020:03 [▶ 97]	UINT32	RO	0x00000000 (0_{dec})

Index 0xA000 Diagnostic parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
A000:0	Diagnostic parameter	Max. Subindex	UINT8	RO	0x01 (1_{dec})
A000:01	Counter extension	Counter extension	UINT16	RO	0x0000 (0_{dec})

Index 0xF000 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	0x0003 (3_{dec})

Index F008 Code word

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

Index 0xF010 Module list

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Max. Subindex	UINT8	RW	0x03 (3_{dec})
F010:01	SubIndex 001	-	UINT32	RW	0x000000FC (252_{dec})
F010:02	SubIndex 002	-	UINT32	RW	0x000000FD (253_{dec})
F010:03	SubIndex 003	-	UINT32	RW	0x000001FF (511_{dec})

9.2.4.2 EL2521-0124

9.2.4.2.1 Object description and parameterization – enhanced operation mode

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.

NOTICE

Parameterization via the CoE list (CAN over EtherCAT)

The EtherCAT device is parameterized via the CoE - Online tab (with a double click on the respective object) or via the Process Data tab (assignment of PDOs). A detailed description can be found in the EtherCAT System-Documentation in chapter "EtherCAT subscriber configuration"

Please note the general CoE notes in the EtherCAT System Documentation in chapter "CoE-interface" when using/manipulating the CoE parameters:
- Keep a startup list if components have to be replaced
- Differentiation between online/offline dictionary,
- existence of current XML description
- use "CoE reload" for resetting changes

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization [▶ 99] during commissioning
- Objects intended for regular operation [▶ 100], e.g. through ADS access.
- Objects for indicating internal settings [▶ 100](may be fixed)

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

9.2.4.2.1.1 Restore object

Index 1011 Restore default parameters

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

9.2.4.2.1.2 Objects for commissioning

Index 0x8000 PTA Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	PTO Settings	Max. Subindex	UINT8	RO	0x18 (24_{dec})
8000:02	Emergency ramp active	TRUE If the watchdog timer responds, the terminal ramps with the time constant set in object 0x8000:18 to the value set in object 0x8000:11. FALSE The function is deactivated	BOOLEAN	RW	0x00 (0_{dec})
8000:03	Watchdog timer inactive	TRUE The watchdog timer is deactivated FALSE The watchdog timer is activated in the delivery state. Either the manufacturer's of the user's switch-on value is output if the watchdog overflows	BOOLEAN	RW	0x00 (0_{dec})
8000:04	Sign/amount representation	TRUE The output value is displayed in signed amount representation: -2_{dec} = 0x8002 -1_{dec} = 0x8001 1_{dec} = 0x0001 2_{dec} = 0x0002 FALSE The output value is output as signed integer in the two's complement: -2_{dec} = 0xFFFE -1_{dec} = 0xFFFF 1_{dec} = 0x0001 2_{dec} = 0x0002	BOOLEAN	RW	0x00 (0_{dec})
8000:06	Ramp function active	TRUE Ramp function activated FALSE Ramp function deactivated	BOOLEAN	RW	0x01 (1_{dec})
8000:07	Ramp base frequency	$0_{(dec)}$ Ramp base frequency: 10 Hz (pull-down menu) $1_{(dec)}$ Ramp base frequency: 1 kHz (pull-down menu)	BIT1	RW	0x00 (0_{dec})
8000:08	Direct input mode	TRUE Direct input mode FALSE Relative input mode	BOOLEAN	RW	0x00 (0_{dec})
8000:09	User switch-on value on wdt	TRUE Behavior with triggered watchdog timer: User switch-on value FALSE Behavior with triggered watchdog timer: Manufacturer's switch-on value	BOOLEAN	RW	0x00 (0_{dec})
8000:0A	Travel distance control active	TRUE Travel distance control activated FALSE Travel distance control deactivated	BOOLEAN	RW	0x00 (0_{dec})
8000:0B	Output set active low	Inversion of the output logic for output 24 V 0: HIGH level in switched state 1: LOW level in switched state	BOOLEAN	RW	0x00 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0E	Operating mode	$0_{(dec)}$ Frequency modulation operating mode (pull-down menu) $1_{(dec)}$ Pulse direction specification operating mode (pull-down menu) $2_{(dec)}$ Incremental encoder operating mode (pull-down menu)	BIT2	RW	0x00 (0_{dec})
8000:10	Negative logic	TRUE Negative logic FALSE Positive logic	BOOLEAN	RW	0x00 (0_{dec})
8000:11	User switch-on-value	User switch-on value (frequency)	UINT16	RW	0x0000 (0_{dec})
8000:12	Base frequency 1	Base frequency 1 = 50000 Hz	UINT32	RW	0x0000C350 (50000_{dec})
8000:13	Base frequency 2	Base frequency 2 = 100000 Hz	UINT32	RW	0x000186A0 (100000_{dec})
8000:14	Ramp time constant (rising)	Ramp time constant (rising)	UINT16	RW	0x03E8 (1000_{dec})
8000:15	Ramp time constant (falling)	Ramp time constant (falling)	UINT16	RW	0x03E8 (1000_{dec})
8000:16	Frequency factor (digit x 10 mHz)	Frequency factor (direct input, digit x 10 mHz)	UINT16	RW	0x0064 (100_{dec})
8000:17	Slowing down frequency	Slowing down frequency, travel distance control	UINT16	RW	0x0032 (50_{dec})
8000:18	Ramp time constant (emergency)	Ramp time constant for controlled switch-off; User switch-on value is driven to (object 0x8000:11)	UINT16	RW	0x03E8 (1000_{dec})

9.2.4.2.1.3 Objects for regular operation

In enhanced operating mode the EL2521-0124 has no such objects.

9.2.4.2.1.4 Standard objects (0x1000-0x1FFF)

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

Index 0x1000 Device type

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

Index 0x1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EL2521-0124

Index 1009 Hardware version

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

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	00

Index 0x1018 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	0x09D93052 (165228626_{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	0x0010007C (1048700_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave: • Low Word ◦ 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 0x1401 ENC RxPDO-Par Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1401:0	ENC RxPDO-Par Control compact	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	04 16 05 16 06 16

Index 0x1402 PLS RxPDO-Par Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1402:0	PLS RxPDO-Par Control compact	PDO Parameter RxPDO 3	UINT8	RO	0x06 (6_{dec})
1402:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 3.	OCTET-STRING[6]	RO	04 16 05 16 06 16

Index 0x1403 PTO RxPDO-Par Target compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1403:0	PTO RxPDO-Par Target compact	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 0x1404 ENC RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1404:0	ENC RxPDO-Par Control	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	01 16 02 16 03 16

Index 0x1405 PLS RxPDO-Par Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1405:0	PLS RxPDO-Par Control	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	01 16 02 16 03 16

Index 0x1406 PTO RxPDO-Par Target

Index (hex)	Name	Meaning	Data type	Flags	Default
1406:0	PTO RxPDO-Par Target	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	01 16 02 16 03 16

Index 0x1600 PTO RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	PTO RxPDO-Map Control	PDO Mapping RxPDO 1	UINT8	RO	0x06 (6_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (PTO Outputs), entry 0x01 (Frequency select))	UINT32	RO	0x7000:01, 1
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (PTO Outputs), entry 0x02 (Disable ramp))	UINT32	RO	0x7000:02, 1
1600:03	SubIndex 003	3. PDO Mapping entry (object 0x7000 (PTO Outputs), entry 0x03 (Go counter))	UINT32	RO	0x7000:03, 1
1600:04	SubIndex 004	4. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1600:05	SubIndex 005	5. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1600:06	SubIndex 006	6. PDO Mapping entry (object 0x7000 (PTO Outputs), entry 0x11 (Frequency value))	UINT32	RO	0x7000:11, 16

Index 0x1601 ENC RxPDO-Map Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	ENC RxPDO-Map Control compact	PDO Mapping RxPDO 2	UINT8	RO	0x07 (7_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x02 (Enable latch extern on positive edge))	UINT32	RO	0x7010:02, 1
1601:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x03 (Set counter))	UINT32	RO	0x7010:03, 1
1601:04	SubIndex 004	4. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x04 (Enable latch extern on negative edge))	UINT32	RO	0x7010:04, 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 0x7010 (ENC Outputs), entry 0x11 (Set counter value))	UINT32	RO	0x7010:11, 16

Index 0x1602 PLS RxPDO-Map Control compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	PLS RxPDO-Map Control compact	PDO Mapping RxPDO 3	UINT8	RO	0x07 (7_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x01 (Enable PLS))	UINT32	RO	0x7020:01, 1
1602:02	SubIndex 002	2. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1602:03	SubIndex 003	3. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x04 (Output))	UINT32	RO	0x7020:04, 1
1602:04	SubIndex 004	4. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
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 0x7020 (PLS Outputs), entry 0x11 (Switch on value))	UINT32	RO	0x7020:11, 16
1602:07	SubIndex 007	7. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x12 (Switch off value))	UINT32	RO	0x7020:12, 16

Index 0x1603 PTO RxPDO-Map Target compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	PTO RxPDO-Map Target compact	PDO Mapping RxPDO 4	UINT8	RO	0x01 (1_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (PTO Outputs), entry 0x12 (Target counter value))	UINT32	RO	0x7000:12, 16

Index 0x1604 ENC RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	ENC RxPDO-Map Control	PDO Mapping RxPDO 5	UINT8	RO	0x07 (7_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1604:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x02 (Enable latch extern on positive edge))	UINT32	RO	0x7010:02, 1
1604:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x03 (Set counter))	UINT32	RO	0x7010:03, 1
1604:04	SubIndex 004	4. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x04 (Enable latch extern on negative edge))	UINT32	RO	0x7010:04, 1
1604:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1604:06	SubIndex 006	6. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1604:07	SubIndex 007	7. PDO Mapping entry (object 0x7010 (ENC Outputs), entry 0x11 (Set counter value))	UINT32	RO	0x7010:11, 32

Index 0x1605 PLS RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	PLS RxPDO-Map Control	PDO Mapping RxPDO 6	UINT8	RO	0x07 (7_{dec})
1605:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x01 (Enable PLS))	UINT32	RO	0x7020:01, 1
1605:02	SubIndex 002	2. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1605:03	SubIndex 003	3. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x04 (Output))	UINT32	RO	0x7020:04, 1
1605:04	SubIndex 004	4. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1605:05	SubIndex 005	5. PDO Mapping entry (8 bits align)	UINT32	RO	0x0000:00, 8
1605:06	SubIndex 006	6. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x11 (Switch on value))	UINT32	RO	0x7020:11, 32
1605:07	SubIndex 007	7. PDO Mapping entry (object 0x7020 (PLS Outputs), entry 0x12 (Switch off value))	UINT32	RO	0x7020:12, 32

Index 0x1606 PTO RxPDO-Map Target

Index (hex)	Name	Meaning	Data type	Flags	Default
1606:0	PTO RxPDO-Map Target	PDO Mapping RxPDO 7	UINT8	RO	0x01 (1_{dec})
1606:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (PTO Outputs), entry 0x12 (Target counter value))	UINT32	RO	0x7000:12, 32

Index 0x1801 ENC TxPDO-Par Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1801:0	ENC TxPDO-Par Status compact	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	04 1A
1801:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data.	BOOLEAN	RO	0x00 (0_{dec})

Index 0x1804 ENC TxPDO-Par Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1804:0	ENC TxPDO-Par Status	PDO parameter TxPDO 5	UINT8	RO	0x09 (9_{dec})
1804:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 5.	OCTET-STRING[2]	RO	01 1A
1804:09	TxPDO Toggle	The TxPDO toggle is toggled with each update the corresponding input data.	BOOLEAN	RO	0x00 (0_{dec})

Index 0x1A00 PTO TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	PTO TxPDO-Map Status	PDO Mapping TxPDO 1	UINT8	RO	0x08 (8_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (PTO Inputs), entry 0x01 (Sel. Ack/End counter))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (PTO Inputs), entry 0x02 (Ramp active))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (PTO Inputs), entry 0x07 (Error))	UINT32	RO	0x6000:07, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x1800, entry 0x09)	UINT32	RO	0x1800:09, 1

Index 0x1A01 ENC TxPDO-Map Status compact

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	ENC TxPDO-Map Status compact	PDO Mapping TxPDO 2	UINT8	RO	0x0D (13_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x02 (Latch extern valid))	UINT32	RO	0x6010:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x03 (Set counter done))	UINT32	RO	0x6010:03, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x04 (Counter underflow))	UINT32	RO	0x6010:04, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x05 (Counter overflow))	UINT32	RO	0x6010:05, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1A01:07	SubIndex 007	7. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x0D (Status of extern latch))	UINT32	RO	0x6010:0D, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A01:0A	SubIndex 010	10. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A01:0B	SubIndex 011	11. PDO Mapping entry (object 0x1801 (ENC TxPDO-Par Status compact), entry 0x09 (TxPDO Toggle))	UINT32	RO	0x1801:09, 1
1A01:0C	SubIndex 012	12. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6010:11, 16
1A01:0D	SubIndex 013	13. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x12 (Latch value))	UINT32	RO	0x6010:12, 16

Index 0x1A02 PLS TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	PLS TxPDO-Map Status	PDO Mapping TxPDO 3	UINT8	RO	0x07 (7_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (PLS Inputs), entry 0x01 (PLS Enabled))	UINT32	RO	0x6020:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (PLS Inputs), entry 0x04 (Status of output))	UINT32	RO	0x6020:04, 1
1A02:04	SubIndex 004	4. PDO Mapping entry (9 bits align)	UINT32	RO	0x0000:00, 9
1A02:05	SubIndex 005	5. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x1802, entry 0x09)	UINT32	RO	0x1802:09, 1

Index 0x1A04 ENC TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	ENC TxPDO-Map Status	PDO Mapping TxPDO 5	UINT8	RO	0x0D (13_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A04:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x02 (Latch extern valid))	UINT32	RO	0x6010:02, 1
1A04:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x03 (Set counter done))	UINT32	RO	0x6010:03, 1
1A04:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x04 (Counter underflow))	UINT32	RO	0x6010:04, 1
1A04:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x05 (Counter overflow))	UINT32	RO	0x6010:05, 1
1A04:06	SubIndex 006	6. PDO Mapping entry (3 bits align)	UINT32	RO	0x0000:00, 3
1A04:07	SubIndex 007	7. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1A04:08	SubIndex 008	8. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x0D (Status of extern latch))	UINT32	RO	0x6010:0D, 1
1A04:09	SubIndex 009	9. PDO Mapping entry (object 0x1C32 (SM output parameter), entry 0x20 (Sync error))	UINT32	RO	0x1C32:20, 1
1A04:0A	SubIndex 010	10. PDO Mapping entry (1 bit align)	UINT32	RO	0x0000:00, 1
1A04:0B	SubIndex 011	11. PDO Mapping entry (object 0x1804 (ENC TxPDO-Par Status), entry 0x09 (TxPDO Toggle))	UINT32	RO	0x1804:09, 1
1A04:0C	SubIndex 012	12. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x11 (Counter value))	UINT32	RO	0x6010:11, 32
1A04:0D	SubIndex 013	13. PDO Mapping entry (object 0x6010 (ENC Inputs), entry 0x12 (Latch value))	UINT32	RO	0x6010:12, 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 0x1C12 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	0x1601 (5633_{dec})
1C12:03	SubIndex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1602 (5634_{dec})
1C12:04	SubIndex 004	4. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 0x1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x03 (3_{dec})
1C13:01	SubIndex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	SubIndex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	SubIndex 003	3. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A02 (6658_{dec})

