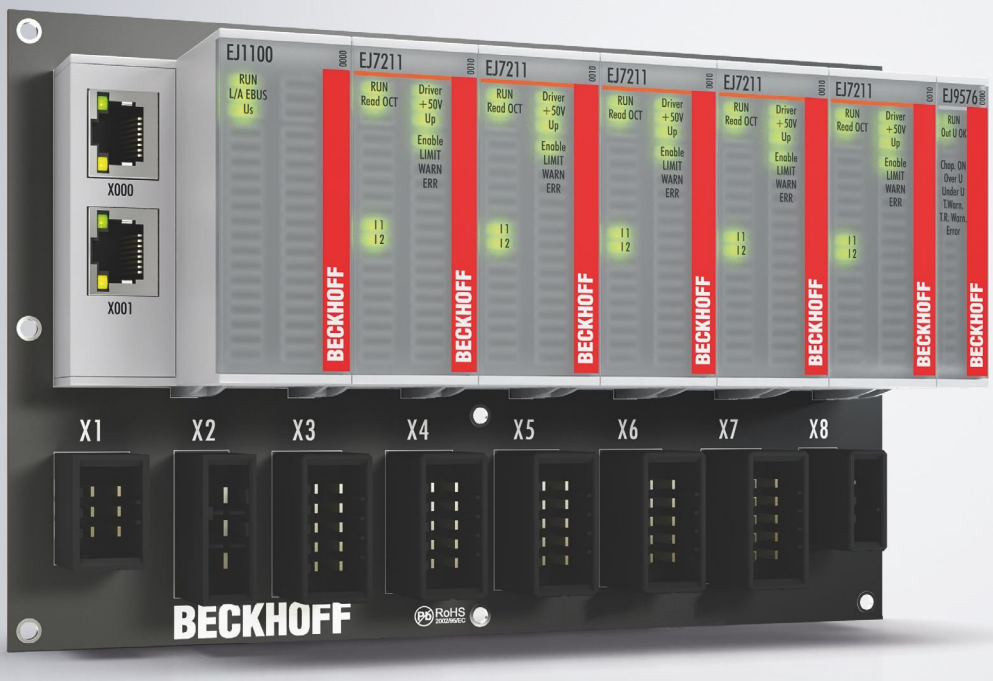
BECKHOFF New Automation Technology

Documentation | EN

EJ6002

2-channel serial interface RS232, RS422 or RS485



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1 Foreword

1.1 Notes on the documentation

Intended audience

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

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

Disclaimer

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

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

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

Trademarks

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

Patent Pending

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

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

Copyright

1.2 Safety instructions

Safety regulations

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

Exclusion of liability

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

Personnel qualification

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

Description of instructions

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

⚠ DANGER

Serious risk of injury!

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

⚠ WARNING

Risk of injury!

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

⚠ CAUTION

Personal injuries!

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

NOTE

Damage to environment/equipment or data loss

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

Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Intended use

⚠ WARNING

Caution - Risk of injury!

EJ components may only be used for the purposes described below!

1.4 Signal distribution board

NOTE

Signal distribution board

Make sure that the EtherCAT plug-in modules are used only on a signal distribution board that has been developed and manufactured in accordance with the Design Guide.

1.5 Documentation issue status

Version	Comment
1.5	• Update chapter *Marking of EtherCAT plug-in modules* • Update Technical Data • Update chapter *Power supply for the EtherCAT plug-in modules* • Update chapter *EJ6002 - Object description and parameterization*
1.4	• Update chapter *Marking of EtherCAT plug-in modules* • Update Technical Data • Chapter *Disposal* added • Update structure
1.3	• Update chapter *Configuration data*
1.2	• New title page • Update Technical data • Update chapter *EJ6002 - Connection* • Chapters *Basics communication, TwinCAT Quick Start* , *TwinCAT development environment* and *General Notes - EtherCAT Slave Application* replaced by references in the chapter *Guide through the documentation* • Chapter *EJ6002 - Object description and parameterization* added • Update revision status • Structural update
1.1	• Note *Signal Distribution Board* added • Chapter *Version identification of EtherCAT devices* replaced by *Marking of EtherCAT plug-in modules* • Update Technical data • Update chapter *Connection*
1.0	• First publication EJ6002

1.6 Guide through documentation

NOTE

Further components of documentation

The documentations named in the following table are further components of the complete documentation. These documentations are required for the use of EtherCAT plug-in modules.

No.	Title	Description
[1]	EtherCAT System Documentation	• System overview • EtherCAT basics • Cable redundancy • Hot Connect • Distributed Clocks • Configuration of EtherCAT-Components
[2]	Infrastructure for EtherCAT/Ethernet	• Technical recommendations and notes for design, implementation an testing
[3]	Design Guide EJ8xxx - Signal distribution board for standard EtherCAT plug-in modules	Requirements for the design of a Signal-Distribution-Board for standard EtherCAT plug-in modules • Backplane mounting guidelines • Module placement • Routing guidelines
[4]	Documentation of the corresponding EtherCAT Terminal ELxxxx	• Notes on the principle of operation and • Descriptions for configuration and parameterization are transferable to the corresponding Module EJxxxx (s. note on documentation of ELxxxx [▶ 39]).

1.7 Marking of EtherCAT plug-in modules

Designation

A Beckhoff EtherCAT device has a 14-digit **technical designation**, made up as follows (e.g. EJ1008-0000-0017)

- **Order identifier**
  - family key: EJ
  - product designation: The first digit of product designation is used for assignment to a product group (e.g. EJ2xxx = digital output module).
  - Version number: The four digit version number identifies different product variants.
- **Revision number:**
  It is incremented when changes are made to the product.

The Order identifier and the revision number are printed on the side of EtherCAT plug-in modules (s. following illustration (A and B).

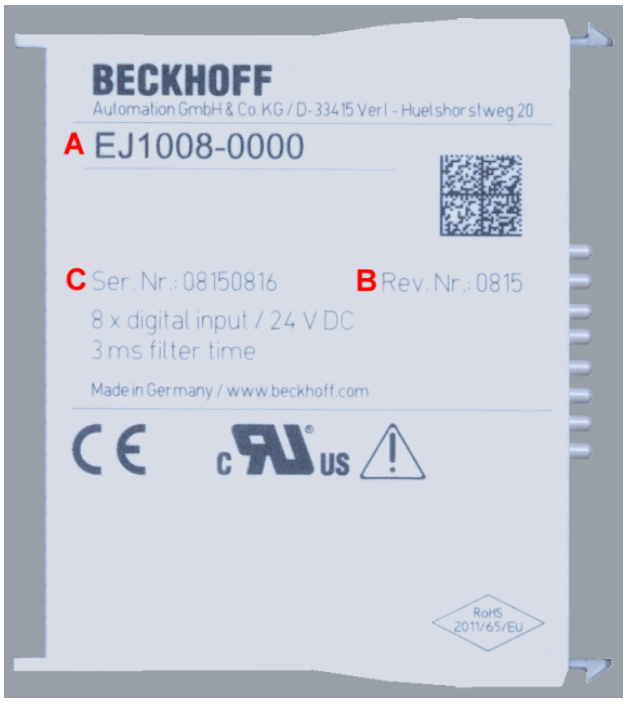


Fig. 1: Order identifier (A), Revision number (B) and serial number (C) using the example of EJ1008

Product group	Example		
	Product designation	Version	Revision
EtherCAT Coupler EJ11xx	EJ1101	-0022 (Coupler with external connectors, power supply module and optional ID switches	-0016
Digital input modules EJ1xxx	EJ1008 8-channel	-0000 (basic type)	-0017
Digital output modules EJ2xxx	EJ2521 1-channel	-0224 (2 x 24 V outputs)	-0016
Analog input modules EJ3xxx	EJ3318 8-channel thermocouple	-0000 (basic type)	-0017
Analog output modules EJ4xxx	EJ4134 4-channel	-0000 (basic type)	-0019
Special function modules EJ5xxx, EJ6xxx	EJ6224 IO-Link master	-0090 (with TwinSAFE SC)	-0016
Motion modules EJ7xxx	EJ7211 servomotor	-9414 (with ECT, STO and TwinSAFE SC)	-0029

Notes

- The elements mentioned above result in the **technical designation**. EJ1008-0000-0017 is used in the example below.
- EJ1008-0000 is the **order identifier**, in the case of “-0000” usually abbreviated to EJ1008.
- The **revision** -0017 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.
  In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.
  Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff web site.
- The product designation, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

Serial number

The serial number for EtherCAT plug-in modules is usually the 8-digit number printed on the side of the module (see following illustration C). The serial number indicates the configuration in delivery state and therefore refers to a whole production batch, without distinguishing the individual modules of a batch.

