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EtherCAT® (SoE)

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General information

Topology

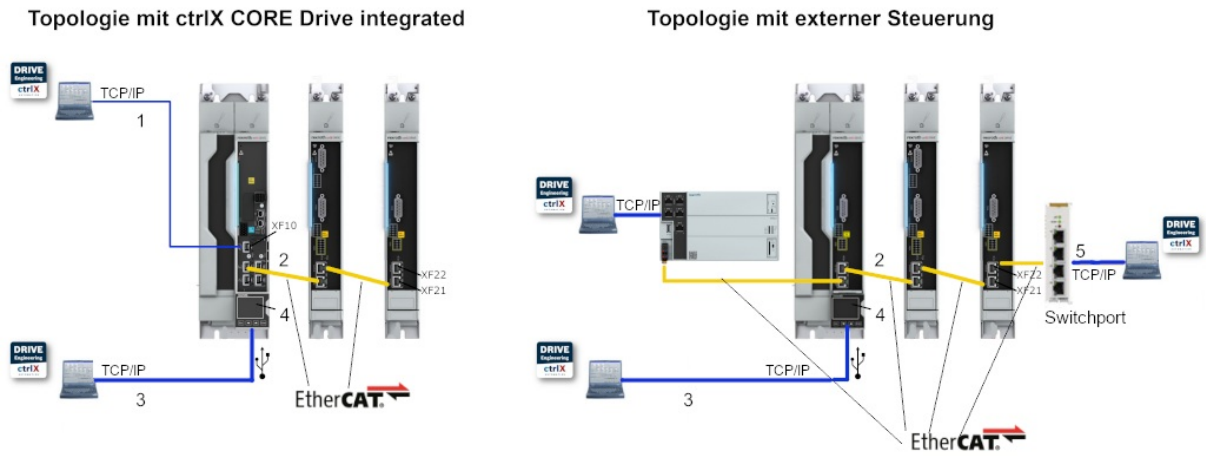

Fig. 84: Engineering options with EtherCAT®

1	ctrlX CORE HMI/Engineering port
2	IP-compatible Industrial Ethernet master communication (field bus)
3	Virtual Ethernet interface via USB to panel
4	Plug-in panel that can be taken from device to device during operation
5	Engineering (only possible via coupler or e.g. EL6601) Note: Connecting Engineering PC directly to the EtherCAT® network is not supported due to restrictions in EtherCAT®

ctrlX DRIVE devices can be operated as EtherCAT® master communication. Via these modules it is possible to exchange real-time data with an EtherCAT® master. The "Servo Drive Profile over EtherCAT® (SoE)" which is based on the profile of the Sercos II specification is supported.

We distinguish the following communication channels:

- **Cyclic data channel** (process data)
  → Data container for cyclic transmission of useful data (**process data**) in real time
- **Acyclic data channel** (service channel)
  → EtherCAT® mailbox method for acyclic transmission of useful data (**service data**)
- **Non-real time channel** [Ethernet over EtherCAT® (EoE)]
  → Transmission of Ethernet telegrams via an EtherCAT® mailbox method [Ethernet over EtherCAT® (EoE)]

Decoupling of the communication and application state machine is only possible for SoE.

Comparison of ADS - EoE

Comparison of ADS - EoE

	ADS	EoE
Parameter w / r	Yes (16 bits only, alias required)	Yes
FWA update	No	Yes
Transmission rate	O	+
Openness	Beckhoff only	Yes
Parameters via control unit	Yes	Yes
Solution		As a prerequisite, the control unit has to support EoE Endpoint.
CoE / SoE	SoE only	CoE and SoE

Legend:

ADS: Automation Device Specification by Beckhoff

Commissioning

When setting up an EtherCAT® network with ctrlX DRIVE, note the following:

- Use slot XF21 as an input (ETHERCAT IN)
- Use slot XF22 as output (ETHERCAT OUT)

Additional information and details

General features

- Transmission rate 100 Mbit/s
- Data transmission via Ethernet cable (CAT5e-copper)
- Topology: "Line"
- 16-bit Sercos parameters of the drive are accessed via "SoE" protocol ("Servo Drive Profile over EtherCAT®" protocol)
- EtherCAT® mailbox method for parameterization and diagnostics
- Cyclic data exchange of command values and actual values
- Free configuration of telegram contents
- max. length of configurable MDT/AT data 15 IDNs with a max. of 48 bytes (+ 2 byte status/control word)
- Minimum cycle time: 250 µs
- Optional synchronization via "Distributed clock synchronization" (exact adjustment of distributed clocks)
- Synchronization between time command value takes effect and feedback acquisition starting time for all drives on a ring when using Distributed Clocks
- Overall synchronization of all connected drives to the master when using Distributed Clocks
- Non-synchronous operation without synchronization via "Distributed Clock" is possible

Parameters involved

- P-0-4075 (/redirect/patternMatch?code=P-0-4075&redirectOrigin=ID1765250_213950827), Field bus: Watchdog
- S-0-0001 (/redirect/patternMatch?code=S-0-0001&redirectOrigin=ID1765250_213950827), NC cycle time (TNcyc)
- S-0-0002 (/redirect/patternMatch?code=S-0-0002&redirectOrigin=ID1765250_213950827), Sercos cycle time (TScyc)
- S-0-0005 (/redirect/patternMatch?code=S-0-0005&redirectOrigin=ID1765250_213950827), Minimum feedback acquisition time (T4min)
- S-0-0014 (/redirect/patternMatch?code=S-0-0014&redirectOrigin=ID1765250_213950827), Interface status
- S-0-0015 (/redirect/patternMatch?code=S-0-0015&redirectOrigin=ID1765250_213950827), Telegram type parameter