Index 0x1C32 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: FreeRun • 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	0x001E8480 (2000000_{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: FreeRun is supported • Bit 1 = 1: Synchron with SM 2 Event is supported • Bit 2–3 = 01: DC mode is supported • Bit 4–5 = 10: Output Shift with SYNC1 event (only DC mode) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08)	UINT16	RO	0xC007 (49159_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x00000000 (0_{dec})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:07	Minimum delay time		UINT32	RO	0x00000000 (0_{dec})
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C32:03, 0x1C32:05, 0x1C32:06, 0x1C32:09, 0x1C33:03 [▶ 108], 0x1C33:06 [▶ 107], 0x1C33:09 [▶ 108] 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 0x1C33 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: FreeRun • 1: Synchron with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 107]	UINT32	RW	0x001E8480 (2000000_{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: FreeRun is supported • Bit 1: Synchron with SM 2 Event is supported (outputs available) • Bit 1: Synchron 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 [▶ 107] or 0x1C33:08)	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 107]	UINT32	RO	0x00000000 (0_{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 [▶ 107]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum Delay time	Time between SYNC1 event and reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11 [▶ 107]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12 [▶ 107]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13 [▶ 107]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32 [▶ 107]	BOOLEAN	RO	0x00 (0_{dec})

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

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

Index 0x6000 PTO Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	PTO Inputs	Max. Subindex	UINT8	RO	0x10 (16_{dec})
6000:01	Sel. Ack/End counter	Confirms the change of the base frequency with activated travel distance control: target counter value reached	BOOLEAN	RO	0x00 (0_{dec})
6000:02	Ramp active	Ramp is currently being followed.	BOOLEAN	RO	0x00 (0_{dec})
6000:07	Error	General error bit, is set together with overrange and underrange.	BOOLEAN	RO	0x00 (0_{dec})
6000:0E	Sync error	The Sync error bit is only required for Distributed Clocks 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})

Index 0x6010 ENC Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	ENC Inputs	Max. Subindex	UINT8	RO	0x12 (18_{dec})
6010:02	Latch extern valid	The counter value was locked by the external latch input. The data with index 0x6010:12 match the latched value when the bit is set. To reactivate the latch input, index 0x7010:02 [▶ 110] or index 0x7010:04 [▶ 110] must be canceled and then reset.	BOOLEAN	RO	0x00 (0_{dec})
6010:03	Set counter done	Counter was set.	BOOLEAN	RO	0x00 (0_{dec})
6010:04	Counter underflow	This bit is set if the 16-bit counter underflows (0 -> 65535). It is reset when the counter drops below two thirds of its measuring range (43690 -> 43689) or immediately an overflow occurs.	BOOLEAN	RO	0x00 (0_{dec})
6010:05	Counter overflow	This bit is set if the 16-bit counter overflows (65535 -> 0). It is reset when the counter exceeds one third of its measuring range (21845 -> 21846) or immediately an underflow occurs.	BOOLEAN	RO	0x00 (0_{dec})
6010:0D	Status of extern latch	The status of the latch input	BOOLEAN	RO	0x00 (0_{dec})
6010:0E	Sync error	The Sync error bit is only required for Distributed Clocks 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	Counter value	Counter value	UINT32	RO	0x00000000 (0_{dec})
6010:12	Latch value	Latch value	UINT32	RO	0x00000000 (0_{dec})

Index 0x6020 PLS Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	PLS Inputs	Max. Subindex	UINT8	RO	0x10 (16_{dec})
6020:01	PLS Enabled	Automatic counting function activated	BOOLEAN	RO	0x00 (0_{dec})
6020:04	Status of output	Status of the output	BOOLEAN	RO	0x00 (0_{dec})
6020:0E	Sync error	The Sync error bit is only required for Distributed Clocks mode. It indicates whether a synchronization error has occurred during the previous cycle.	BOOLEAN	RO	0x00 (0_{dec})
6020:10	TxPDO Toggle	The TxPDO Toggle is toggled by the slave when the data of the associated TxPDO is updated.	BOOLEAN	RO	0x00 (0_{dec})

Index 0x7000 PTO Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	PTO Outputs	Max. Subindex	UINT8	RO	0x12 (18_{dec})
7000:01	Frequency select	Fast toggling of the base frequency (only if ramp function is deactivated) 0_{bin} = base frequency 1 (object 0x8000:12 [▶ 99]) 1_{bin} = base frequency 2 (object 0x8000:13 [▶ 99])	BOOLEAN	RO	0x00 (0_{dec})
7000:02	Disable ramp	The ramp function is disabled despite active object 0x8000:06 [▶ 99]; if the travel distance control is active, it is aborted by this bit.	BOOLEAN	RO	0x00 (0_{dec})
7000:03	Go counter	If travel distance control is activated (object 0x8000:0A [▶ 99]), a specified counter value is driven to if the bit is set	BOOLEAN	RO	0x00 (0_{dec})
7000:11	Frequency value	Frequency value	UINT16	RO	0x0000 (0_{dec})
7000:12	Target counter value	Target counter value	UINT32	RO	0x00000000 (0_{dec})

Index 0x7010 ENC Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	ENC Outputs	Max. Subindex	UINT8	RO	0x11 (17_{dec})
7010:02	Enable latch extern on positive edge	Activate external latch with positive edge.	BOOLEAN	RO	0x00 (0_{dec})
7010:03	Set counter	Set counter value	BOOLEAN	RO	0x00 (0_{dec})
7010:04	Enable latch extern on negative edge	Activate external latch with negative edge.	BOOLEAN	RO	0x00 (0_{dec})
7010:11	Set counter value	This is the counter value to be set via “Set counter” (index 0x7010:03 [▶ 110]).	UINT32	RO	0x00000000 (0_{dec})

Index 0x7020 PLS Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7020:0	PLS Outputs	Max. Subindex	UINT8	RO	0x12 (18_{dec})
7020:01	Enable PLS	Activate automatic counting function	BOOLEAN	RO	0x00 (0_{dec})
7020:04	Output	Signal at the output	BOOLEAN	RO	0x00 (0_{dec})
7020:11	Switch-on value	Counter value at which the 24 V output is switched on	UINT32	RO	0x00000000 (0_{dec})
7020:12	Switch-off value	Counter value at which the 24 V output is switched off	UINT32	RO	0x00000000 (0_{dec})

Index 0xF000 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	0x0003 (3_{dec})

Index F008 Code word

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

Index 0xF010 Module list

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Max. Subindex	UINT8	RW	0x03 (3_{dec})
F010:01	SubIndex 001	Reserved	UINT32	RW	0x000000FD (253_{dec})
F010:02	SubIndex 002	reserved	UINT32	RW	0x000001FF (511_{dec})
F010:03	SubIndex 003	reserved	UINT32	RW	0x00000200 (512_{dec})

9.3 EL2522

9.3.1 Basic function principles

Operation modes of the EL2522

In addition to the “extended operation mode” familiar from the EL2521, the EL2522 also supports an “extended operation mode with continuous position specification” and an “extended operation mode with continuous position specification and arrival time”.
As an extension of the EL2521, the EL2522 offers the “extended operation mode” in 1-channel or single operation mode with A, B, and C tracks (“zero track”/reference) or in 2-channel or dual operation mode with A and B tracks, respectively.

Version	PDO settings	Comments	FW/HW	ESI	Process data	CoE parameters
Legacy	formerly MDP 252	Not available for the EL2522	-	-	-	-
Enhanced operation mode	1 Ch. Standard 16 Bit (MDP 253/511) 2 Ch. Standard 16 Bit (MDP 253/511) 1 Ch. Standard 32 Bit (MDP 253/511) 2 Ch. Standard 32 Bit (MDP 253/511)	1 Ch.: with C-track	from 02	from EL2522-0000 -0000	PDO assignment Inputs 0x1A00, 0x1A02 Outputs: 0x1600, 0x1602, 0x160A	*Feature-Bits and Settings in CoE objects (hex) 8000, 8010, 8020 and 8030*
Enhanced operation mode with continuous position specification	1 Ch. Standard 32 Bit (MDP 253/511) continues position 2 Ch. Standard 32 Bit (MDP 253/511) continues position	1 Ch.: with C-track; *Travel path without ramp, DC-Synchron must be selected*	from 02	from EL2522-0000 -0000	PDO assignment Inputs: 0x1A03 Outputs: 0x160B, 0x1601	
Enhanced operation mode with continuous position specification and arrival time	1 Ch. Standard 32 Bit (MDP 253/511) continues position, with arrival time 2 Ch. Standard 32 Bit (MDP 253/511) continues position, with arrival time	1 Ch.: with C-track; *Travel path without ramp, specification of arrival time possible (target time); DC-Synchron must be selected*	from 02	from EL2522-0000 -0000	PDO assignment Inputs: 0x1A03 Outputs: 0x160B, 0x1601, 0x1604	

Output modes of the EL2522

About the following indices in the CoE

- Index 0x8000 [▶ 127]:0E for incremental encoder 1 or
- Index 0x8010 [▶ 129]:0E for incremental encoder 2.

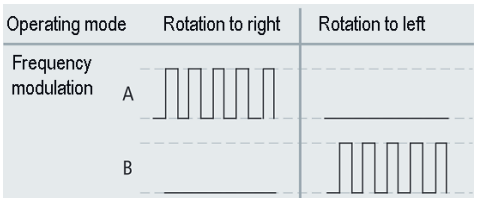
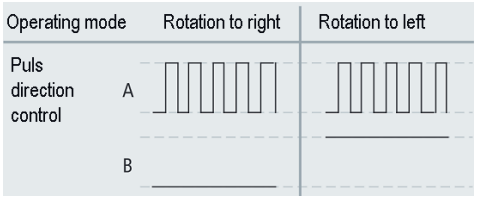
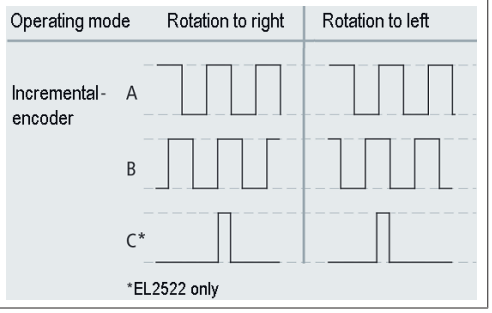
the following output modes are available for choice:

- “Frequency modulation (value: 0)”,
- “Pulse direction signal (value: 1)” and
- “Incremental encoder (value: 2)”.

Cycle-synchronous output in operation modes with “continuous position”

- “32 Bit, continues position”
  The terminal operates cycle-synchronously when using the “continues position” PDO presets and thus generates pinpoint output control clock signals synchronously with the task cycle.
- “32 Bit, continues position with arrival time”
  Instead of specifying a frequency, a target time is specified within which a target position must be reached.

  ⇨ The clock signals are also output cycle-synchronously in this case, too, as long as this specification is within the plausible range.

Output modes	Meaning	Index 0x8000 [▶ 127]:0E value	
Frequency modulation	Only one channel is active in each direction at a time. A frequency-modulated signal is output on this channel. Clockwise rotation is achieved via channel A, and counterclockwise rotation via channel B.	0	
Pulse direction signal	The direction is controlled by channel B. The clockwise direction is represented by a low-level and the counter clockwise direction by a high level. The actual signal, is then output in modulated via channel A.	1	
Incremental encoders	The direction is defined by the shifting of channels A and B. If channel A leads by 90°, this indicates a “forward” movement. Channel B, which leads by 90°, in response to a “backward” movement. In the single-channel variant, the C track (zero track) can also be output.	2	

Process data monitoring

- WcState: if ≠ 0, this EtherCAT device does not take part in the process data traffic
- State: If ≠ 8, the EtherCAT device is not in OP (operational) state
- TxPDO State, SyncError: if ≠ 0, then no valid process data are available, e.g. caused by wire break
- TxPDO Toggle: if this bit toggles, a new set of process data is available

Delivery state

Independent of the hardware/firmware version, an EL2522 newly integrated in the system registers itself in the operating mode “2-channel standard 32-bit (MDP 253/511)”.

Incremental encoder simulation

The “enhanced operation mode (253/511)” is the enhanced operation mode familiar from the EL2521. Please refer to the corresponding chapter of the EL2521 (see also chapter EL2521 [▶ 60] function) for an explanation of the functionality and the steps necessary for commissioning.

Unlike the EL2521, it is possible to choose between a 1-channel and a 2-channel operation mode (single or double operation).

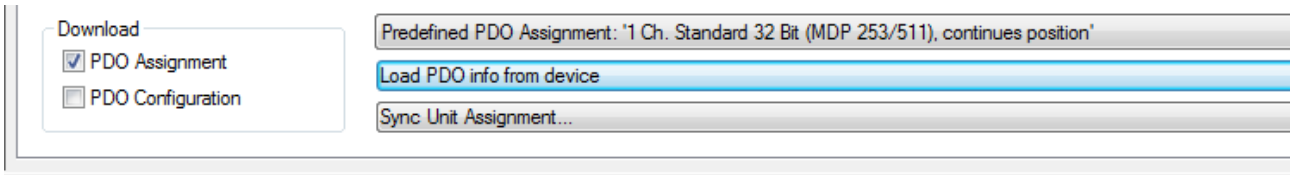
- In 1-channel operation mode a C-track is output in addition to the A- and B-tracks.
- In 2-channel operation mode two outputs are offered per channel, each with an A- and a B-track. Both behave in the same way as the known 1-channel operation mode.

Incremental encoder simulation with continuous position specification

In the operation modes “1 Ch. Standard 32 Bit, continues Position” and “2 Ch. Standard 32 Bit, continues Position”, the EL2522 can simulate an incremental encoder with A, B, and C tracks (1-channel or single operation mode) or two independent incremental encoders (2-channel or dual operation mode), each with A and B tracks. As previously with the EL2521 there is also a choice here between the output modes incremental encoder, frequency modulation or pulse direction control.

Basically, the clock signals are output here cycle-synchronously (necessary selection in the EL2522 DC settings: “DC-Synchron”).

After selection of the respective PDO assignment, the associated process data are represented in accordance with the following illustration.



Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Set counter done	0	BIT	0.1	1562.2	Input	0	
Counter underfl...	0	BIT	0.1	1562.3	Input	0	
Counter overflow	0	BIT	0.1	1562.4	Input	0	
Sync error	0	BIT	0.1	1563.5	Input	0	
TxPDO State	0	BIT	0.1	1563.6	Input	0	
TxPDO Toggle	1	BIT	0.1	1563.7	Input	0	
Counter value	135384648	UDINT	4.0	1564.0	Input	0	
WcState	0	BIT	0.1	3058.0	Input	0	
InputToggle	0	BIT	0.1	3060.0	Input	0	
State	8	UINT	2.0	3096.0	Input	0	
AdsAddr	172.17.214.97.3.1:1...	AMSADDR	8.0	3098.0	Input	0	
DcOutputShift	3010200	DINT	4.0	3106.0	Input	0	
DcInputShift	16989800	DINT	4.0	3110.0	Input	0	
Automatic direc...	0	BIT	0.1	1562.3	Output	0	
Forward	1	BIT	0.1	1562.4	Output	0	
Reward	0	BIT	0.1	1562.5	Output	0	
Target counter v... X	15000	UDINT	4.0	1564.0	Output	0	Test.nTarget . PlcTask2 ...
Set counter	0	BIT	0.1	1568.2	Output	0	
Reserved	0	BIT	0.1	1569.7	Output	0	
Set counter value	0	UDINT	4.0	1570.0	Output	0	

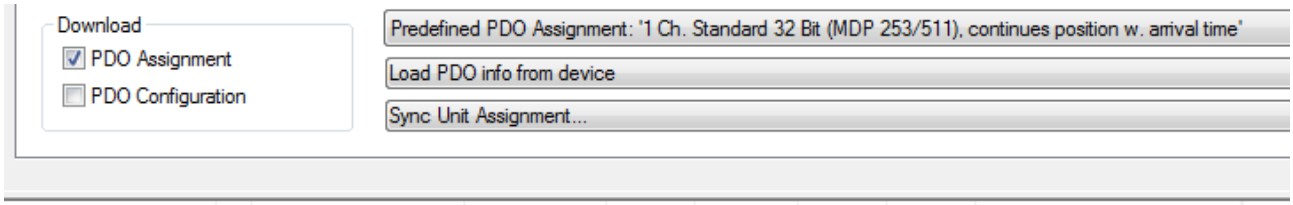
Fig. 54: Representation of the process data according to the PDO selection “1-channel standard 32-bit, continuous position” in the TwinCAT System Manager

The output value “Target counter value” is written with the desired target position for the next cycle. Depending on the current position (input value “Counter value”), the EL2522 calculates the frequency necessary for reaching the desired position in the next cycle. A fixed running direction can be specified by the output bits “Forward” and “Reward”. If the “Automatic direction” bit is set, the terminal selects the running direction depending on the position difference (actual value and setpoint) in favor of the shorter distance.

If 2-channel mode is in use, the process data for the second incremental encoder are added analogously to those for the first.

Incremental encoder simulation with continuous position specification and arrival time

In addition to the functions mentioned above, it is possible in the operation mode “continuous position specification and arrival time” to define when the target position should be reached. Consequently, the calculation no longer takes place with the specification of the target position to be reached in the next cycle, but taking into account an arrival time specified by the user instead.



Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Set counter done		BIT	0.1	71.2	Input	0	
Counter underfl...		BIT	0.1	71.3	Input	0	
Counter overflow		BIT	0.1	71.4	Input	0	
Sync error		BIT	0.1	72.5	Input	0	
TxPDO State		BIT	0.1	72.6	Input	0	
TxPDO Toggle		BIT	0.1	72.7	Input	0	
Counter value		UDINT	4.0	73.0	Input	0	
WcState		BIT	0.1	1522.3	Input	0	
InputToggle		BIT	0.1	1524.3	Input	0	
State		UINT	2.0	1560.0	Input	0	
AdsAddr		AMSADDR	8.0	1562.0	Input	0	
DcOutputShift		DINT	4.0	1570.0	Input	0	
DcInputShift		DINT	4.0	1574.0	Input	0	
Set counter		BIT	0.1	71.2	Output	0	
Reserved		BIT	0.1	72.7	Output	0	
Set counter value		UDINT	4.0	73.0	Output	0	
Automatic direc...		BIT	0.1	77.3	Output	0	
Forward		BIT	0.1	77.4	Output	0	
Reward		BIT	0.1	77.5	Output	0	
Target counter v...		UDINT	4.0	79.0	Output	0	
Target arrival time		ULINT	8.0	83.0	Output	0	

Fig. 55: Representation of the process data according to the PDO selection “1-channel standard 32-bit, continuous position w. arrival time” in the TwinCAT System Manager

The desired target time for reaching the set position can be specified by the output value “Target arrival time”.

The frequency is then calculated accordingly. Is the

calculated frequency > Maximum frequency (0x8000 [▶ 127]:12/0x8010 [▶ 129] “Base Frequency 1”)

=> this limits the frequency to this value, and the set position is reached later as a result.

Use of microincrements

When using microincrement values, care must be taken not to exceed the internal 100 MHz limit.

Example: Cycle time 1 ms, 15-bit microincrements

If three “true” increments are to be output in a cycle, this already amounts to
(3 × 2^15) / 1 ms = approximately 98 MHz.

Setting the counter value / zero calibration (A/B adaptation)

The counter value can be manually set.

✓ Prerequisite: The parameters for the direction of movement must be set to FALSE (“Automatic direction”, “Forward”, “Backward”, 0x7000 [▶ 144]:04–0x7000 [▶ 144]:06).

a) To do this, the desired counter value must be entered in the index 0x7020 [▶ 145]:11 “Set counter value”.

b) Setting index 0x7020 [▶ 145]:03, “Set Counter”, causes the counter value is applied.

⇨ If the counter value is set to 0
, the C-track goes into the HIGH state.

c) The behavior of channels A and B in this case can be defined by index 0x80x00:01 “Adapt A/B on position set”.

⇨ By factory setting, the value is set to FALSE.
The position of the C-track relative to A and B is then not changed.

⇨ If the value is set to TRUE,
channels A and B are both set to HIGH. Consequently, a change of state occurs on both channels!

Function: Automatic adoption of the setpoint

In the enhanced operation modes “continuous position specification” and “continuous position specification with arrival time”, a threshold value can be specified for the automatic adoption of setpoints. The specification is made via the CoE objects

- 0x8020 [▶ 130]:1A for incremental encoder 1,
- 0x8030 [▶ 131]:1A for incremental encoder 2.

If the difference between the setpoint and the actual value exceeds this pre-set threshold value, the actual value will be overwritten
with the setpoint on the next Sync; i.e. the value of the target counter is directly applied as the counter value **without** incremental encoder clock signals being output.

The following steps must be performed in order to use this function.

1. Activate “DC-Synchron”
2. Activate PDOs 0x1A03 [▶ 139] (Input) and 0x1603 [▶ 135] (Output)
3. Set the threshold value

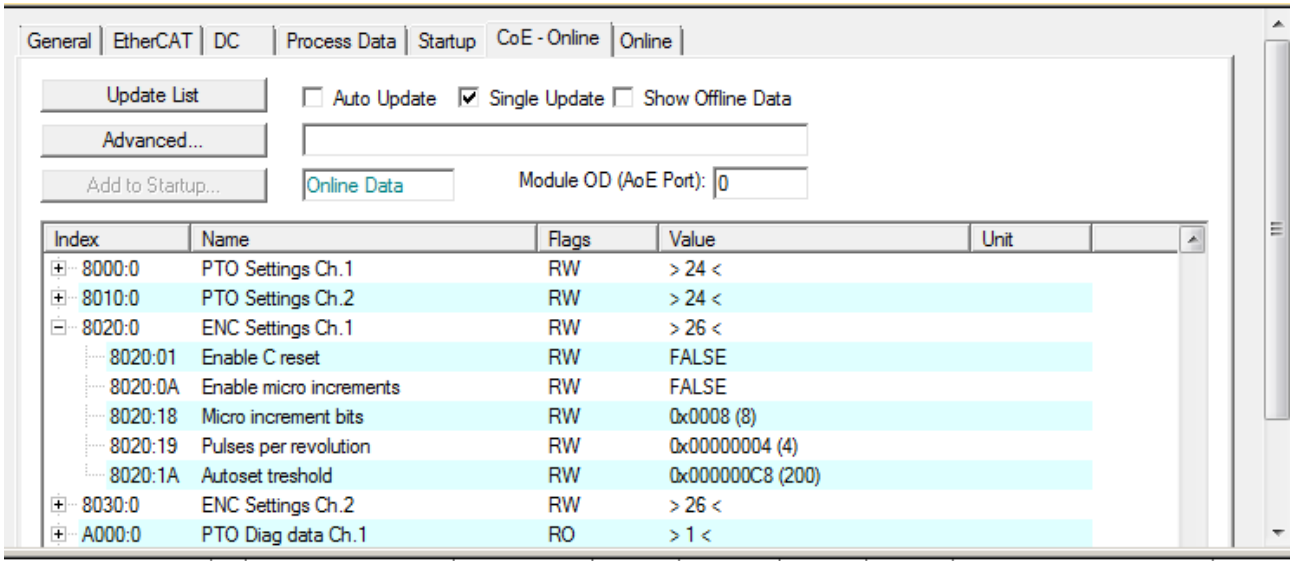


Fig. 56: Threshold setting in object 0x8020:1A [▶ 130] for incremental encoder 1

Example:

- 0x8020:1A = “Autoset threshold” = 0x00000100
  - (→ the value is >=1: “Autoset treshold”, “Automatic setting” is activated)
- Cycle n (setting the target counter value):
  - “Target counter value” = 0x00000**200**
  - “Counter value” = 0x00000000

→ Threshold for automatic setting is exceeded; **No** clock signals will be output at the output of the terminal.

- The “Target counter value” is directly applied into the “Counter value”.
  - “Target counter value” = 0x00000200
  - “Counter value” = 0x00000**200**
- Cycle n+1 (resetting the target counter value):
  - “Target counter value” = 0x00000**220**
  - “Counter value” = 0x00000200

The threshold (0x00000100) is **not** overwritten with the difference between target counter value and current counter value (in this case the value: 0x20) for automatic setting. Therefore clock signals are output at the output of the terminal until the target counter value is reached.

- Cycle n+2 (continuation in this operation mode with further target counter values):
  - “Target counter value” = 0x????????
  - “Counter value” = 0x00000**220**

This function therefore allows you to set the counter value directly, as an alternative to using the 0x7020:03 (or 0x7030:03) “Set counter” object.

It is recommended to use the function of the automatic adoption of the setpoint only in special exceptional cases!

Initialization

The actual value is initialized during the transition from SafeOp to Op. The current setpoint is applied here as the actual value.

Exceeding the maximum frequency

If the set maximum frequency is exceeded when calculating the necessary frequency for reaching the set position within the foreseen period, the maximum frequency is adopted. This leads to extended travel distances and should be taken into account and if necessary checked accordingly. The maximum frequency can be set via index 0x8010:12/0x8020 [▶ 130]:12 (Base Frequency 1).

9.3.2 Process data

The process data selection in the System Manager specifies the operation mode of the EL2522.

The process data are entered individually by hand or as “Predefined PDO Assignment” via the “Process Data” tab.

When selecting the EL2522 in the System Manager, the appropriate operation mode can be selected in accordance with the table above by clicking on the “Process Data” tab and selecting the predefined PDO assignments.

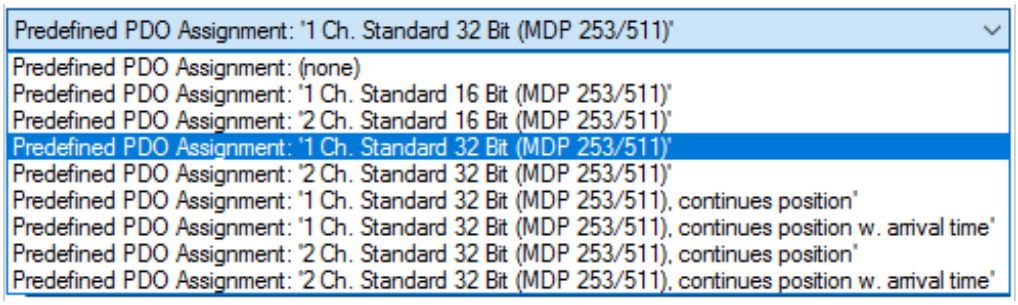


Fig. 57: “Predefined PDO-Assignment” – excerpt from the TwinCAT System Manager on the “Process Data” tab of the EL2522

Eight process data sets are available for the EL2522 and are listed in following table on the basis of the CoE objects used.

Sync Manager (SM)

PDO assignment of the SyncManager

SM1, PDO Assignment 0x1C13, inputs					
Index	**assigned to PDO setting**	**Index of excluded PDOs**	**Size (byte.bit)**	**Name**	**PDO Content Index – Name**
0x1A00	1 Ch. Standard 16 Bit (MDP 253/511) 1 Ch. Standard 32 Bit (MDP 253/511)	0x1A01, 0x1A03, 0x1A04, 0x1A05	2.0	PTO Status Ch. 1	0x6000:01 – Sel. Ack/End counter 0x6000:02 – Ramp active 0x6000:07 – Error 0x6000:0E – Sync error 0x6000:10 – TxPDO Toggle
	2 Ch. Standard 16 Bit (MDP 253/511)	0x1A03, 0x1A05			
0x1A01	2 Ch. Standard 16 Bit (MDP 253/511)		2.0	PTO Status Ch. 2	
0x1A02	1 Ch. Standard 16 Bit (MDP 253/511)	0x1A01, 0x1A03, 0x1A04, 0x1A05	4.0	ENC Status compact Ch. 1	0x6020:03 – Set counter done 0x6020:04 – Counter underflow 0x6020:05 – Counter overflow 0x6020:0E – Sync error 0x6020:0F – TxPDO State 0x6020:10 – TxPDO Toggle 0x6020:11 – Counter value
	2 Ch. Standard 16 Bit (MDP 253/511)	0x1A03, 0x1A05			
0x1A03	1 Ch. Standard 32 Bit (MDP 253/511)	0x1A01, 0x1A02, 0x1A04, 0x1A05	6.0	ENC Status Ch. 1	
	1 Ch. Standard 32 Bit (MDP 253/511), continues position 1 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1A00, 0x1A01, 0x1A02, 0x1A04, 0x1A05			
	2 Ch. Standard 32 Bit (MDP 253/511), continuous position	0x1A00, 0x1A01, 0x1A02, 0x1A04			
0x1A04	2 Ch. Standard 16 Bit (MDP 253/511)	0x1A03, 0x1A05	4.0	ENC Status compact Ch. 2	
0x1A05	2 Ch. Standard 32 Bit (MDP 253/511)	0x1A02, 0x1A04	6.0	ENC Status Ch. 2	
	2 Ch. Standard 32 Bit (MDP 253/511), continuous position 2 Ch. Standard 32 Bit (MDP 253/511), continuous position w. arrival time	0x1A00, 0x1A01, 0x1A02, 0x1A04			

SM2, PDO assignment 0x1C12, outputs					
Index	**assigned to PDO setting**	**Index of excluded PDOs**	**Size (byte.bit)**	**Name**	**PDO Content Index – Name**
0x1600	1 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160B, 0x160C, 0x160D	4.0	PTO Control Ch. 1	0x7000:01 – Frequency select 0x7000:02 – Disable ramp 0x7000:03 – Go counter 0x7000:11 – Frequency value
	2 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1606, 0x1608, 0x1609, 0x160B, 0x160D			
	1 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D			
	2 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1606, 0x1607, 0x1609, 0x160A, 0x160C			
0x1601	1 Ch. Standard 32 Bit (MDP 253/511), continues position	0x1600, 0x1602, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D	6.0	PTO Control Position Ch. 1	0x7000:04 – Automatic direction 0x7000:05 – Forward 0x7000:06 – Backward 0x7000:12 – Target counter value
	1 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D			
	2 Ch. Standard 32 Bit (MDP 253/511), continues position	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
	2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
0x1602	1 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160B, 0x160C, 0x160D	2.0	PTO Target compact Ch. 1	0x7000:12 – Target counter value
	2 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1606, 0x1608, 0x1609, 0x160B, 0x160D			
0x1603	1 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D	4.0	PTO Target Ch. 1	0x7000:12 – Target counter value
	2 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1606, 0x1607, 0x1609, 0x160A, 0x160C			