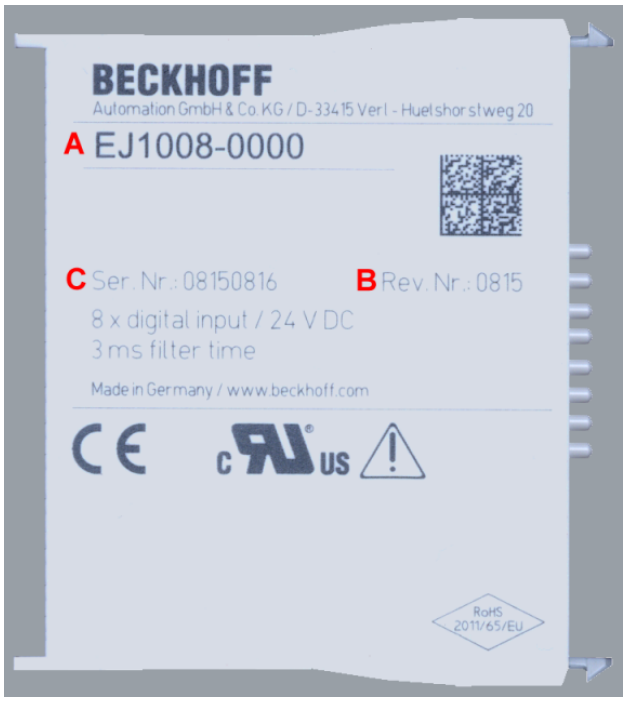


Fig. 2: Order identifier (A), revision number (B) and serial number (C) using the example of EJ1008

Serial number	Example serial number: 08 15 08 16
KK - week of production (CW, calendar week)	08 - week of production: 08
YY - year of production	15 - year of production: 2015
FF - firmware version	08 -f irmware version: 08
HH - hardware version	16 - hardware version: 16

1.7.1 Beckhoff Identification Code (BIC)

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

Fig. 3: BIC as data matrix code (DMC, code scheme ECC200)

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

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

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

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

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, it shall be replaced by spaces. The data under positions 1-4 are always available.

The following information is contained:

Item no.	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	**Beckhoff order number**	1P	8	1P072222
2	Beckhoff Traceability Number (BTN)	**Unique serial number, see note below**	S	12	SBTNk4p562d7
3	Article description	**Beckhoff article description, e.g. EL1008**	1K	32	1KEL1809
4	Quantity	**Quantity in packaging unit, e.g. 1, 10, etc.**	Q	6	Q1
5	Batch number	Optional: Year and week of production	2P	14	2P401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	51S678294104
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	30PF971 , 2*K183
...					

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

Structure of the BIC

Example of composite information from items 1 - 4 and with the above given example value on positon 6. The data identifiers are marked in bold font for better display:

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

Accordingly as DMC:

Fig. 4: Example DMC **1P**072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, item no. 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTE

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

1.7.2 Electronic access to the BIC (eBIC)

Electronic BIC (eBIC)

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

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

K-bus devices (IP20, IP67)

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

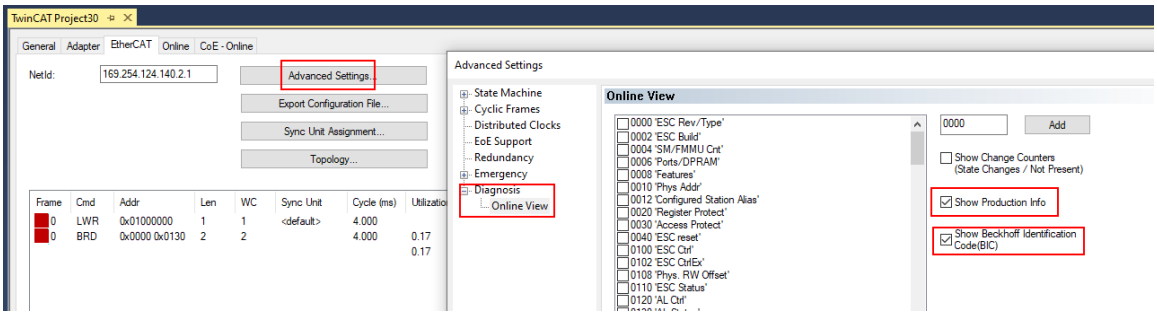
EtherCAT devices (IP20, IP67)

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

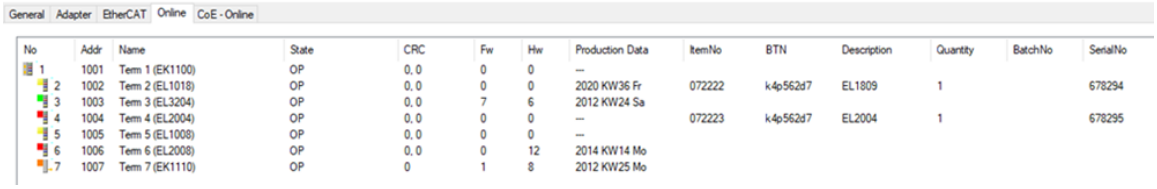
The eBIC is also stored in the ESI-EEPROM. The eBIC was introduced into the Beckhoff I/O production (terminals, box modules) from 2020; widespread implementation is expected in 2021.

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

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



  - The BTN and its contents are then displayed:



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

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

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

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

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

Profibus/Profinet/DeviceNet... Devices

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

1.7.3 Certificates

- The EhterCAT plug-in modules meet the requirements of the EMC and Low Voltage Directive. The CE mark is printed on the side of the modules.
- The cRUus imprint identifies devices that meet product safety requirements according to U.S. and Canadian regulations.
- The warning symbol is a request to read the corresponding documentation. The documentations for EtherCAT plug-in modules can be downloaded from the Beckhoff homepage.

Fig. 5: Marking for CE and UL using EJ1008 as an example

2 System overview

Electronically, the EJxxxx EtherCAT plug-in modules are based on the EtherCAT I/O system. The EJ system consists of the signal distribution board and EtherCAT plug-in modules. It is also possible to connect an IPC to the EJ system.
The EJ system is suitable for mass production applications, applications with small footprint and applications requiring a low total weight.
The machine complexity can be extended by means of the following:

- reserve slots,
- the use of placeholder modules,
- linking of EtherCAT Terminals and EtherCAT Boxes via an EtherCAT connection.

The following diagram illustrates an EJ system. The components shown are schematic, to illustrate the functionality.