- S-0-0016 (/redirect/patternMatch?code=S-0-0016&redirectOrigin=ID1765250_213950827), Configuration list of AT
- S-0-0024 (/redirect/patternMatch?code=S-0-0024&redirectOrigin=ID1765250_213950827), Configuration list of MDT
- S-0-0029 (/redirect/patternMatch?code=S-0-0029&redirectOrigin=ID1765250_213950827), MDT error counter
- S-0-0097 (/redirect/patternMatch?code=S-0-0097&redirectOrigin=ID1765250_213950827), Mask class 2 diagnostics
- S-0-0098 (/redirect/patternMatch?code=S-0-0098&redirectOrigin=ID1765250_213950827), Mask class 3 diagnostics
- S-0-0134 (/redirect/patternMatch?code=S-0-0134&redirectOrigin=ID1765250_213950827), Master control word
- S-0-0135 (/redirect/patternMatch?code=S-0-0135&redirectOrigin=ID1765250_213950827), Drive status
- S-0-0185 (/redirect/patternMatch?code=S-0-0185&redirectOrigin=ID1765250_213950827), Length of the configurable data record in the AT
- S-0-0186 (/redirect/patternMatch?code=S-0-0186&redirectOrigin=ID1765250_213950827), Length of the configurable data record in the MDT
- S-0-0187 (/redirect/patternMatch?code=S-0-0187&redirectOrigin=ID1765250_213950827), List of config. data in cycl. actual value data channel
- S-0-0188 (/redirect/patternMatch?code=S-0-0188&redirectOrigin=ID1765250_213950827), List of config. data in cycl. command value data channel
- S-0-1040 (/redirect/patternMatch?code=S-0-1040&redirectOrigin=ID1765250_213950827), Drive address of master communication
- S-0-1042 (/redirect/patternMatch?code=S-0-1042&redirectOrigin=ID1765250_213950827), Topology index

S-0-1040 (/redirect/patternMatch?code=S-0-1040&redirectOrigin=ID1765250_213950827) represents the EtherCAT® device ID.

Diagnostics involved

- A0004 (/redirect/patternMatch?code=A0004&redirectOrigin=ID1765250_213950827) Initialization
- A0005 (/redirect/patternMatch?code=A0005&redirectOrigin=ID1765250_213950827) Pre-Operational
- A0006 (/redirect/patternMatch?code=A0006&redirectOrigin=ID1765250_213950827) Safe-Operational
- C0101 (/redirect/patternMatch?code=C0101&redirectOrigin=ID1765250_213950827) Incomplete parameter set ->S-0-0021 (/redirect/patternMatch?code=S-0-0021&redirectOrigin=ID1765250_213950827)
- C0104 (/redirect/patternMatch?code=C0104&redirectOrigin=ID1765250_213950827) Config. IDNs for MDT not configurable
- C0105 (/redirect/patternMatch?code=C0105&redirectOrigin=ID1765250_213950827) Maximum

length for MDT exceeded
- C0106 (/redirect/patternMatch?code=C0106&redirectOrigin=ID1765250_213950827) Config. IDNs for AT not configurable
- C0107 (/redirect/patternMatch?code=C0107&redirectOrigin=ID1765250_213950827) Maximum length for AT exceeded
- C0108 (/redirect/patternMatch?code=C0108&redirectOrigin=ID1765250_213950827) Incorrect timing parameterization
- C0112 (/redirect/patternMatch?code=C0112&redirectOrigin=ID1765250_213950827) Timing setting not allowed
- C0113 (/redirect/patternMatch?code=C0113&redirectOrigin=ID1765250_213950827) Relation TNcyc (S-0-0001 (/redirect/patternMatch?code=S-0-0001&redirectOrigin=ID1765250_213950827)) to TScyc (S-0-0002 (/redirect/patternMatch?code=S-0-0002&redirectOrigin=ID1765250_213950827)) error
- C0133 (/redirect/patternMatch?code=C0133&redirectOrigin=ID1765250_213950827) MastCom: Address conflict
- C0190 (/redirect/patternMatch?code=C0190&redirectOrigin=ID1765250_213950827) EtherCAT: Invalid Watchdog Configuration
- C0191 (/redirect/patternMatch?code=C0191&redirectOrigin=ID1765250_213950827) EtherCAT: Freerun needs 3buffer mode
- C0192 (/redirect/patternMatch?code=C0192&redirectOrigin=ID1765250_213950827) EtherCAT: Sync0 Cycle Time does not fit
- C0201 (/redirect/patternMatch?code=C0201&redirectOrigin=ID1765250_213950827) Incomplete parameter set ->S-0-0423 (/redirect/patternMatch?code=S-0-0423&redirectOrigin=ID1765250_213950827)
- E4072 (/redirect/patternMatch?code=E4072&redirectOrigin=ID1765250_213950827) EtherCAT EoE mailbox error
- F4002 (/redirect/patternMatch?code=F4002&redirectOrigin=ID1765250_213950827) Failure of a consumer connection
- F4009 (/redirect/patternMatch?code=F4009&redirectOrigin=ID1765250_213950827) Bus failure