SM2, PDO assignment 0x1C12, outputs					
Index	**assigned to PDO setting**	**Index of excluded PDOs**	**Size (byte.bit)**	**Name**	**PDO Content Index – Name**
0x1604	1 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D	8.0	PTO Arrival Ch. 1	0x7000:13 – Target arrival time
	2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
0x1605	2 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1606, 0x1608, 0x1609, 0x160B, 0x160D	4.0	PTO Control Ch. 2	0x7010:01 – Frequency select 0x7010:02 – Disable ramp 0x7010:03 – Go counter 0x7010:11 – Frequency value
	2 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1606, 0x1607, 0x1609, 0x160A, 0x160C			
0x1606	2 Ch. Standard 32 Bit (MDP 253/511), continues position	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C	6.0	PTO Control Position Ch. 2	0x7010:04 – Automatic direction 0x7010:05 – Forward 0x7010:06 – Backward 0x7010:12 – Target counter value
	2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
0x1607	2 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1606, 0x1608, 0x1609, 0x160B, 0x160D	2.0	PTO Target compact Ch. 2	0x7010:12 – Target counter value
0x1608	2 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1606, 0x1607, 0x1609, 0x160A, 0x160C	4.0	PTO Target Ch. 2	0x7010:12 – Target counter value
0x1609	2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C	8.0	PTO Arrival Ch. 2	0x7010:13 – Target arrival time
0x160A	1 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160B, 0x160C, 0x160D	4.0	ENC Control compact Ch. 1	0x7020:03 – Set counter (0x7020:10 – Reserved) 0x7020:11 – Set counter value
	2 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1606, 0x1608, 0x1609, 0x160B, 0x160D			

SM2, PDO assignment 0x1C12, outputs					
Index	**assigned to PDO setting**	**Index of excluded PDOs**	**Size (byte.bit)**	**Name**	**PDO Content Index – Name**
0x160B	1 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D	6.0	ENC Control Ch. 1	0x7020:03 – Set counter (0x7020:10 – Reserved) 0x7020:11 – Set counter value
	2 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1606, 0x1607, 0x1609, 0x160A, 0x160C			
	1 Ch. Standard 32 Bit (MDP 253/511), continues position	0x1600, 0x1602, 0x1604, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D			
	1 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1605, 0x1606, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C, 0x160D			
	2 Ch. Standard 32 Bit (MDP 253/511), continues position	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
	2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
0x160C	2 Ch. Standard 16 Bit (MDP 253/511)	0x1601, 0x1603, 0x1604, 0x1606, 0x1608, 0x1609, 0x160B, 0x160D	4.0	ENC Control compact Ch. 2	0x7030:03 – Set counter (0x7030:10 – Reserved) 0x7030:11 – Set counter value
0x160D	2 Ch. Standard 32 Bit (MDP 253/511)	0x1601, 0x1602, 0x1604, 0x1606, 0x1607, 0x1609, 0x160A, 0x160C	6.0	ENC Control Ch. 2	0x7030:03 – Set counter (0x7030:10 – Reserved) 0x7030:11 – Set counter value
	2 Ch. Standard 32 Bit (MDP 253/511), continues position	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			
	2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time	0x1600, 0x1602, 0x1603, 0x1604, 0x1605, 0x1607, 0x1608, 0x1609, 0x160A, 0x160C			

Process data setting options

The extent of process data can be set via the Process Data tab as described below (2-level incremental encoder settings are presented only):

1 Ch. Standard 16 Bit (MDP 253/511)

- preset standard configuration in TwinCAT 2.11, TwinCAT 3
- so-called compact process image, since it has only 16-bit-wide variables
- allows linking to NC axes according to MDP 253, sub profile 511
- C-track in Incremental Encoder output mode

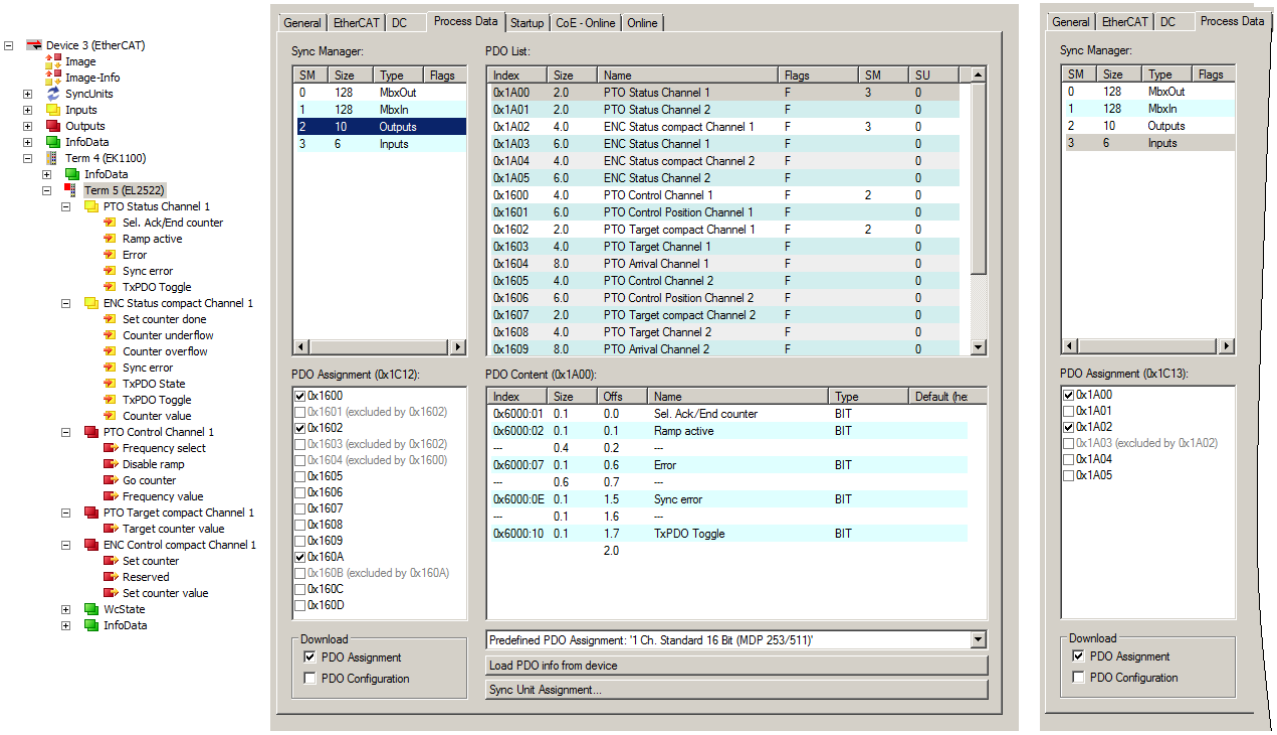


Fig. 58: Process data and PDO assignment: “Standard 16 bits (MDP 253/511)”

1 Ch. Standard 32 Bit (MDP 253/511), continues position

- 32-bit-wide variables
- allows linking to NC axes according to MDP 253, sub profile 511
- continuous positioning / output cycles cycle-synchronous
- Additional output of C-track with incremental encoder output mode (single mode operation only)

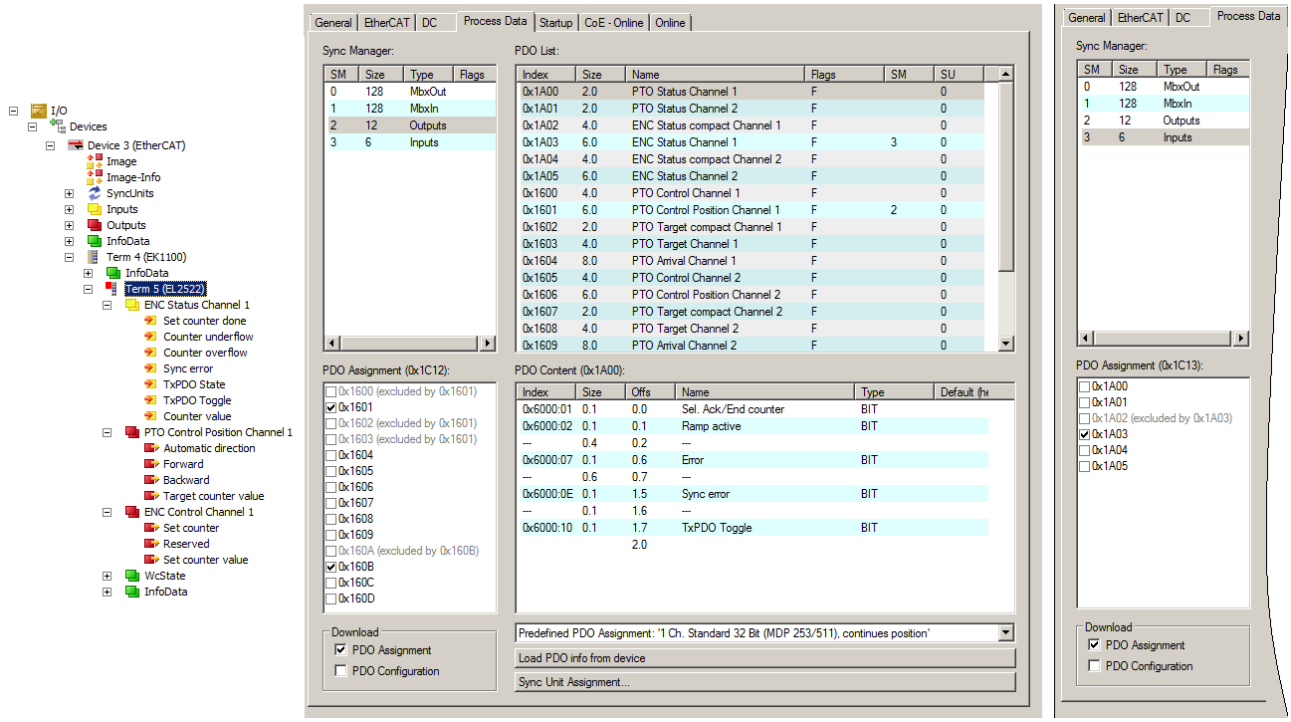


Fig. 59: Process data and PDO assignment: “1 Ch. Standard 32 bits (MDP 253/511), continuous position”

2 Ch. Standard 32 Bit (MDP 253/511), continues position

- 32-bit-wide variables
- allows linking to NC axes according to MDP 253, sub profile 511
- continuous positioning / output cycles cycle-synchronous
- 2 fold

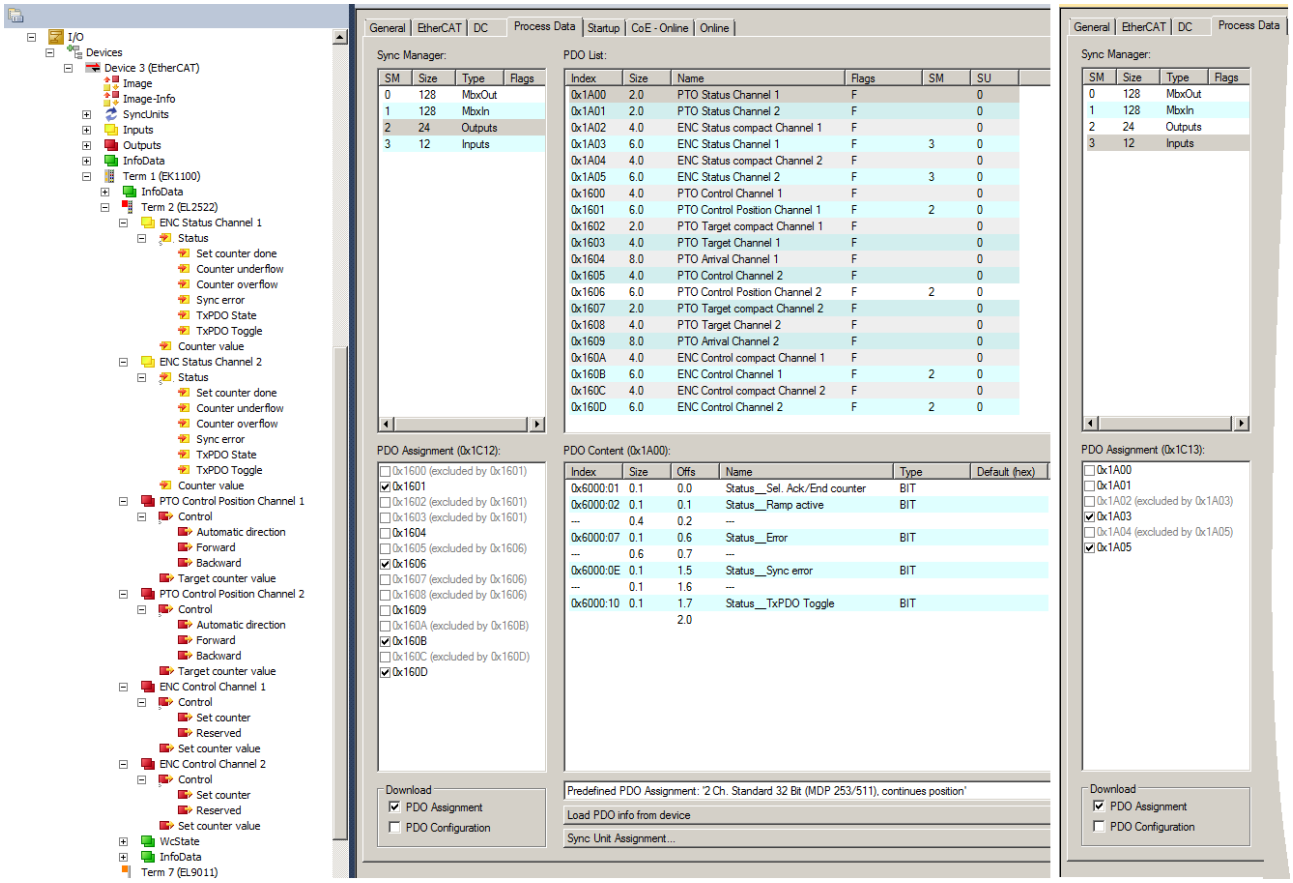


Fig. 60: Process data and PDO assignment: “2 Ch. Standard 32 bits (MDP 253/511), continuous position”

2 Ch. Standard 32 Bit (MDP 253/511), continues position w. arrival time

- 32-bit-wide variables
- allows linking to NC axes according to MDP 253, sub profile 511
- continuous positioning / output cycles cycle-synchronous
- Specifying the arrival time
- 2 fold