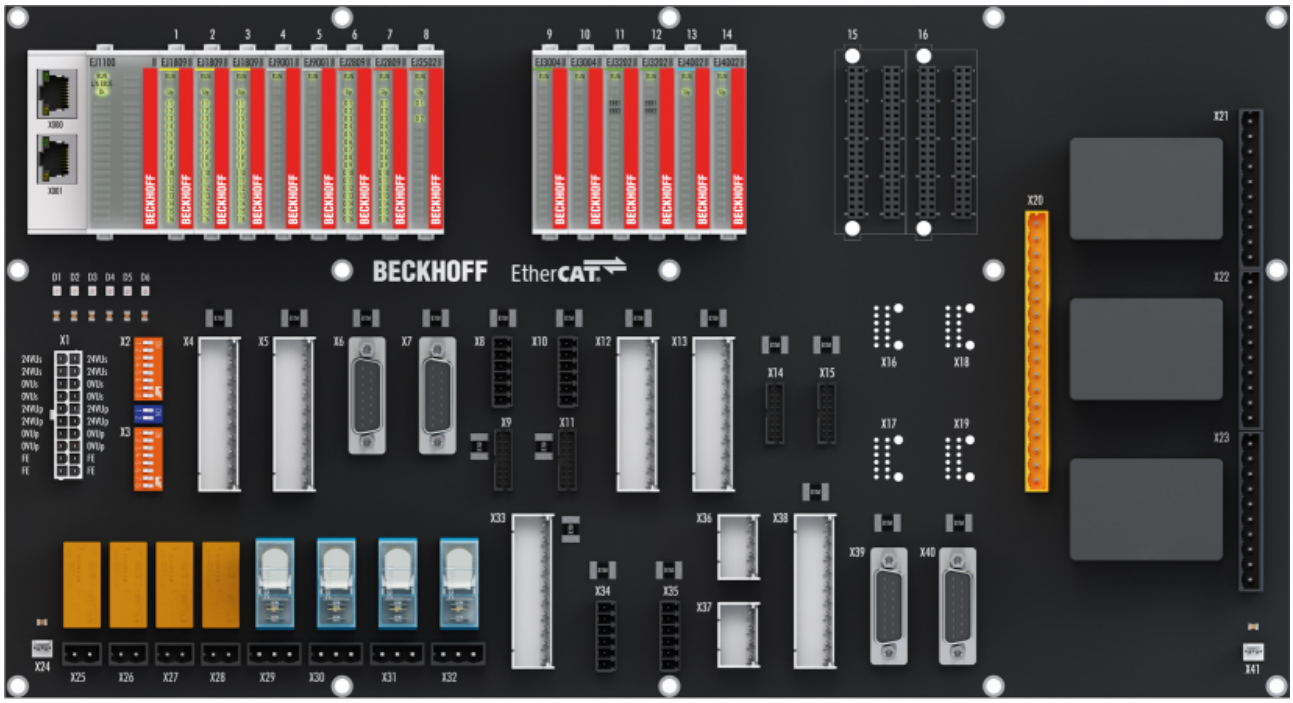


Fig. 6: EJ system sample

Signal distribution board

The signal distribution board distributes the signals and the power supply to individual application-specific plug connectors, in order to connect the controller to further machine modules. Using pre-assembled cable harnesses avoids the need for time-consuming connection of individual wires. Coded components reduce the unit costs and the risk of miswiring.
Beckhoff offers development of signal distribution boards as an engineering service. Customers have the option to develop their own signal distribution board, based on the design guide.

EtherCAT plug-in modules

Similar to the EtherCAT Terminal system, a module strand consists of a bus coupler and I/O modules. Almost all of the EtherCAT Terminals can also be manufactured in the EJ design as EtherCAT plug-in modules. The EJ modules are directly attached to the signal distribution board. The communication, signal distribution and supply take place via the contact pins at the rear of the modules and the PCB tracks of the signal distribution board. The coding pins at the rear serve as mechanical protection against incorrect connection. Color coding on the housing facilitates distinguishing of the modules.

3 EJ6002 - Product description

3.1 Introduction

Fig. 7: EJ6002

2-channel serial interface RS232, RS422 or RS485

The serial interface EJ6002 allows the connection of up to two devices with RS232, RS422 or RS485 interfaces. The interfaces are electrically isolated from each other and from the EtherCAT.

Different operation modes (RS232, RS422 and RS485), baud rates and modes (e.g. termination, BIAS failsafe) can be configured via software.

The devices connected to the EJ6002 EtherCAT plug-in module communicate with the automation device via the coupler in an electrically isolated manner and thus guarantee a high level of interference immunity.

The active communication channel operates independently of the higher-level EtherCAT system in full duplex mode with 300 baud up to 256 kbaud.

In conjunction with the TwinCAT Virtual Serial COM Driver the EJ6002 can be used as a normal Windows COM interface.

3.2 Technical Data

Technical data	EJ6002
Technology	Serial interface
Interfaces	Individually selectable RS232, RS422 or RS485 Termination settings via software configuration
Data transfer channels	2
Data transfer rate	300 ... 256000 Baud (freely configurable)
Distributed Clocks	-
Data buffer	864 byte receive buffer, 128 byte transmit buffer per channel
Electrical isolation	500 V (E-bus/field voltage)
Current consumption via E-bus	190 mA
Permissible ambient temperature range during operation	-25°C ... +60°C
Permissible ambient temperature range during storage	-40°C ... +85°C
Permissible relative air humidity	95 %, no condensation
Operating altitude	max. 2,000 m
Dimensions (W x H x D)	approx. 12 mm x 66 mm x 55 mm
Weight	approx. 30 g
Mounting	on signal distribution board
Pollution degree	2
Mounting position	Standard [▶ 27]
Position of the coding pins [▶ 30]	2 and 5
Color coding	grey
Vibration/shock resistance	according to EN 60068-2-6/EN 60068-2-27 (with corresponding signal distribution board)
EMC immunity/emission	conforms to EN 61000-6-2 /EN 61000-6-4 (with corresponding signal distribution board)
Protection class	EJ module: IP20 EJ system: dependent on the signal distribution board and housing
Approvals/markings*	CE, EAC, UKCA, UL

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

CE approval

The CE Marking refers to the EtherCAT plug-in module mentioned above.
If the EtherCAT plug-in module is used in the production of a ready-to-use end product (PCB in conjunction with a housing), the manufacturer of the end product must check compliance of the overall system with relevant directives and CE certification.
To operate the EtherCAT plug-in modules, they must be installed in a housing.

3.3 Pinout RS232

EJ6002 RS232				
Pin#		Signal		
1	2	U_{EBUS}	U_{EBUS}	**E-Bus contacts**
3	4	GND	GND	
5	6	RX0+	TX1+	
7	8	RX0-	TX1-	The power supply U_{EBUS} is provided by the coupler and supplied from the supply voltage U_S of the EtherCAT coupler.
9	10	GND	GND	
11	12	TX0+	RX1+	
13	14	TX0-	RX1-	
15	16	GND	GND	
17	18	RTS_1	RX_1	**Signals**
19	20	TX_1	CTS_1	
21	22	NC	NC	
23	24	NC	GND_Sensor1	
25	26	RTS_2	RX_2	
27	28	TX_2	CTS_2	
29	30	NC	NC	
31	32	NC	GND_Sensor2	
33	34	NC	NC	**U_P-Contacts**
35	36	NC	NC	The device has no U_P-contacts.
37	38	NC	NC	The power is supplied
39	40	SGND	SGND	exclusively via U_{EBUS}.

Signal	Description
U_{EBUS}	E-Bus power supply 3.3 V
GND	E-Bus GND signal. Don`t connect with 0V Up!
RXn+	Positive E-Bus receive signal
RXn-	Negative E-Bus receive signal
TXn+	Positive E-Bus transmit signal
TXn-	Negative E-Bus transmit signal
RTS_1	Request to send signal (Channel 1)
TX_1	Transmit signal (Channel 1)
RTS_2	Request to send signal (Channel 2)
TX_2	Transmit signal (Channel 2)
RX_1	Receive signal (Channel 1)
CTS_1	Clear to send signal (Channel 1)
GND_Sensor1	0 V power supply (sensor1)
RX_2	Receive signal (Channel 2)
CTS_2	Clear to send signal (Channel 2)
GND_Sensor2	0 V power supply (sensor2)
NC	Do not connect
SGND	Shield Ground

Fig. 8: EJ6002 - Pinout RS232

The PCB footprint can be downloaded from the Beckhoff homepage.

NOTE

Damage to devices possible!

- The pins named with “NC” must not be connected.
- Before installation and commissioning read the chapters Installation of EJ modules [▶ 23] and Commissioning [▶ 39]!

3.4 Pinout RS422

EJ6002 RS422				
Pin#		Signal		
1	2	U_{EBUS}	U_{EBUS}	**E-Bus contacts**
3	4	GND	GND	
5	6	RX0+	TX1+	
7	8	RX0-	TX1-	The power supply U_{EBUS} is provided by the coupler and supplied from the supply voltage U_S of the EtherCAT coupler.
9	10	GND	GND	
11	12	TX0+	RX1+	
13	14	TX0-	RX1-	
15	16	GND	GND	
17	18	TX_1+	RX_1+	**Signals**
19	20	TX_1-	RX_1-	
21	22	NC	NC	
23	24	NC	GND_Sensor1	
25	26	TX_2+	RX_2+	
27	28	TX_2-	RX_2-	
29	30	NC	NC	
31	32	NC	GND_Sensor2	
33	34	NC	NC	**U_P-Contacts**
35	36	NC	NC	The device has no U_P-contacts.
37	38	NC	NC	The power is supplied
39	40	SGND	SGND	exclusively via U_{EBUS}.