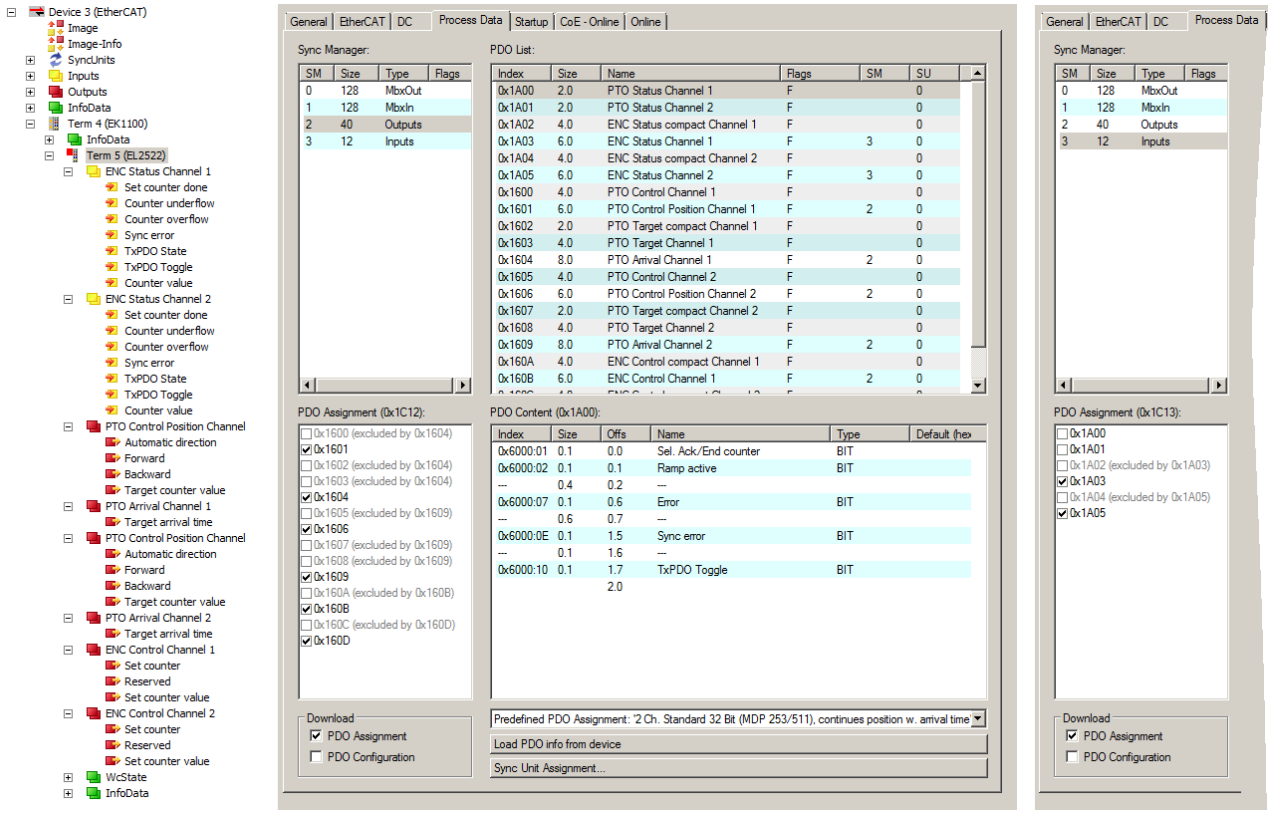


Fig. 61: Process data and PDO assignment: “2-channel standard 32 bits (MDP 253/511), continuous position with arrival time”

9.3.3 Object description and parameterization

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.

NOTICE



Parameterization via the CoE list (CAN over EtherCAT)

The EtherCAT device is parameterized via the CoE - Online tab (with a double click on the respective object) or via the Process Data tab (assignment of PDOs). A detailed description can be found in the EtherCAT System-Documentation in chapter "EtherCAT subscriber configuration"

Please note the general CoE notes in the EtherCAT System Documentation in chapter "CoE-interface" when using/manipulating the CoE parameters:
- Keep a startup list if components have to be replaced
- Differentiation between online/offline dictionary,
- existence of current XML description
- use "CoE reload" for resetting changes

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization [▶ 127] during commissioning
- Objects intended for regular operation [▶ 146], e.g. through ADS access
- Objects for indicating internal settings [▶ 131](may be fixed)

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

9.3.3.1 Restore object

Index 1011 Restore default parameters

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

9.3.3.2 Objects for commissioning

Index 0x8000 PTO settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	PTO Settings Ch.1	Max. subindex	UINT8	RO	0x18 (24_{dec})
8000:01	Adapt A/B on position set	If the counter value is set to 0, the C-track goes into the High state. The behavior of channels A and B can be defined in this case. • By default, the value is set to FALSE, the position of the C track relative to A and B is then not changed. • If the value is set to TRUE, channels A and B are both set to high. Consequently, a change of state occurs on both channels!	BOOLEAN	RW	0x00 (0_{dec})
8000:02	Emergency Ramp active	TRUE If the watchdog timer triggers, the terminal moves a ramp with the time constant set in index 0x8020:18 “Ramp time constant (emergency)” to the value set in index 0x8000:11 “Users switch-on-value” set in index 0x8000:11. FALSE The function is disabled	BOOLEAN	RW	0x00 (0_{dec})
8000:03	Watchdog timer deactive	TRUE The watchdog timer is disabled FALSE The watchdog timer is activated in the delivery state. Either the manufacturer or the user switch-on value is output if the watchdog overflows.	BOOLEAN	RW	0x00 (0_{dec})
8000:04	Sign/amount representation	TRUE The output value is displayed in magnitude-sign format: -2_{dec} = 0x8002 -1_{dec} = 0x8001 1_{dec} = 0x0001 2_{dec} = 0x0002 FALSE The output value is returned as a signed integer in two's complement: -2_{dec} = 0xFFFE -1_{dec} = 0xFFFF 1_{dec} = 0x0001 2_{dec} = 0x0002	BOOLEAN	RW	0x00 (0_{dec})
8000:06	Ramp function active	TRUE Ramp function enabled (Required when operating with travel distance control) FALSE Ramp function disabled (Required for NC operation)	BOOLEAN	RW	0x01 (1_{dec})
8000:07*	Ramp base frequency	permitted values: 0: 10 Hz 1: 1 kHz	BIT1	RW	0x00 (0_{dec})
8000:08	Direct input mode	TRUE Direct input mode (only when operating with travel distance control) FALSE Input mode relative to (Required for NC operation)	BOOLEAN	RW	0x00 (0_{dec})
8000:09	Users switch-on-value on wdt	TRUE Behavior with triggered watchdog timer: User-defined switch-on value FALSE Behavior with triggered watchdog timer: Manufacturer's defined switch-on value	BOOLEAN	RW	0x00 (0_{dec})
* Only when operated with travel distance control					

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0A	Travel distance control active	TRUE Travel distance control enabled (Required for operation with route control) FALSE Travel distance control disabled (Required for operation with NC)	BOOLEAN	RW	0x00 (0_{dec})
8000:0E	Operating mode	permitted values: 0: Frequency modulation 1: Pulse-direction control 2: Incremental encoder.	BIT2	RW	0x00 (0_{dec})
8000:10	Negative logic	TRUE Negative logic FALSE Positive logic	BOOLEAN	RW	0x00 (0_{dec})
8000:11	Users switch-on-value	User switch-on value (frequency)	UINT16	RW	0x0000 (0_{dec})
8000:12	Base frequency 1	Base frequency 1 = 50000 Hz	UINT32	RW	0x0000C350 (50000_{dec})
8000:13	Base frequency 2	Base frequency 2 = 100000 Hz	UINT32	RW	0x000186A0 (100000_{dec})
8000:14*	Ramp time constant (rising)	Ramp time constant (rising)	UINT16	RW	0x03E8 (1000_{dec})
8000:15*	Ramp time constant (falling)	Ramp time constant (falling)	UINT16	RW	0x03E8 (1000_{dec})
8000:16*	Frequency factor (Digit x 10 mHz)	Frequency factor (direct input, digit x 10 mHz)	UINT16	RW	0x0064 (100_{dec})
8000:17*	Slowing down frequency	Slowing down frequency, travel distance control	UINT16	RW	0x0032 (50_{dec})
8000:18	Ramp time constant (emergency)	Ramp time constant for controlled shutdown; “Users switch-on value” is driven to (Index 0x8000:11)	UINT16	RW	0x03E8 (1000_{dec})
* Only when operated with travel distance control					

Index 0x8010 PTO settings Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0	PTO Settings Ch.2	Max. subindex	UINT8	RO	0x18 (24_{dec})
8010:01	Adapt A/B on position set	If the counter value is set to 0, the C-track goes into the High state. The behavior of channels A and B can be defined in this case. • By default, the value is set to FALSE, the position of the C track relative to A and B is then not changed. • If the value is set to TRUE, channels A and B are both set to high. Consequently, a change of state occurs on both channels!	BOOLEAN	RW	0x00 (0_{dec})
8010:02	Emergency Ramp active	TRUE If the watchdog timer triggers, the terminal moves a ramp with the time constant set in index 0x8030:18 “Ramp time constant (emergency)” to the value set in index 0x8010:11 “Users switch-on value” set in index 0x8010:11. FALSE The function is disabled	BOOLEAN	RW	0x00 (0_{dec})
8010:03	Watchdog timer deactive	TRUE The watchdog timer is disabled FALSE The watchdog timer is activated in the delivery state. Either the manufacturer or the user switch-on value is output if the watchdog overflows.	BOOLEAN	RW	0x00 (0_{dec})
8010:04	Sign/amount representation	TRUE The output value is displayed in magnitude-sign format: -2_{dec} = 0x8002 -1_{dec} = 0x8001 1_{dec} = 0x0001 2_{dec} = 0x0002 FALSE The output value is returned as a signed integer in two's complement: -2_{dec} = 0xFFFE -1_{dec} = 0xFFFF 1_{dec} = 0x0001 2_{dec} = 0x0002	BOOLEAN	RW	0x00 (0_{dec})
8010:06	Ramp function active	TRUE Ramp function enabled (Required when operating with travel distance control) FALSE Ramp function disabled (Required for NC operation)	BOOLEAN	RW	0x01 (1_{dec})
8010:07*	Ramp base frequency	permitted values: 0: 10 Hz 1: 1 kHz	BIT1	RW	0x00 (0_{dec})
8010:08	Direct input mode	TRUE Direct input mode (only when operating with travel distance control) FALSE Input mode relative to (Required for NC operation)	BOOLEAN	RW	0x00 (0_{dec})
8010:09	Users switch-on-value on wdt	TRUE Behavior with triggered watchdog timer: User-defined switch-on value FALSE Behavior with triggered watchdog timer: Manufacturer's defined switch-on value	BOOLEAN	RW	0x00 (0_{dec})
* Only when operated with travel distance control					

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0A	Travel distance control active	TRUE Travel distance control enabled (Required for operation with route control) FALSE Travel distance control disabled (Required for operation with NC)	BOOLEAN	RW	0x00 (0_{dec})
8010:0E	Operating mode	permitted values: 0: Frequency modulation 1: Pulse-direction control 2: Incremental encoder.	BIT2	RW	0x00 (0_{dec})
8010:10	Negative logic	TRUE Negative logic FALSE Positive logic	BOOLEAN	RW	0x00 (0_{dec})
8010:11	Users switch-on-value	User switch-on value (frequency)	UINT16	RW	0x0000 (0_{dec})
8010:12	Base frequency 1	Base frequency 1 = 50000 Hz	UINT32	RW	0x0000C350 (50000_{dec})
8010:13	Base frequency 2	Base frequency 2 = 100000 Hz	UINT32	RW	0x000186A0 (100000_{dec})
8010:14*	Ramp time constant (rising)	Ramp time constant (rising)	UINT16	RW	0x03E8 (1000_{dec})
8010:15*	Ramp time constant (falling)	Ramp time constant (falling)	UINT16	RW	0x03E8 (1000_{dec})
8010:16*	Frequency factor (Digit x 10mHz)	Frequency factor (direct input, digit x 10 mHz)	UINT16	RW	0x0064 (100_{dec})
8010:17*	Slowing down frequency	Slowing down frequency, travel distance control	UINT16	RW	0x0032 (50_{dec})
8010:18	Ramp time constant (emergency)	Ramp time constant for controlled shutdown; “Users switch-on-value” is driven to (Index 0x8010:11).	UINT16	RW	0x03E8 (1000_{dec})
* Only when operated with travel distance control					

Index 0x8020 ENC Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8020:0	ENC Settings Ch.1	Max. subindex	UINT8	RO	0x1A (26_{dec})
8020:01	Enable C reset	The counter is reset via the C-track	BOOLEAN	RW	0x00 (0_{dec})
8020:0A	Enable micro increments	The counter is more highly resolved with the bits specified in 0x8020:18 “Micro increment bits”	BOOLEAN	RW	0x00 (0_{dec})
8020:18	Micro increment bits	If 0x8020:0A “Enable miro increments” = TRUE: Number of micro increment bits	UINT16	RW	0x0008 (8_{dec})
8020:19	Pulses per revolution	If C reset is active: Number of increments per revolution. At 1024 the counter counts	UINT32	RW	0x00000400 (1024_{dec})
8020:1A**	Autoset treshold	If the difference between “Target counter value” and “Counter value” exceeds this threshold, no output takes place. 0: Function for automatic setting is inactive > 0: Automatic setting active No frequency output if: “Target counter value” – “Counter value” > “Autoset threshold”.	UINT32	RW	0x00000000 (0_{dec})
** only for operation modes with continuous position specification					

Index 0x8030 ENC Settings Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
8030:0	ENC Settings Ch.2	Max. subindex	UINT8	RO	0x1A (26_{dec})
8030:01	Enable C reset	The counter is reset via the C-track.	BOOLEAN	RW	0x00 (0_{dec})
8030:0A	Enable micro increments	The counter is more highly resolved with the bits specified in 0x8030:18 “Micro increment bits”.	BOOLEAN	RW	0x00 (0_{dec})
8030:18	Micro increment bits	If 0x8030:0A “Enable micro increments” = TRUE: Number of micro increment bits	UINT16	RW	0x0008 (8_{dec})
8030:19	Pulses per revolution	If C reset is active: Number of increments per revolution. At 1024 the counter counts.	UINT32	RW	0x00000400 (1024_{dec})
8030:1A**	Autoset treshold	If the difference between “Target counter value” and “Counter value” exceeds this threshold, no output takes place. 0: Function for automatic setting is inactive > 0: Automatic setting active No frequency output if: “Target counter value” – “Counter value” > “Autoset threshold”.	UINT32	RW	0x00000000 (0_{dec})
** only for operation modes with continuous position specification					

9.3.3.3 Standard objects (0x1000-0x1FFF)

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

Index 0x1000 Device type

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

Index 0x1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EL2522

Index 1009 Hardware version

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

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	00

Index 0x1018 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	0x09DA3052 (165294162_{dec})
1018:03	Revision	Revision number of the EtherCAT slave: • The low word (bit 0–15) identifies the special terminal number. • The high word (bit 16–31) refers to the device description.	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave: • Low word ◦ 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 0x1400 PTO RxPDO par control Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1400:0	PTO RxPDO-Par Control Ch.1	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 04 16 00 00

Index 0x1401 PTO RxPDO par control position Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1401:0	PTO RxPDO-Par Control Position Ch.1	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 02 16 03 16

Index 0x1402 PTO RxPDO par target compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1402:0	PTO RxPDO-Par Target compact Ch.1	PDO Parameter RxPDO 3	UINT8	RO	0x06 (6_{dec})
1402:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 3.	OCTET-STRING[6]	RO	01 16 03 16 00 00

Index 0x1403 PTO RxPDO par target Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1403:0	PTO RxPDO-Par Target Ch.1	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	01 16 02 16 00 00

Index 0x1404 PTO RxPDO par arrival Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1404:0	PTO RxPDO-Par Arrival Ch.1	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	00 16 02 16 03 16

Index 0x1405 PTO RxPDO par control Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1405:0	PTO RxPDO-Par Control Ch.2	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	06 16 09 16 00 00

Index 0x1406 PTO RxPDO par control position Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1406:0	PTO RxPDO-Par Control Position Ch.2	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	05 16 07 16 08 16

Index 0x1407 PTO RxPDO par target compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1407:0	PTO RxPDO-Par Target compact Ch.2	PDO Parameter RxPDO 8	UINT8	RO	0x06 (6_{dec})
1407:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 8.	OCTET-STRING[6]	RO	06 16 08 16 00 00

Index 0x1408 PTO RxPDO par target Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1408:0	PTO RxPDO-Par Target Ch.2	PDO Parameter RxPDO 9	UINT8	RO	0x06 (6_{dec})
1408:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 9.	OCTET-STRING[6]	RO	06 16 07 16 00 00

Index 0x1409 PTO RxPDO par arrival Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1409:0	PTO RxPDO-Par Arrival Ch.2	PDO Parameter RxPDO 10	UINT8	RO	0x06 (6_{dec})
1409:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 10.	OCTET-STRING[6]	RO	05 16 07 16 08 16

Index 0x140A ENC RxPDO par control compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
140A:0	ENC RxPDO-Par Control compact Ch.1	PDO Parameter RxPDO 11	UINT8	RO	0x06 (6_{dec})
140A:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 11.	OCTET-STRING[6]	RO	0B 16 00 00 00 00

Index 0x140B ENC RxPDO par control Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
140B:0	ENC RxPDO-Par Control Ch.1	PDO Parameter RxPDO 12	UINT8	RO	0x06 (6_{dec})
140B:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 12.	OCTET-STRING[6]	RO	0A 16 00 00 00 00

Index 0x140C ENC RxPDO par control compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
140C:0	ENC RxPDO-Par Control compact Ch.2	PDO Parameter RxPDO 13	UINT8	RO	0x06 (6_{dec})
140C:06	Exclude RxPDOs	Specifies the RxPDOs (index of RxPDO mapping objects) that must not be transferred together with RxPDO 13.	OCTET-STRING[6]	RO	0D 16 00 00 00 00

Index 0x140D ENC RxPDO par control Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
140D:0	ENC RxPDO-Par Control Ch.2	PDO Parameter RxPDO 14	UINT8	RO	0x06 (6_{dec})
140D:06	Exclude RxPDOs	Specifies the RxPDOs (index 0x of RxPDO mapping objects) that must not be transferred together with RxPDO 14.	OCTET-STRING[6]	RO	0C 16 00 00 00 00

Index 0x1600 PTO RxPDO map control Ch.1*

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	PTO RxPDO-Map Control Ch.1	PDO Mapping RxPDO 1	UINT8	RO	0x05 (5_{dec})
1600:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x01 (Frequency select))	UINT32	RO	0x7000:01, 1
1600:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x02 (Disable ramp))	UINT32	RO	0x7000:02, 1
1600:03	SubIndex 0x003	3. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x03 (Go counter))	UINT32	RO	0x7000:03, 1
1600:04	SubIndex 0x004	4. PDO Mapping entry (13 bit aligns)	UINT32	RO	0x0000:00, 13
1600:05	SubIndex 0x005	5. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x11 (Frequency value))	UINT32	RO	0x7000:11, 16
*only for operation modes **without** continuous position specification					

Index 0x1601 PTO RxPDO map control position Ch.1*

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	PTO RxPDO-Map Control Position Ch.1	PDO Mapping RxPDO 2	UINT8	RO	0x06 (6_{dec})
1601:01	SubIndex 0x001	1. PDO Mapping entry (3 bit aligns)	UINT32	RO	0x0000:00, 3
1601:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x04 (Automatic direction))	UINT32	RO	0x7000:04, 1
1601:03	SubIndex 0x003	3. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x05 (Forward))	UINT32	RO	0x7000:05, 1
1601:04	SubIndex 0x004	4. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x06 (Backward))	UINT32	RO	0x7000:06, 1
1601:05	SubIndex 0x005	5. PDO Mapping entry (10 bit aligns)	UINT32	RO	0x0000:00, 10
1601:06	SubIndex 0x006	6. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x12 (Target counter value))	UINT32	RO	0x7000:12, 32
*only for operation modes **with** continuous position specification					

Index 0x1602 PTO RxPDO map target compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	PTO RxPDO-Map Target compact Ch.1	PDO Mapping RxPDO 3	UINT8	RO	0x01 (1_{dec})
1602:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x12 (Target counter value))	UINT32	RO	0x7000:12, 16
*For 16-bit standard operation mode only					

Index 0x1603 PTO RxPDO map target Ch.1*

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	PTO RxPDO map target Ch.1	PDO Mapping RxPDO 4	UINT8	RO	0x01 (1_{dec})
1603:01	Subindex 0x001	1. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x12 (Target counter value))	UINT32	RO	0x7000:12, 32
*only for 32-bit Standard operation mode					

Index 0x1604 PTO RxPDO map arrival Ch.1*

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	PTO RxPDO-Map Arrival Ch.1	PDO Mapping RxPDO 5	UINT8	RO	0x01 (1_{dec})
1604:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7000 (PTO Outputs Ch.1), entry 0x13 (Target arrival time))	UINT32	RO	0x7000:13, 64
*only for operation modes with a position specification and arrival time					

Index 0x1605 PTO RxPDO map control Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	PTO RxPDO-Map Control Ch.2	PDO Mapping RxPDO 6	UINT8	RO	0x05 (5_{dec})
1605:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x01 (Frequency select))	UINT32	RO	0x7010:01, 1
1605:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x02 (Disable ramp))	UINT32	RO	0x7010:02, 1
1605:03	SubIndex 0x003	3. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x03 (Go counter))	UINT32	RO	0x7010:03, 1
1605:04	SubIndex 0x004	4. PDO Mapping entry (13 bit aligns)	UINT32	RO	0x0000:00, 13
1605:05	SubIndex 0x005	5. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x11 (Frequency value))	UINT32	RO	0x7010:11, 16
*only for 2-channel Standard 16-bit and 32-bit operation modes					

Index 0x1606 PTO RxPDO map control position Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1606:0	PTO RxPDO-Map Control Position Ch.2	PDO Mapping RxPDO 7	UINT8	RO	0x06 (6_{dec})
1606:01	SubIndex 0x001	1. PDO Mapping entry (3 bit aligns)	UINT32	RO	0x0000:00, 3
1606:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x04 (Automatic direction))	UINT32	RO	0x7010:04, 1
1606:03	SubIndex 0x003	3. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x05 (Forward))	UINT32	RO	0x7010:05, 1
1606:04	SubIndex 0x004	4. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x06 (Backward))	UINT32	RO	0x7010:06, 1
1606:05	SubIndex 0x005	5. PDO Mapping entry (10 bit aligns)	UINT32	RO	0x0000:00, 10
1606:06	SubIndex 0x006	6. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x12 (Target counter value))	UINT32	RO	0x7010:12, 32

Index 0x1607 PTO RxPDO map target compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1607:0	PTO RxPDO-Map Target compact Ch.2	PDO Mapping RxPDO 8	UINT8	RO	0x01 (1_{dec})
1607:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x12 (Target counter value))	UINT32	RO	0x7010:12, 16

Index 0x1608 PTO RxPDO map target Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1608:0	PTO RxPDO-Map Target Ch.2	PDO Mapping RxPDO 9	UINT8	RO	0x01 (1_{dec})
1608:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x12 (Target counter value))	UINT32	RO	0x7010:12, 32

Index 0x1609 PTO RxPDO map arrival Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1609:0	PTO RxPDO-Map Arrival Ch.2	PDO Mapping RxPDO 10	UINT8	RO	0x01 (1_{dec})
1609:01	SubIndex 0x001	1. PDO Mapping entry (object 0x7010 (PTO Outputs Ch.2), entry 0x13 (Target arrival time))	UINT32	RO	0x7010:13, 64

Index 0x160A ENC RxPDO map control compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
160A:0	ENC RxPDO-Map Control compact Ch.1	PDO Mapping RxPDO 11	UINT8	RO	0x05 (5_{dec})
160A:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
160A:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7020 (ENC Outputs Ch.1), entry 0x03 (Set counter))	UINT32	RO	0x7020:03, 1
160A:03	SubIndex 0x003	3. PDO Mapping entry (12 bit aligns)	UINT32	RO	0x0000:00, 12
160A:04	SubIndex 0x004	4. PDO Mapping entry (object 0x7020 (ENC Outputs Ch.1), entry 0x10 (Reserved))	UINT32	RO	0x7020:10, 1
160A:05	SubIndex 0x005	5. PDO Mapping entry (object 0x7020 (ENC Outputs Ch.1), entry 0x11 (Set Counter value))	UINT32	RO	0x7020:11, 16

Index 0x160B ENC RxPDO map control Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
160B:0	ENC RxPDO-Map Control Ch.1	PDO Mapping RxPDO 12	UINT8	RO	0x05 (5_{dec})
160B:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
160B:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7020 (ENC Outputs Ch.1), entry 0x03 (Set counter))	UINT32	RO	0x7020:03, 1
160B:03	SubIndex 0x003	3. PDO Mapping entry (12 bit aligns)	UINT32	RO	0x0000:00, 12
160B:04	SubIndex 0x004	4. PDO Mapping entry (object 0x7020 (ENC Outputs Ch.1), entry 0x10 (Reserved))	UINT32	RO	0x7020:10, 1
160B:05	SubIndex 0x005	5. PDO Mapping entry (object 0x7020 (ENC Outputs Ch.1), entry 0x11 (Set counter value))	UINT32	RO	0x7020:11, 32

Index 0x160C ENC RxPDO map control compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
160C:0	ENC RxPDO-Map Control compact Ch.2	PDO Mapping RxPDO 13	UINT8	RO	0x05 (5_{dec})
160C:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
160C:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7030 (ENC Outputs Ch.2), entry 0x03 (Set counter))	UINT32	RO	0x7030:03, 1
160C:03	SubIndex 0x003	3. PDO Mapping entry (12 bit aligns)	UINT32	RO	0x0000:00, 12
160C:04	SubIndex 0x004	4. PDO Mapping entry (object 0x7030 (ENC Outputs Ch.2), entry 0x10 (Reserved))	UINT32	RO	0x7030:10, 1
160C:05	SubIndex 0x005	5. PDO Mapping entry (object 0x7030 (ENC Outputs Ch.2), entry 0x11 (Set counter value))	UINT32	RO	0x7030:11, 16

Index 0x160D ENC RxPDO map control Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
160D:0	ENC RxPDO-Map Control Ch.2	PDO Mapping RxPDO 14	UINT8	RO	0x05 (5_{dec})
160D:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
160D:02	SubIndex 0x002	2. PDO Mapping entry (object 0x7030 (ENC Outputs Ch.2), entry 0x03 (Set counter))	UINT32	RO	0x7030:03, 1
160D:03	SubIndex 0x003	3. PDO Mapping entry (12 bit aligns)	UINT32	RO	0x0000:00, 12
160D:04	SubIndex 0x004	4. PDO Mapping entry (object 0x7030 (ENC Outputs Ch.2), entry 0x10 (Reserved))	UINT32	RO	0x7030:10, 1
160D:05	SubIndex 0x005	5. PDO Mapping entry (object 0x7030 (ENC Outputs Ch.2), entry 0x11 (Set counter value))	UINT32	RO	0x7030:11, 32

Index 0x1802 ENC TxPDO par status compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1802:0	ENC TxPDO-Par Status compact Ch.1	PDO Parameter TxPDO 3	UINT8	RO	0x06 (6_{dec})
1802:06	Exclude TxPDOs	Specifies the TxPDOs (index 0x of TxPDO mapping objects) that must not be transferred together with TxPDO 3.	OCTET-STRING[2]	RO	03 1A

Index 0x1803 ENC TxPDO par status Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1803:0	ENC TxPDO-Par Status Ch.1	PDO Parameter TxPDO 4	UINT8	RO	0x06 (6_{dec})
1803:06	Exclude TxPDOs	Specifies the TxPDOs (index 0x of TxPDO mapping objects) that must not be transferred together with TxPDO 4.	OCTET-STRING[2]	RO	02 1A

Index 0x1804 ENC TxPDO par status compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1804:0	ENC TxPDO-Par Status compact Ch.2	PDO Parameter TxPDO 5	UINT8	RO	0x06 (6_{dec})
1804:06	Exclude TxPDOs	Specifies the TxPDOs (index 0x of TxPDO mapping objects) that must not be transferred together with TxPDO 5.	OCTET-STRING[2]	RO	05 1A

Index 0x1805 ENC TxPDO par status Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1805:0	ENC TxPDO-Par Status Ch.2	PDO Parameter TxPDO 6	UINT8	RO	0x06 (6_{dec})
1805:06	Exclude TxPDOs	Specifies the TxPDOs (index 0x of TxPDO mapping objects) that must not be transferred together with TxPDO 6.	OCTET-STRING[2]	RO	04 1A

Index 0x1A00 PTO TxPDO map status Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	PTO TxPDO-Map Status Ch.1	PDO Mapping TxPDO 1	UINT8	RO	0x08 (8_{dec})
1A00:01	SubIndex 0x001	1. PDO Mapping entry (object 0x6000 (PTO Inputs Ch.1), entry 0x01 (Sel. Ack/End counter))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 0x002	2. PDO Mapping entry (object 0x6000 (PTO Inputs Ch.1), entry 0x02 (Ramp active))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 0x003	3. PDO Mapping entry (4 bit aligns)	UINT32	RO	0x0000:00, 4
1A00:04	SubIndex 0x004	4. PDO Mapping entry (object 0x6000 (PTO Inputs Ch.1), entry 0x07 (Error))	UINT32	RO	0x6000:07, 1
1A00:05	SubIndex 0x005	5. PDO Mapping entry (6 bit aligns)	UINT32	RO	0x0000:00, 6
1A00:06	SubIndex 0x006	6. PDO Mapping entry (object 0x6000 (PTO Inputs Ch.1), entry 0x0E (Sync error))	UINT32	RO	0x6000:0E, 1
1A00:07	SubIndex 0x007	7. PDO Mapping entry (1 bit aligns)	UINT32	RO	0x0000:00, 1
1A00:08	SubIndex 0x008	8. PDO Mapping entry (object 0x6000 (PTO Inputs Ch.1), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6000:10, 1