Signal	Description
U_{EBUS}	E-Bus power supply 3.3 V
GND	E-Bus GND signal. Don`t connect with 0V Up!
RXn+	Positive E-Bus receive signal
RXn-	Negative E-Bus receive signal
TXn+	Positive E-Bus transmit signal
TXn-	Negative E-Bus transmit signal
TX_1+	Positive transmit signal (Channel 1)
TX_1-	Negative transmit signal (Channel 1)
TX_2+	Positive transmit signal (Channel 2)
TX_2-	Negative transmit signal (Channel 2)
RX_1+	Positive receive signal (Channel 1)
RX_1-	Negative receive signal (Channel 1)
GND_Sensor1	0 V power supply (sensor1)
RX_2+	Positive receive signal (Channel 2)
RX_2-	Negative receive signal (Channel 2)
GND_Sensor2	0 V power supply (sensor2)
NC	Do not connect
SGND	Shield Ground

Fig. 9: EJ6002 - Pinout RS422

The PCB footprint can be downloaded from the Beckhoff homepage.

NOTE

Damage to devices possible!

- The pins named with “NC” must not be connected.
- Before installation and commissioning read the chapters Installation of EJ modules [▶ 23] and Commissioning [▶ 39]!

3.5 Pinout RS485

EJ6002 RS485				
Pin#		Signal		
1	2	U_{EBUS}	U_{EBUS}	**E-Bus contacts**
3	4	GND	GND	
5	6	RX0+	TX1+	
7	8	RX0-	TX1-	The power supply U_{EBUS} is provided by the coupler and supplied from the supply voltage U_S of the EtherCAT coupler.
9	10	GND	GND	
11	12	TX0+	RX1+	
13	14	TX0-	RX1-	
15	16	GND	GND	
17	18	DATA_1+	NC	**Signals**
19	20	DATA_1-	NC	
21	22	NC	NC	
23	24	NC	GND Sensor1	
25	26	DATA_2+	NC	
27	28	DATA_2-	NC	
29	30	NC	NC	
31	32	NC	GND Sensor2	
33	34	NC	NC	**U_P-Contacts**
35	36	NC	NC	The device has no U_P-contacts. The power is supplied exclusively via U_{EBUS}.
37	38	NC	NC	
39	40	SGND	SGND	

Signal	Description
U_{EBUS}	E-Bus power supply 3.3 V
GND	E-Bus GND signal. Don't connect with 0V Up!
RXn+	Positive E-Bus receive signal
RXn-	Negative E-Bus receive signal
TXn+	Positive E-Bus transmit signal
TXn-	Negative E-Bus transmit signal
DATA_1+	Positive DATA signal (Channel 1)
DATA_1-	Negative DATA signal (Channel 1)
DATA_2+	Positive DATA signal (Channel 2)
DATA_2-	Negative DATA signal (Channel 2)
GND Sensor1	0 V power supply (sensor1)
GND Sensor2	0 V power supply (sensor2)
NC	Do not connect
SGND	Shield Ground

Fig. 10: EJ6002 - Pinout RS485

The PCB footprint can be downloaded from the Beckhoff homepage.

NOTE

Damage to devices possible!

- The pins named with “NC” must not be connected.
- Before installation and commissioning read the chapters Installation of EJ modules [▶ 23] and Commissioning [▶ 39]!

3.6 LEDs

LED No.	EJ6002
A	RUN
B	
C	
1	TX1
2	RX1
3	ERR 1
4	TX2
5	RX2
6	ERR 2
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

Fig. 11: EJ6002 - LEDs

LED	Color	Display	State	Description
RUN	green	off	Init	State of the EtherCAT State Machine: **INIT** = initialization of the plug-in module
		flashing	Pre-Operational	State of the EtherCAT State Machine: **PREOP =** function for mailbox communication and different default settings set
		single flash	Safe-Operational	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync Manager channels and the distributed clocks. Outputs remain in safe state
		on	Operational	State of the EtherCAT State Machine: **OP =** normal operating state; mailbox and process data communication is possible
		flickering	Bootstrap	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware Update EL/ES/EM/ELM/EPxxxx of the plug-in module
TX1, TX2	green	on	-	Data is transmitted via the respective signal line (channel 1, channel 2)
		off	-	No activity on the transmission line
RX1, RX2	green	on	-	Data are received via the respective signal line (channel 1, channel 2)
		off	-	No activity on the receive line
ERR1 ERR2	red	off	-	No error
		on	-	An error has occurred.

4 Installation of EJ modules

4.1 Power supply for the EtherCAT plug-in modules

⚠ WARNING

Power supply from SELV/PELV power supply unit!

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

Notes:

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

The signal distribution board should have a power supply designed for the maximum possible current load of the module string. Information on the current required from the E-bus supply can be found for each module in the respective documentation in section “Technical data”, online and in the catalog. The power requirement of the module string is displayed in the TwinCAT System Manager.

E-bus power supply with EJ1100 or EJ1101-0022 and EJ940x

The EJ1100 Bus Coupler supplies the connected EJ modules with the E-bus system voltage of 3.3 V. The Coupler can accommodate a load up to 2.2 A. If a higher current is required, a combination of the coupler EJ1101-0022 and the power supply units EJ9400 (2.5 A) or EJ9404 (12 A) should be used. The EJ940x power supply units can be used as additional supply modules in the module string.

Depending on the application, the following combinations for the E-bus supply are available:

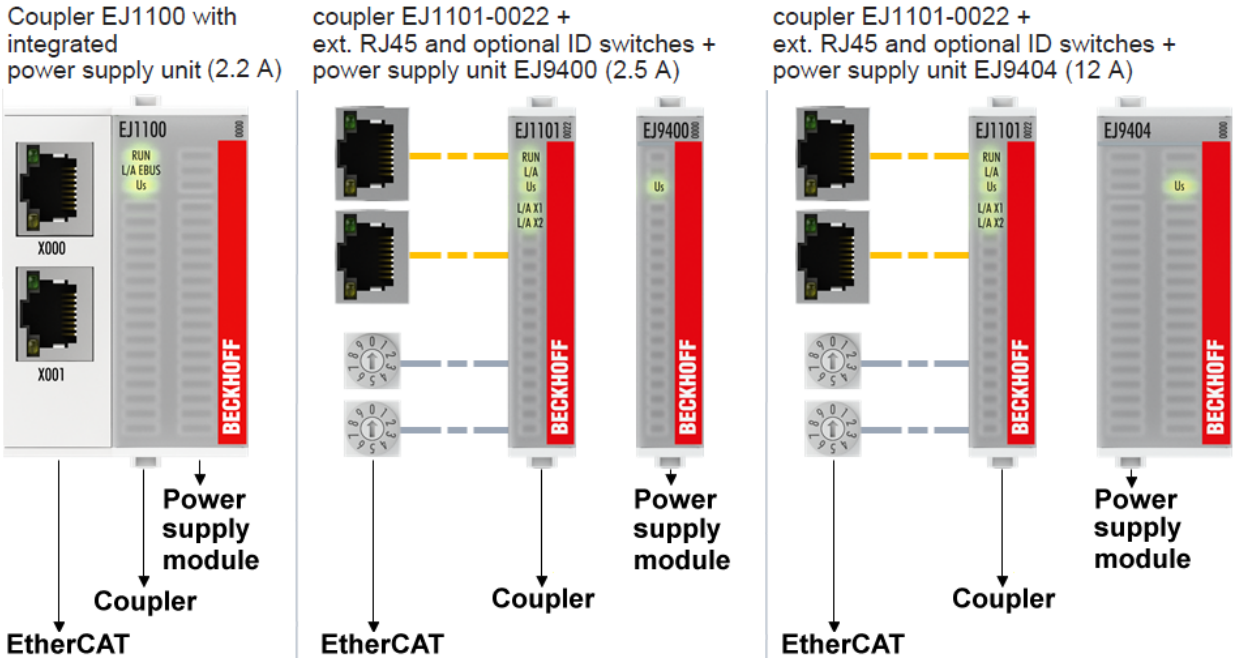


Fig. 12: E-bus power supply with EJ1100 or EJ1101-0022 + EJ940x

In the EJ1101-0022 coupler, the RJ45 connectors and optional ID switches are external and can be positioned anywhere on the signal distribution board, as required. This facilitates feeding through a housing.