Index 0x1A01 PTO TxPDO map status Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	PTO TxPDO-Map Status Ch.2	PDO Mapping TxPDO 2	UINT8	RO	0x0A (10_{dec})
1A01:01	SubIndex 0x001	1. PDO mapping entry (object 0x6010 (PTO Inputs Ch.2), entry 0x01 (Sel. Ack/End counter))	UINT32	RO	0x6010:01, 1
1A01:02	SubIndex 0x002	2. PDO Mapping entry (object 0x6010 (PTO Inputs Ch.2), entry 0x02 (Ramp active))	UINT32	RO	0x6010:02, 1
1A01:03	SubIndex 0x003	3. PDO Mapping entry (4 bit aligns)	UINT32	RO	0x0000:00, 4
1A01:04	SubIndex 0x004	4. PDO Mapping entry (object 0x6010 (PTO Inputs Ch.2), entry 0x07 (Error))	UINT32	RO	0x6010:07, 1
1A01:05	SubIndex 0x005	5. PDO Mapping entry (6 bit aligns)	UINT32	RO	0x0000:00, 6
1A01:06	SubIndex 0x006	6. PDO Mapping entry (object 0x6010 (PTO Inputs Ch.2), entry 0x0E (Sync error))	UINT32	RO	0x6010:0E, 1
1A01:07	SubIndex 0x007	7. PDO Mapping entry (1 bit aligns)	UINT32	RO	0x0000:00, 1
1A01:08	SubIndex 0x008	8. PDO Mapping entry (object 0x6010 (PTO Inputs Ch.2), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6010:10, 1

Index 0x1A02 ENC TxPDO map status compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	ENC TxPDO-Map Status compact Ch.1	PDO Mapping TxPDO 3	UINT8	RO	0x09 (9_{dec})
1A02:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
1A02:02	SubIndex 0x002	2. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x03 (Set counter done))	UINT32	RO	0x6020:03, 1
1A02:03	SubIndex 0x003	3. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x04 (Counter underflow))	UINT32	RO	0x6020:04, 1
1A02:04	SubIndex 0x004	4. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x05 (Counter overflow))	UINT32	RO	0x6020:05, 1
1A02:05	SubIndex 0x005	5. PDO Mapping entry (8 bit aligns)	UINT32	RO	0x0000:00, 8
1A02:06	SubIndex 0x006	6. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x0E (Sync error))	UINT32	RO	0x6020:0E, 1
1A02:07	SubIndex 0x007	7. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x0F (TxPDO State))	UINT32	RO	0x6020:0F, 1
1A02:08	SubIndex 0x008	8. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6020:10, 1
1A02:09	SubIndex 0x009	9. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x11 (Counter value))	UINT32	RO	0x6020:11, 16

Index 0x1A03 ENC TxPDO map status Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	ENC TxPDO-Map Status Ch.1	PDO Mapping TxPDO 4	UINT8	RO	0x09 (9_{dec})
1A03:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
1A03:02	SubIndex 0x002	2. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x03 (Set counter done))	UINT32	RO	0x6020:03, 1
1A03:03	SubIndex 0x003	3. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x04 (Counter underflow))	UINT32	RO	0x6020:04, 1
1A03:04	SubIndex 0x004	4. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x05 (Counter overflow))	UINT32	RO	0x6020:05, 1
1A03:05	SubIndex 0x005	5. PDO Mapping entry (8 bit aligns)	UINT32	RO	0x0000:00, 8
1A03:06	SubIndex 0x006	6. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x0E (Sync error))	UINT32	RO	0x6020:0E, 1
1A03:07	SubIndex 0x007	7. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x0F (TxPDO State))	UINT32	RO	0x6020:0F, 1
1A03:08	SubIndex 0x008	8. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6020:10, 1
1A03:09	SubIndex 0x009	9. PDO Mapping entry (object 0x6020 (ENC Inputs Ch.1), entry 0x11 (Counter value))	UINT32	RO	0x6020:11, 32

Index 0x1A04 ENC TxPDO map status compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	ENC TxPDO-Map Status compact Ch.2	PDO Mapping TxPDO 5	UINT8	RO	0x09 (9_{dec})
1A04:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
1A04:02	SubIndex 0x002	2. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x03 (Set counter))	UINT32	RO	0x6030:03, 1
1A04:03	SubIndex 0x003	3. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x04 (Counter underflow))	UINT32	RO	0x6030:04, 1
1A04:04	SubIndex 0x004	4. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x05 (Counter overflow))	UINT32	RO	0x6030:05, 1
1A04:05	SubIndex 0x005	5. PDO Mapping entry (8 bit aligns)	UINT32	RO	0x0000:00, 8
1A04:06	SubIndex 0x006	6. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x0E (Sync error))	UINT32	RO	0x6030:0E, 1
1A04:07	SubIndex 0x007	7. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x0F (TxPDO State))	UINT32	RO	0x6030:0F, 1
1A04:08	SubIndex 0x008	8. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6030:10, 1
1A04:09	SubIndex 0x009	9. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x11 (Counter value))	UINT32	RO	0x6030:11, 16

Index 0x1A05 ENC TxPDO map status Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	ENC TxPDO-Map Status Ch.2	PDO Mapping TxPDO 6	UINT8	RO	0x09 (9_{dec})
1A05:01	SubIndex 0x001	1. PDO Mapping entry (2 bit aligns)	UINT32	RO	0x0000:00, 2
1A05:02	SubIndex 0x002	2. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x03 (Set Counter done))	UINT32	RO	0x6030:03, 1
1A05:03	SubIndex 0x003	3. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x04 (Counter underflow))	UINT32	RO	0x6030:04, 1
1A05:04	SubIndex 0x004	4. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x05 (Counter overflow))	UINT32	RO	0x6030:05, 1
1A05:05	SubIndex 0x005	5. PDO Mapping entry (8 bit aligns)	UINT32	RO	0x0000:00, 8
1A05:06	SubIndex 0x006	6. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x0E (Sync error))	UINT32	RO	0x6030:0E, 1
1A05:07	SubIndex 0x007	7. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x0F (TxPDO State))	UINT32	RO	0x6030:0F, 1
1A05:08	SubIndex 0x008	8. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6030:10, 1
1A05:09	SubIndex 0x009	9. PDO Mapping entry (object 0x6030 (ENC Inputs Ch.2), entry 0x11 (Counter value))	UINT32	RO	0x6030:11, 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 0x1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x06 (6_{dec})
1C12:01	Subindex 001	1. allocated RxPDO (contains the index 0x of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2. allocated RxPDO (contains the index 0x of the associated RxPDO mapping object)	UINT16	RW	0x1603 (5635_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index 0x of the associated RxPDO mapping object)	UINT16	RW	0x1605 (5637_{dec})
1C12:04	Subindex 004	4. allocated RxPDO (contains the index 0x of the associated RxPDO mapping object)	UINT16	RW	0x1608 (5640_{dec})
1C12:05	Subindex 005	5. allocated RxPDO (contains the index 0x of the associated RxPDO mapping object)	UINT16	RW	0x160B (5643_{dec})
1C12:06	Subindex 006	6. allocated RxPDO (contains the index 0x of the associated RxPDO mapping object)	UINT16	RW	0x160D (5645_{dec})

Index 0x1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x04 (4_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index 0x of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index 0x of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	Subindex 003	3. allocated TxPDO (contains the index 0x of the associated TxPDO mapping object)	UINT16	RW	0x1A03 (6659_{dec})
1C13:04	Subindex 004	4. allocated TxPDO (contains the index 0x of the associated TxPDO mapping object)	UINT16	RW	0x1A05 (6661_{dec})

Index 0x1C32 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: FreeRun • 1: Synchronous 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: cycle time of the master • 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: FreeRun is supported • Bit 1 = 1: Synchron with SM 2 Event is supported • Bit 2–3 = 01: DC mode is supported • Bit 4–5 = 10: Output Shift with SYNC1 Event (DC mode only) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08)	UINT16	RO	0x4C07 (19463_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x000186A0 (100000_{dec})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 Event (in ns, DC Mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:07	Minimum delay time		UINT32	RO	0x00000000 (0_{dec})
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C32:03, 0x1C32:05, 0x1C32:06, 0x1C32:09, 0x1C33:03 [▶ 142], 0x1C33:06 [▶ 141], 0x1C33:09 [▶ 142] 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 0x1C33 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: FreeRun • 1: Synchron with SM 3 Event (no outputs available) • 2: DC – Synchron with SYNC0 Event • 3: DC – Synchron with SYNC1 Event • 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02 [▶ 141]	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: Free Run is supported • Bit 1: Synchron with SM 2 Event is supported (outputs available) • Bit 1: Synchron 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 [▶ 141] or 0x1C33:08)	UINT16	RO	0x4C07 (19463_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05 [▶ 141]	UINT32	RO	0x000186A0 (100000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and the inputs being available for the master (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00000000 (0_{dec})
1C33:08	Command	as 0x1C32:08 [▶ 141]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11 [▶ 141]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12 [▶ 141]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13 [▶ 141]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32 [▶ 141]	BOOLEAN	RO	0x00 (0_{dec})

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

Index 0x6000 PTO inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	PTO Inputs Ch.1		UINT8	RO	0x10 (16_{dec})
6000:01	Sel. Ack/End counter	Confirms the change of base frequency. If travel distance control is activated: Target counter value reached	BOOLEAN	RO	0x00 (0_{dec})
6000:02*	Ramp active	Ramp is currently being followed.	BOOLEAN	RO	0x00 (0_{dec})
6000:07	Error	General error bit; set together with “Overrange” and “Underrange.”	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 in the cycle that has elapsed.	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})
* only when operated with track control					

Index 0x6010 PTO inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	PTO Inputs Ch.2	Max. subindex	UINT8	RO	0x10 (16_{dec})
6010:01	Sel. Ack/End counter	Confirms the change of base frequency. If travel distance control is activated: Target counter value reached	BOOLEAN	RO	0x00 (0_{dec})
6010:02*	Ramp active	Ramp is currently being followed	BOOLEAN	RO	0x00 (0_{dec})
6010:07	Error	General error bit; set together with “Overrange” and “Underrange.”	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 in the cycle that has elapsed.	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})
* only when operated with track control					

Index 0x6020 ENC Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	ENC Inputs Ch.1		UINT8	RO	0x11 (17_{dec})
6020:03	Set Counter done	The counter was set.	BOOLEAN	RO	0x00 (0_{dec})
6020:04	Counter underflow	The counter has passed the zero crossing backwards.	BOOLEAN	RO	0x00 (0_{dec})
6020:05	Counter overflow	Counter overflow.	BOOLEAN	RO	0x00 (0_{dec})
6020:0E	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})
6020:0F	TxPDO State	Validity of the data of the associated TxPDO (0 = valid, 1 = invalid).	BOOLEAN	RO	0x00 (0_{dec})
6020:10	TxPDO Toggle	The TxPDO toggle is toggled by the slave when the data in the associated TxPDO has been updated.	BOOLEAN	RO	0x00 (0_{dec})
6020:11	Counter value	The counter value.	UINT32	RO	0x00000000 (0_{dec})

Index 0x6030 ENC Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
6030:0	ENC Inputs Ch.2	Max. subindex	UINT8	RO	0x11 (17_{dec})
6030:03	Set Counter done	The counter was set.	BOOLEAN	RO	0x00 (0_{dec})
6030:04	Counter underflow	The counter has passed the zero crossing backwards.	BOOLEAN	RO	0x00 (0_{dec})
6030:05	Counter overflow	Counter overflow.	BOOLEAN	RO	0x00 (0_{dec})
6030:0E	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})
6030:0F	TxPDO State	Validity of the data of the associated TxPDO (0 = valid, 1 = invalid).	BOOLEAN	RO	0x00 (0_{dec})
6030:10	TxPDO Toggle	The TxPDO toggle is activated by the slave when the data in the associated TxPDO has been updated.	BOOLEAN	RO	0x00 (0_{dec})
6030:11	Counter value	The counter value.	UINT32	RO	0x00000000 (0_{dec})

Index 0x7000 PTO Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	PTO Outputs Ch.1	Max. subindex	UINT8	RO	0x13 (19_{dec})
7000:01	Frequency select	Fast toggling of the base frequency (only if ramp function is disabled) 0_{bin} = base frequency 1 (Index 0x8000:12 “Base frequency 1”) 1_{bin} = base frequency 2 (Index 0x8000:13 “Base frequency 2”)	BOOLEAN	RO	0x00 (0_{dec})
7000:02	Disable ramp	The ramp function is disabled, even though index 0x8000:06 “Ramp function active” is active.	BOOLEAN	RO	0x00 (0_{dec})
7000:03*, **	Go counter	If travel distance control is activated (index 0x8000:0A “Travel distance control active”), a specified counter value is driven to if the bit is set.	BOOLEAN	RO	0x00 (0_{dec})
7000:04***	Automatic direction	The shortest direction is automatically determined	BOOLEAN	RW	0x00 (0_{dec})
7000:05***	Forward	Manual specification of the output direction. (“Automatic direction” may not be set)	BOOLEAN	RW	0x00 (0_{dec})
7000:06***	Backward	Manual specification of the output direction. (“Automatic direction” must not be set)	BOOLEAN	RW	0x00 (0_{dec})
7000:11**	Frequency value	Output frequency	UINT16	RO	0x0000 (0_{dec})
7000:12*	Target Counter value	Target counter value	UINT32	RO	0x00000000 (0_{dec})
7000:13	Target arrival time	DC time by which the target counter value is to be reached (only for operation modes with position specification and arrival time)	UINT64	RO	

* in the “16- and 32-bit Standard” operation modes, this feature can only be used when operating with travel distance control.
** Only when operating with travel distance control
*** Only for operation modes with position specification

Index 0x7010 PTO Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	PTO Outputs Ch.2	Max. subindex	UINT8	RO	0x13 (19_{dec})
7010:01	Frequency select	Fast toggling of the base frequency (only if ramp function is disabled) 0_{bin} = base frequency 1 (Index 0x8010:12 “Base frequency 1”) 1_{bin} = base frequency 2 (Index 0x8010:13 “Base frequency 2”)	BOOLEAN	RO	0x00 (0_{dec})
7010:02	Disable ramp	The ramp function is disabled despite active object 0x8010:06.	BOOLEAN	RO	0x00 (0_{dec})
7010:03*,**	Go counter	If travel distance control is activated (object 0x8010:0A), a specified counter value is driven to if the bit is set	BOOLEAN	RO	0x00 (0_{dec})
7010:04***	Automatic direction	The shortest direction is automatically determined	BOOLEAN	RW	0x00 (0_{dec})
7010:05***	Forward	Manual specification of the output direction. (“Automatic direction” must not be set)	BOOLEAN	RW	0x00 (0_{dec})
7010:06***	Backward	Manual specification of the output direction. (“Automatic direction” must not be set)	BOOLEAN	RW	0x00 (0_{dec})
7010:11**	Frequency value	Output frequency	UINT16	RO	0x0000 (0_{dec})
7010:12*	Target Counter value	Target counter value	UINT32	RO	0x00000000 (0_{dec})
7010:13	Target arrival time	DC time by which the target counter value is to be reached (only for operation modes with position specification and arrival time)	UINT64	RO	

* in the “16- and 32-bit Standard” operation modes, this feature can only be used when operating with travel distance control.
** Only when operating with travel distance control
*** Only for operation modes with position specification

Index 0x7020 ENC Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7020:0	ENC Outputs Ch.1	Max. subindex	UINT8	RO	0x11 (17_{dec})
7020:03	Set counter	Set the counter value	BOOLEAN	RO	0x00 (0_{dec})
7020:10	Reserved		BOOLEAN	RO	0x00 (0_{dec})
7020:11	Set counter value	This is the meter reading to be set based on the initial process date “Set counter”.	UINT32	RO	0x00000000 (0_{dec})

Index 0x7030 ENC Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
7030:0	ENC Outputs Ch.2	Max. subindex	UINT8	RO	0x11 (17_{dec})
7030:03	Set counter	Set the counter value	BOOLEAN	RO	0x00 (0_{dec})
7030:10	Reserved		BOOLEAN	RO	0x00 (0_{dec})
7030:11	Set Counter value	This is the meter reading to be set based on the initial process date “Set counter.”	UINT32	RO	0x00000000 (0_{dec})

Index 0xA000 PTO Diag data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
A000:0	PTO Diag data Ch.1	Max. subindex	UINT8	RO	0x01 (1_{dec})
A000:01	Overspeed counter	Counts up if the calculated set position does not correspond to the actual position in the next cycle. Possible causes: • the output frequency is limited by the corresponding “Base frequency 1” • Microincrements are active and the “internal 100 MHz” are exceeded	UINT16	RO	0x0000 (0_{dec})

Index 0xA010 PTO Diag data Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
A010:0	PTO Diag data Ch.2	Max. subindex	UINT8	RO	0x01 (1_{dec})
A010:01	Overspeed counter	Counts up if the calculated set position does not correspond to the actual position in the next cycle. Possible causes: • the output frequency is limited by the corresponding “Base frequency 1” • Microincrements are active and the “internal 100 MHz” are exceeded	UINT16	RO	0x0000 (0_{dec})

Index 0xF000 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	0x0004 (4_{dec})

Index F008 Code word

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

Index 0xF010 Module list

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Max. subindex	UINT8	RW	0x04 (4_{dec})
F010:01	SubIndex 0x001	Profile number 253	UINT32	RW	0x000000FD (253_{dec})
F010:02	SubIndex 0x002	Profile number 253	UINT32	RW	0x000000FD (253_{dec})
F010:03	SubIndex 0x003	Profile number 511	UINT32	RW	0x000001FF (511_{dec})
F010:04	SubIndex 0x004	Profile number 511	UINT32	RW	0x000001FF (511_{dec})

9.3.3.5 Objects for regular operation

The EL2522 has no such objects.