The EJ940x power supply plug-in modules provide an optional reset function (see chapter Connection of the documentation for EJ9400 and EJ9404)

E-bus power supply with CXxxxx and EK1110-004x

The Embedded PC supplies the attached EtherCAT Terminals and the EtherCAT EJ coupler

- with a supply voltage Us of 24 V_{DC} (-15 %/+20%). This voltage supplies the E-bus and the bus terminal electronics.
  The CXxxxx units supply the E-bus with up to 2,000 mA E-bus current. If a higher current is required due to the attached terminals, power feed terminals or power supply plug-in modules must be used for the E-bus supply.
- with a peripheral voltage Up of 24 V_{DC} to supply the field electronics.

The EK1110-004x EtherCAT EJ couplers relay the following parameters to the signal distribution board via the rear connector:

- the E-bus signals,
- the E-bus voltage U_{EBUS} (3.3 V) and
- the peripheral voltage U_P (24 V_{DC}).

Fig. 13: PCB with Embedded PC, EK1110-0043 and EJxxxx, rear view EK1110-0043

4.2 EJxxxx - dimensions

The EJ modules are compact and lightweight thanks to their design. Their volume is approx. 50% smaller than the volume of the EL terminals. A distinction is made between four different module types, depending on the width and the height:

Module type	Dimensions (W x H x D)	Sample in figure below
Coupler	44 mm x 66 mm x 55 mm	EJ1100 (ej_44_2xrj45_coupler)
Single module	12 mm x 66 mm x 55 mm	EJ1809 (ej_12_16pin_code13)
Double module	24 mm x 66 mm x 55 mm	EJ7342 (ej_24_2x16pin_code18)
Single module (long)	12 mm x 152 mm x 55 mm	EJ1957 (ej_12_2x16pin_extended_code4747)

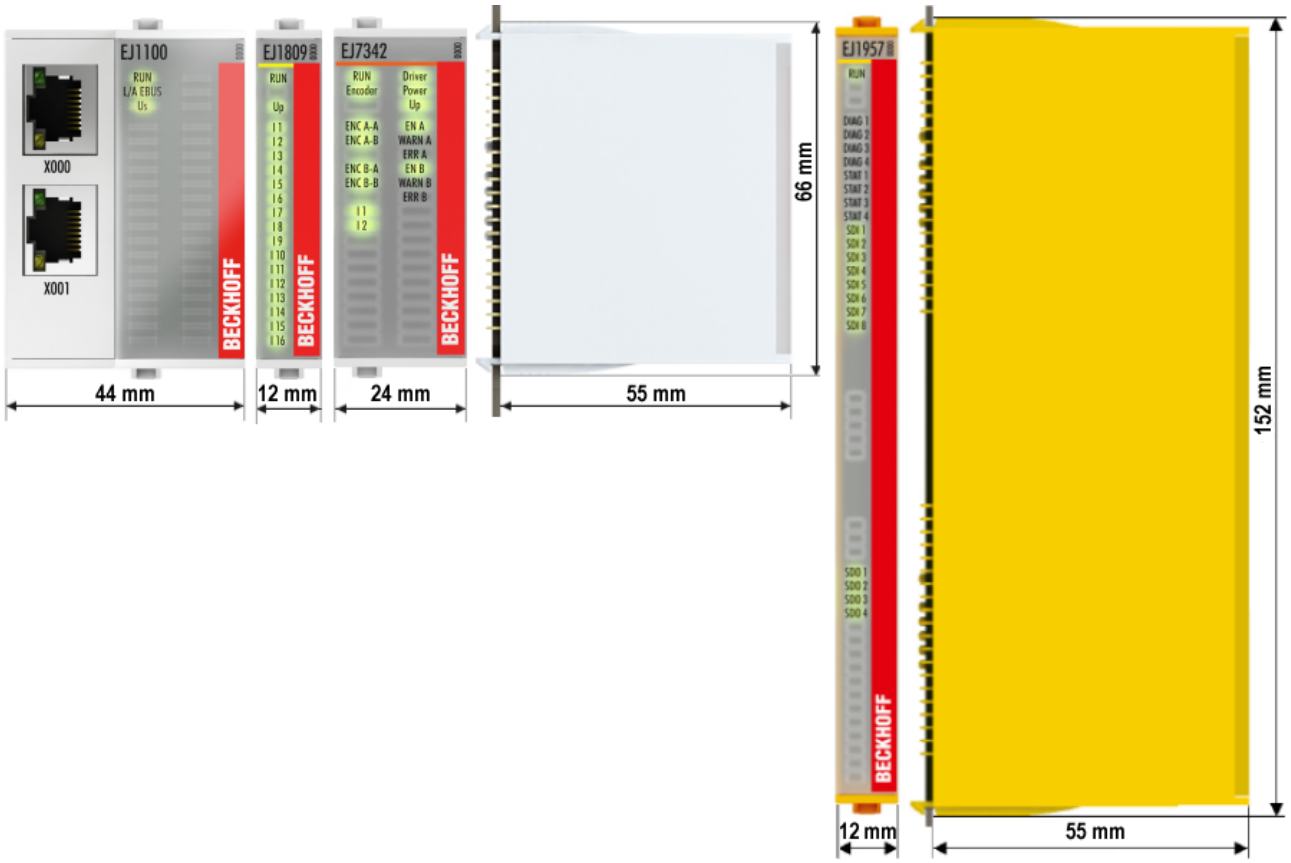


Fig. 14: EJxxxx - Dimensions

The technical drawings can be downloaded from the Beckhoff homepage. The drawings are named as described in the drawing below.

Fig. 15: Naming of the technical drawings

4.3 Installation positions and minimum distances

4.3.1 Minimum distances for ensuring installability

Note the dimensions shown in the following diagram for the design of the signal distribution board to ensure safe latching and simple assembly / disassembly of the modules.

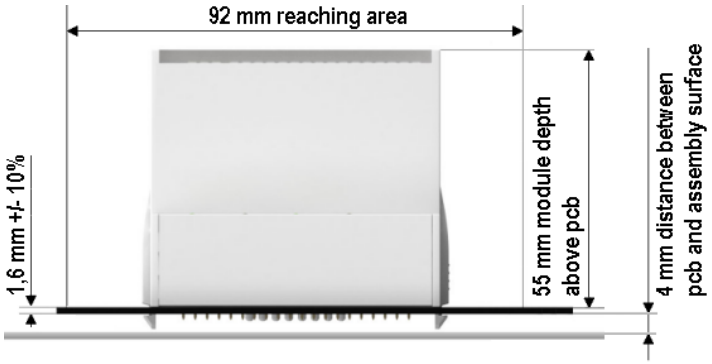


Fig. 16: Mounting distances EJ module - PCB

Observing the reaching area

A minimum reaching area of 92 mm is required for assembly / disassembly, in order to be able to reach the mounting tabs with the fingers.
Adherence to the recommended minimum distances for ventilation (see section Installation position [▶ 27]) ensures an adequate reaching area.

The signal distribution board must have a thickness of 1.6 mm and a minimum distance of 4 mm from the mounting surface, in order to ensure latching of the modules on the board.

4.3.2 Installation positions

NOTE

Constraints regarding installation position and operating temperature range

Please refer to the technical data [▶ 18] for the installed components to ascertain whether any restrictions regarding the mounting position and/or the operating temperature range have been specified. During installation of modules with increased thermal dissipation, ensure adequate distance above and below the modules to other components in order to ensure adequate ventilation of the modules during operation!

The standard installation position is recommended. If a different installation position is used, check whether additional ventilation measures are required.

Ensure that the specified conditions (see Technical data) are adhered to!

Optimum installation position (standard)

For the optimum installation position the signal distribution board is installed horizontally, and the fronts of the EJ modules face forward (see Fig. *Recommended distances for standard installation position*). The modules are ventilated from below, which enables optimum cooling of the electronics through convection. “From below” is relative to the acceleration of gravity.