9.3.4 Connection of the EL2522 in the NC

Required Firmware (FW) Version and TwinCAT Version

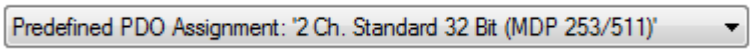
At least FW Version 07 is required for Connection of terminal EL2522 to the NC;

TwinCAT-Versions:
- up to TC 2.11 R3 Build 2250
- up to TC 3.1 Build 4018.16 (recommended)

Procedure

When EL2522 terminal was added to TwinCAT-IO, the procedure is as follows:

1. Select a specific EL2522 operating mode

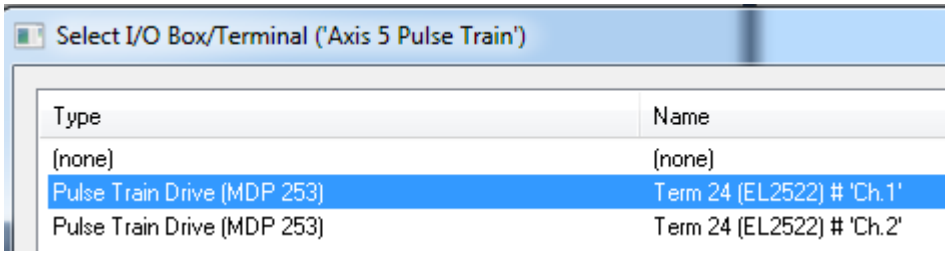


2. Link the non-referenced axes to the terminal

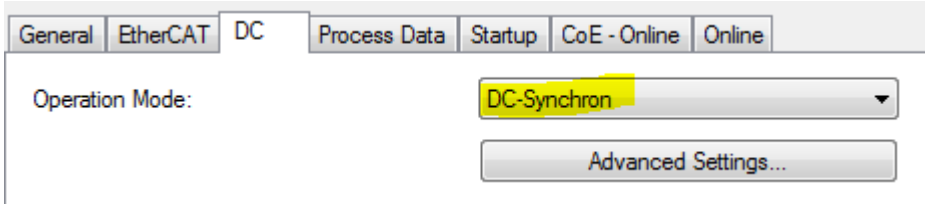
a)



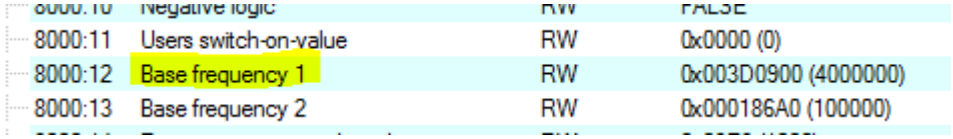
b)



3. Set distributed clock: “DC-Synchron” on “DC” tab



4. Set the frequency of the terminal in order to achieve the required velocity.



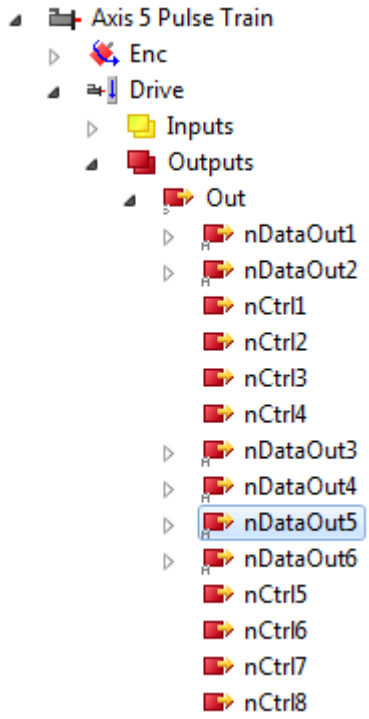
When using no up to date FW or rather not up dated TwinCAT versions, accordingly to the “Continues Position” Mode the following should be noticed, if applicable:

- Update the NC driver
- Add axis to the NC

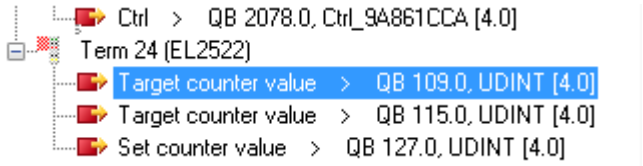
As soon as (between step 2. And 3.):

- Link Axis/Drive/nOutData5 to the “Target counter value” of the terminal

a)

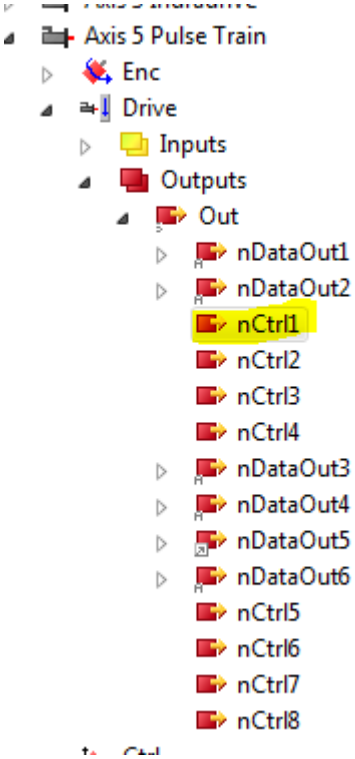


b)

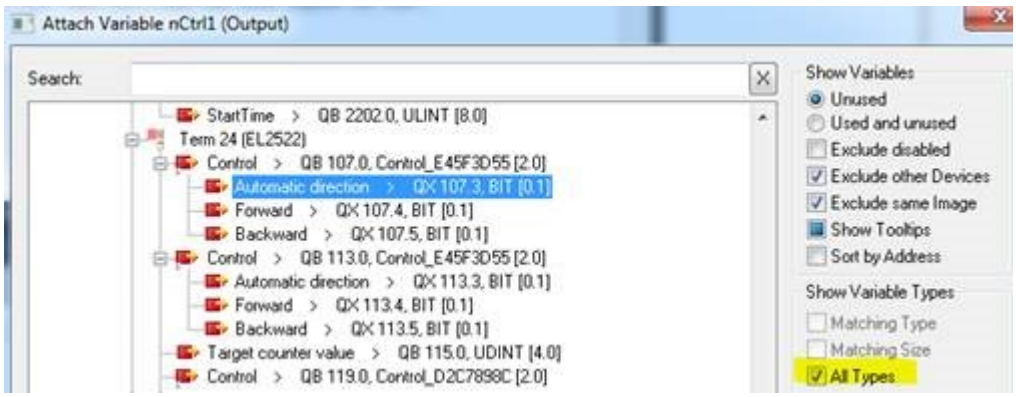


- Link Axis/Drive/nCtrl1 to “Automatic direction” of the terminal

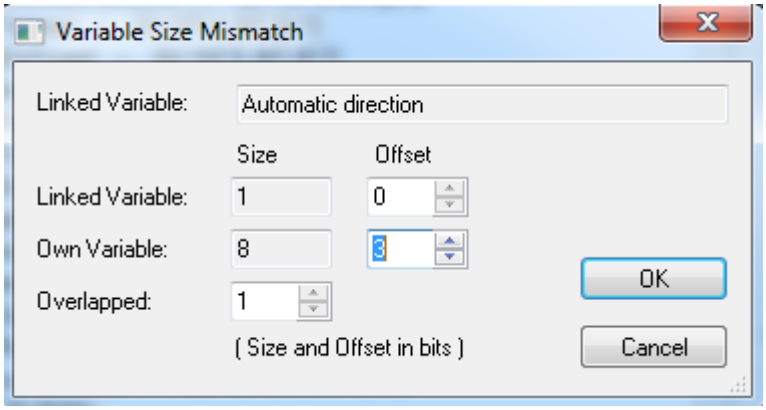
a)



b)


Attach Variable nCtrl1 (Output)
Search:
StartTime > QB 2202.0, ULINT [8.0]
Term 24 (EL2522)
Control > QB 107.0, Control_E45F3D55 [2.0]
Automatic direction > QX 107.3, BIT [0.1]
Forward > QX 107.4, BIT [0.1]
Backward > QX 107.5, BIT [0.1]
Control > QB 113.0, Control_E45F3D55 [2.0]
Automatic direction > QX 113.3, BIT [0.1]
Forward > QX 113.4, BIT [0.1]
Backward > QX 113.5, BIT [0.1]
Target counter value > QB 115.0, UDINT [4.0]
Control > QB 119.0, Control_D2C7898C [2.0]
Show Variables
Unused
Used and unused
Exclude disabled
Exclude other Devices
Exclude same Image
Show Tooltips
Sort by Address
Show Variable Types
Matching Type
Matching Size
All Types

c)


Variable Size Mismatch
Linked Variable:
Automatic direction
Size
Offset
Linked Variable:
1
0
Own Variable:
8
3
Overlapped:
1
(Size and Offset in bits)
OK
Cancel

10 Appendix

10.1 Firmware compatibility

Beckhoff EtherCAT devices are delivered with the latest available firmware version. Firmware and hardware must be compatible; not every combination ensures compatibility. The overview below shows the hardware versions on which a firmware can be operated.

Note

- The newest possible firmware for the respective hardware should be implemented
- Beckhoff is not under any obligation to provide customers with free firmware updates for delivered products.

NOTICE

Risk of damage to the device!

Observe the notes on the firmware update in the EtherCAT System Manual in chapter “Firmware Update”.
If a device is set to BOOTSTRAP mode for firmware update, it may not check whether the new firmware is suitable during download.
This may result in damage to the device! Therefore, always make sure that the firmware is suitable for the hardware version!

EL2521			
Hardware (HW)	**Firmware**	**Revision no.**	**Release date**
02	03	EL2521-0000-0016	2008/08
02–05	04		2008/09
	05		2008/09
05–16*	06	EL2521-0000-0018	2009/01
	07	EL2521-0000-0019	2011/01
	08		2011/04
	09		2011/04
	10		2012/04
		EL2521-0000-0020	2012/05
		EL2521-0000-0021	2012/07
	11*		2014/05
		EL2521-0000-0022	2014/11

EL2521-0024			
Hardware (HW)	**Firmware**	**Revision no.**	**Release date**
05–16*	06	EL2521-0024-1016/17	2009/01
	07	EL2521-0024-1018	2011/01
	08		2011/04
	09		2011/04
	10		2012/04
		EL2521-0024-1019	2012/05
		EL2521-0024-1020	2012/07
	11*		2014/05
		EL2521-0024-1021	2014/11

EL2521-0124			
Hardware (HW)	**Firmware**	**Revision no.**	**Release date**
05–06	01	EL2521-0124-0016	2009/09
	02		2010/03
	03	EL2521-0124-0017	2010/06
06–16*	04	EL2521-0124-0018	2011/01
	05		2011/05
		EL2521-0124-0019	2012/05
		EL2521-0124-0020	2012/07
	06*		2014/06

EL2521-0025			
Hardware (HW)	**Firmware**	**Revision no.**	**Release date**
00–08*	06	EL2521-0025-1016/17	2009/12
	07	EL2521-0025-1018	2011/01
	08		2011/04
	09		2011/04
	10		2012/04
		EL2521-0025-1019	2012/05
		EL2521-0025-1020	2012/07
	11*		2014/05
		EL2521-0025-1021	2014/11

EL2521-1001			
Hardware (HW)	**Firmware**	**Revision no.**	**Release date**
02	03	EL2521-1001-0016	2008/08
02–05	04		2008/09
	05		2008/09
05–14*	06	EL2521-1001-0017	2009/01
	07	EL2521-1001-0018	2011/01
	08		2011/04
	09		2011/04
	10		2012/04
		EL2521-1001-0019	2012/05
		EL2521-1001-0020	2012/07
	11*		2014/05

EL2522			
Hardware (HW)	**Firmware**	**Revision no.**	**Release date**
00–06*	01	EL2522-0000-0016	2013/12
	02	EL2522-0000-0017	2014/08
	03	EL2522-0000-0018	2014/09
	04	EL2522-0000-0019	2015/01
	05	EL2522-0000-0020	2015/01
	06	EL2522-0000-0021	2015/01
	07	EL2522-0000-0022	2015/07
	08*	EL2522-0000-0022	2023/01

*) This is the current compatible firmware/hardware version at the time of the preparing this documentation. Check on the Beckhoff website whether more up-to-date documentation is available.

10.2 Support and Service

Beckhoff Support and Service provides assistance with questions regarding Beckhoff products and system solutions, as well as with their planning, commissioning, and operation.

Beckhoff subsidiaries and representative offices

Please contact your Beckhoff subsidiary or your representative office for local support and service for Beckhoff products. You can find the addresses of Beckhoff subsidiaries and representative offices at: www.beckhoff.com/worldwide.

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Beckhoff Support

Beckhoff Support provides assistance with technical questions regarding the use, planning, programming, and commissioning of Beckhoff products.

☎ Hotline:	+49 5246 963-157
✉ Email:	support@beckhoff.com, Support form
Web page:	www.beckhoff.com/support

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☎ Hotline:	+49 5246 963-460
✉ Email:	service@beckhoff.com, Service form
Web page:	www.beckhoff.com/service

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The Download finder serves as a central source for downloadable documents and files related to Beckhoff products, such as application reports, technical documentation, drawings, and configuration files.

Beckhoff Information System

The Beckhoff Information System is the central online documentation resource for Beckhoff products and contains documentation on products and automation topics, as well as sample code.

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