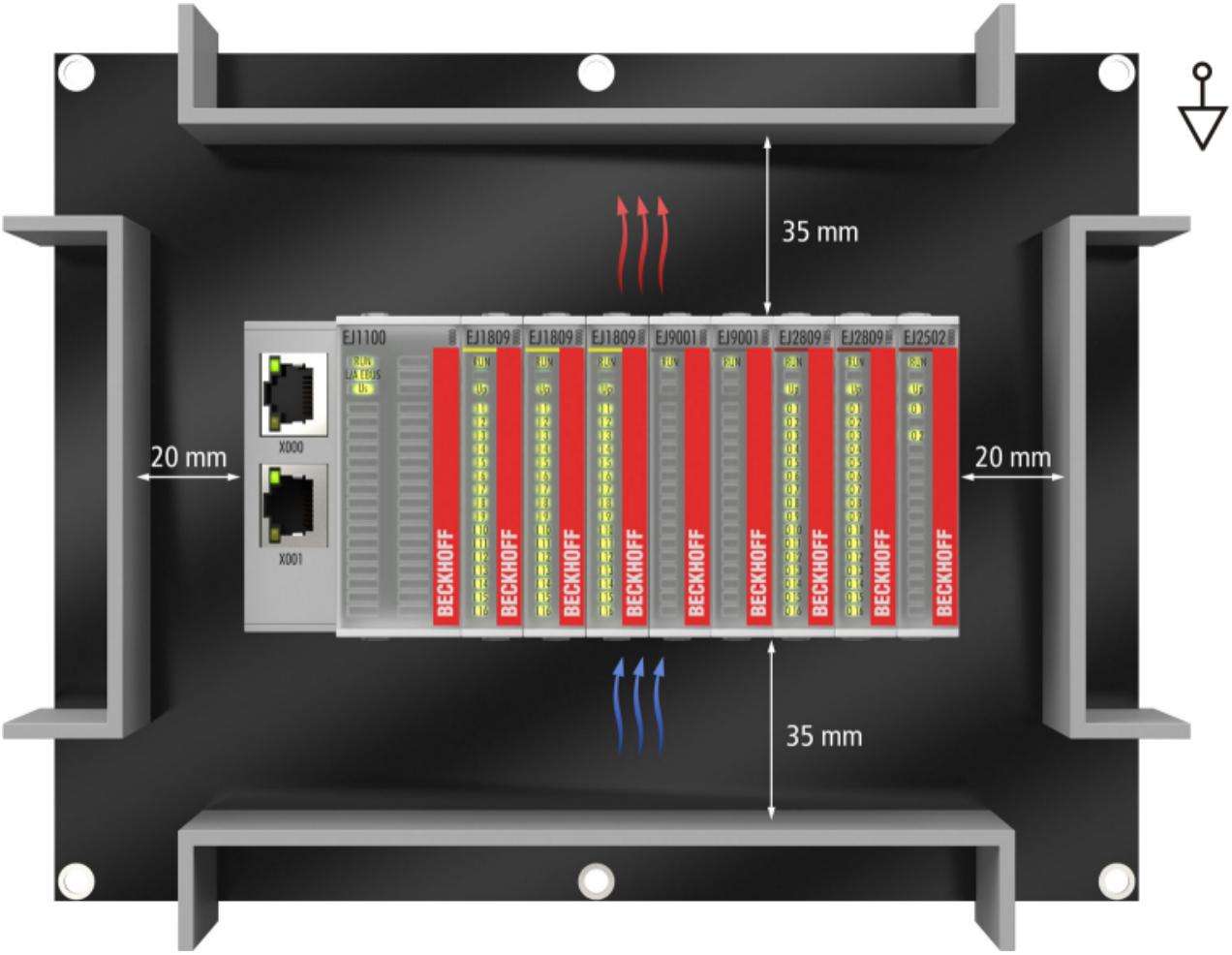


Fig. 17: Recommended distances for standard installation position

Compliance with the distances shown in Fig. *Recommended distances for standard installation position* is recommend. The recommended minimum distances should not be regarded as restricted areas for other components. The customer is responsible for verifying compliance with the environmental conditions described in the technical data. Additional cooling measures must be provided, if required.

Other installation positions

All other installation positions are characterized by a different spatial position of the signal distribution board, see Fig. *Other installation positions.*

The minimum distances to ambient specified above also apply to these installation positions.

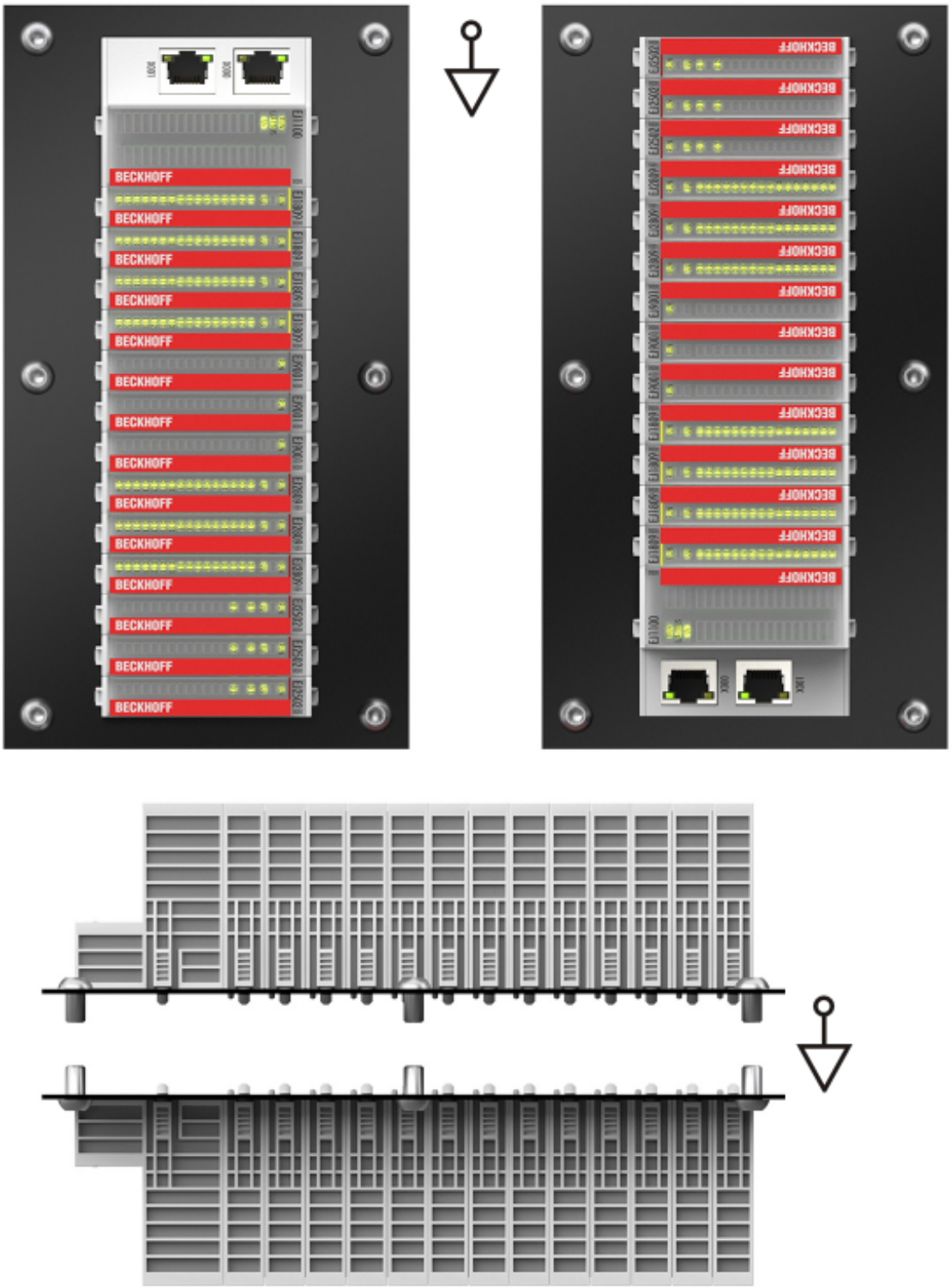


Fig. 18: Other installation positions

4.4 Codings

4.4.1 Color coding

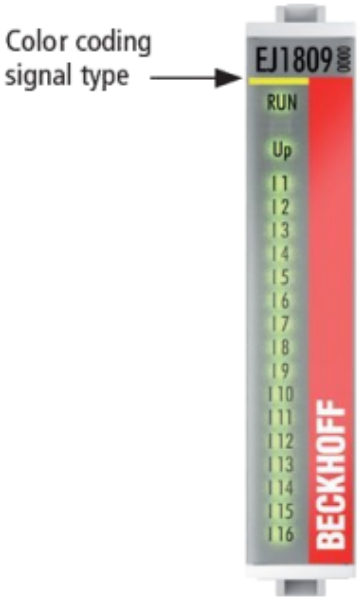


Fig. 19: EJ modules color code; sample: EJ1809

The EJ modules are color-coded for a better overview in the control cabinet (see diagram above). The color code indicates the signal type. The following table provides an overview of the signal types with corresponding color coding.

Signal type	Modules	Color
Coupler	EJ11xx	No color coding
Digital input	EJ1xxx	Yellow
Digital output	EJ2xxx	Red
Analog input	EJ3xxx	Green
Analog output	EJ4xxx	Blue
Position measurement	EJ5xxx	grey
Communication	EJ6xxx	grey
Motion	EJ7xxx	orange
System	EJ9xxx	grey

4.4.2 Mechanical position coding

The modules have two signal-specific coding pins on the underside (see Figs. B1 and B2 below). In conjunction with the coding holes in the signal distribution board (see Figs. A1 and A2 below), the coding pins provide an option for mechanical protection against incorrect connection. This significantly reduces the risk of error during installation and service.
Couplers and placeholder modules have no coding pins.

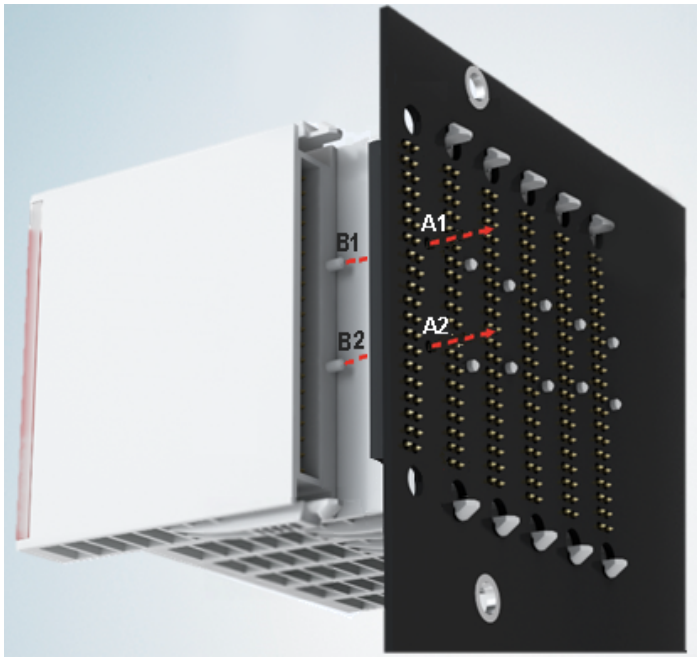


Fig. 20: Mechanical position coding with coding pins (B1 and B2) and coding holes (A1 and A2)

The following diagram shows the position of the position coding with position numbers on the left-hand side. Modules with the same signal type have the same coding. For sample, all digital input modules have the coding pins at positions one and three. There is no plug protection between modules with the same signal type. During installation the module type should therefore be verified based on the device name.

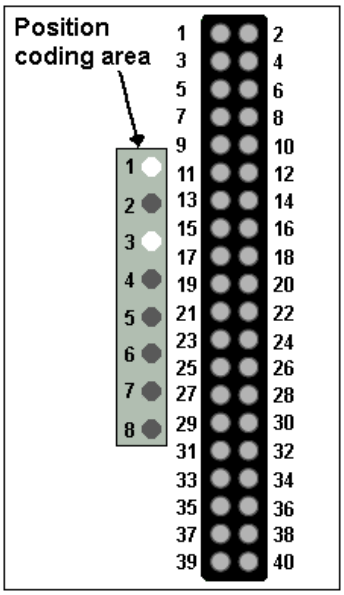


Fig. 21: Pin coding; sample: digital input modules

4.5 Installation on the signal distribution board

EJ modules are installed on the signal distribution board. The electrical connections between coupler and EJ modules are realized via the pin contacts and the signal distribution board.

The EJ components must be installed in a control cabinet or enclosure which must provide protection against fire hazards, environmental conditions and mechanical impact.

⚠ WARNING

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

Bring the module system into a safe, de-energized state before starting installation, disassembly or wiring of the modules.

NOTE

Risk of damage to components through electrostatic discharge!

Observe the regulations for ESD protection.

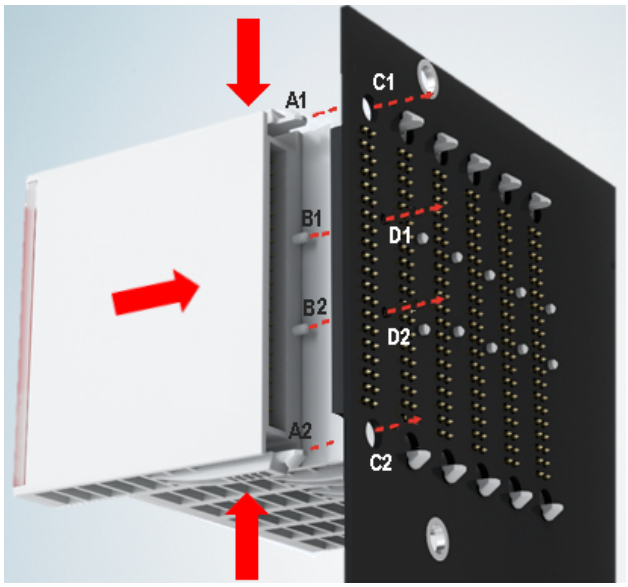


Fig. 22: Installation of EJ modules

A1 / A2	Latching lugs top / bottom	C1 / C2	Mounting holes
B1 / B2	Coding pins	D1 / D2	Coding holes

To install the modules on the signal distribution board proceed as follows:

1. Before the installation, ensure that the signal distribution board is securely connected to the mounting surface. Installation on an unsecured signal distribution board may result in damage to the board.
2. If necessary, check whether the positions of the coding pins (B) match the corresponding holes in the signal distribution board (D).
3. Compare the device name on the module with the information in the installation drawing.
4. Press the upper and the lower mounting tabs simultaneously and push the module onto the board while gently moving it up and down, until the module is latched securely.
   The required contact pressure can only be established and the maximum current carrying capacity ensured if the module is latched securely.
5. Use placeholder modules (EJ9001) to fill gaps in the module strand.

NOTE

- During installation ensure safe latching of the modules on the signal distribution board! The consequences of inadequate contact pressure include:

⇨ loss of quality of the transferred signals,

⇨ increased power dissipation of the contacts,

⇨ impairment of the service life.

4.6 Extension options

Three options are available for modifications and extensions of the EJ system.

- Replacing the placeholder modules with the function modules provided for the respective slot
- Assigning function modules specified for the respective slots for the reserve slots at the end of the module string
- Linking with EtherCAT Terminals and EtherCAT Box modules via an Ethernet/EtherCAT connection

4.6.1 Using placeholder modules for unused slots

The EJ9001 placeholder modules are used to close temporary gaps in the module strands (see Fig. A1 below). Gaps in the module strand cause interruption in EtherCAT communication and must be equipped with placeholder modules.
In contrast to the passive terminals of the EL series, the placeholder modules actively participate in the data exchange. Several placeholder modules can therefore be connected in series, without impairing the data exchange.
Unused slots at the end of the module strand can be left as reserve slots (see Fig. B1 below).

The machine complexity is extended (extended version) by allocating unused slots (see Figs. A2 below - Exchanging placeholder modules and B2 - Assigning reserve slots) according to the specifications for the signal distribution board.

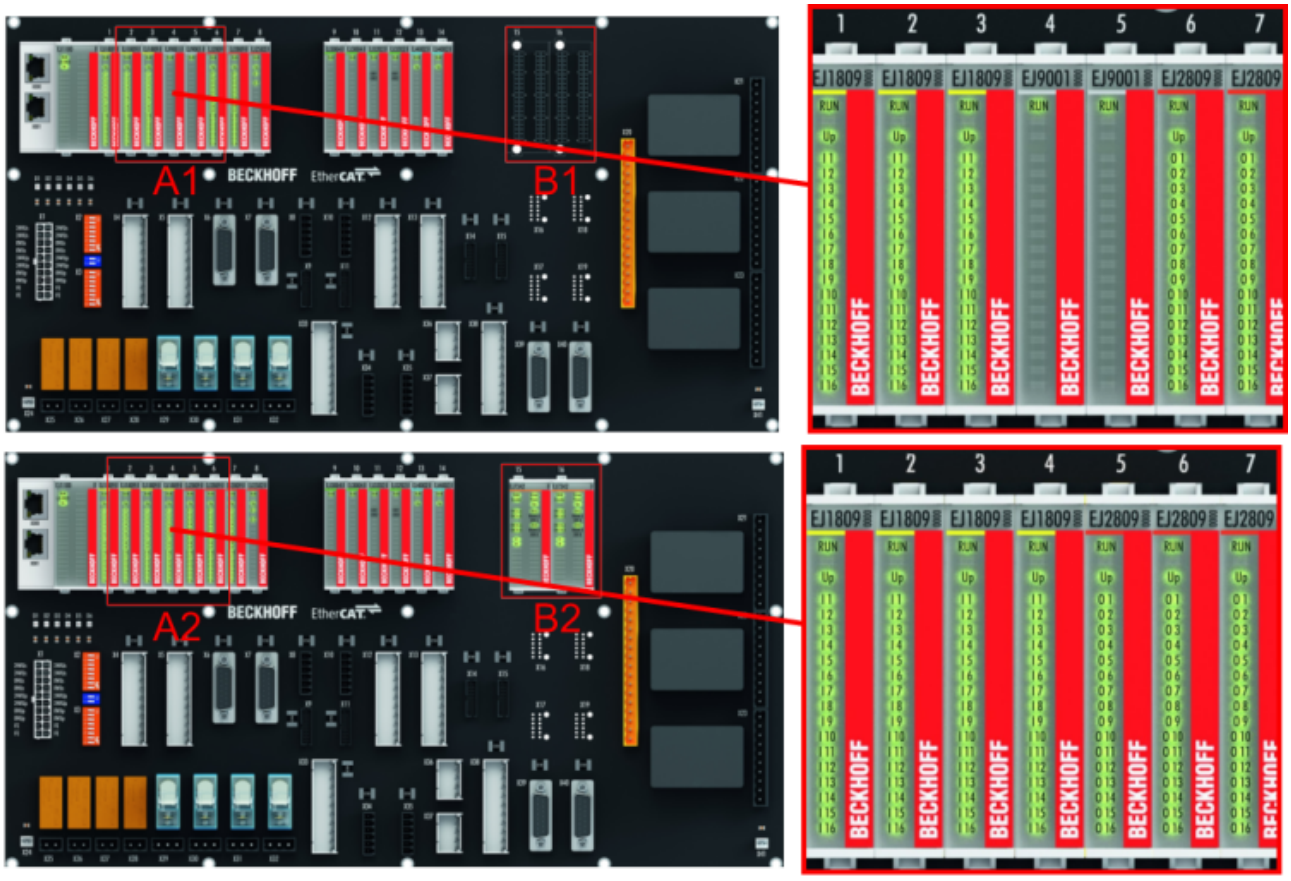


Fig. 23: Sample: Exchanging placeholder modules and assigning reserve slots

E-bus supply

Exchange the placeholder modules with other modules changes the current input from the E-Bus. Ensure that adequate power supply is provided.

4.6.2 Linking with EtherCAT Terminals and EtherCAT Box modules via an Ethernet/EtherCAT connection

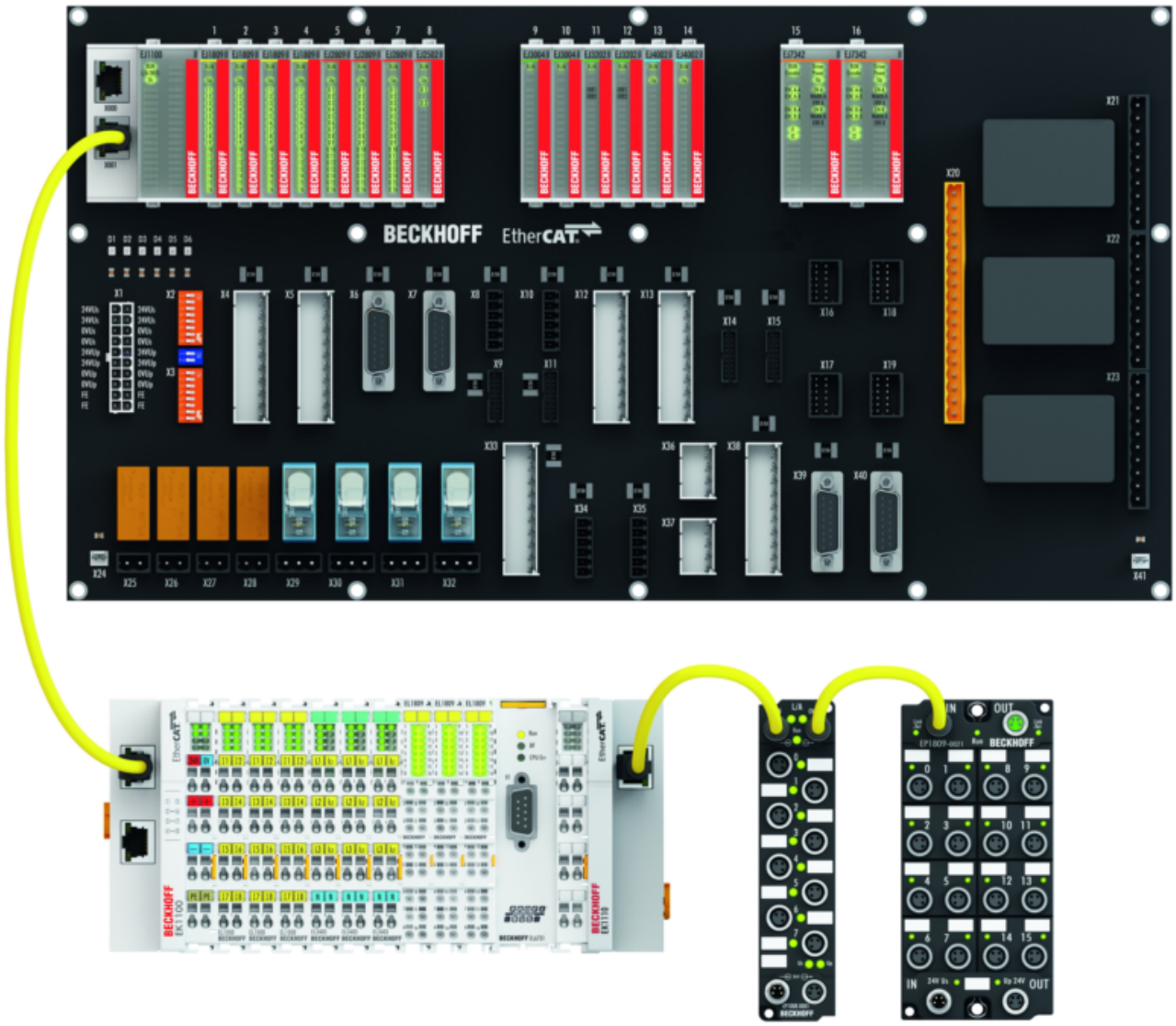


Fig. 24: Example of extension via an Ethernet/EtherCAT connection

4.7 IPC integration

Connection of CX and EL terminals via the EK1110-004x EtherCAT EJ coupler

The EK1110-0043 and EK1110-0044 EtherCAT EJ couplers connect the compact DIN-rail PCs of the CX series and attached EtherCAT Terminals (ELxxxx) with the EJ modules on the signal distribution board.

The EK1110-004x are supplied from the power supply unit of the Embedded PC.
The E-bus signals and the supply voltage of the field side U_P are routed directly to the PCB via a plug connector at the rear of the EtherCAT EJ couplers.

Due to the direct coupling of the Embedded PC and the EL terminals with the EJ modules on the PCB, no EtherCAT Extension (EK1110) or EtherCAT Coupler (EJ1100) is required.

The Embedded PC can be expanded with EtherCAT Terminals that are not yet available in the EJ system, for example.

Fig. 25: Example PCB with Embedded PC, EK1110-0043 and EJxxxx, rear view EK1110-0043

Connection of C6015 / C6017 via the EJ110x-00xx EtherCAT Coupler

Thanks to their ultra-compact design and versatile mounting options, the C6015 and C6017 IPCs are ideally suited for connection to an EJ system.

In combination with the ZS5000-0003 mounting set, it is possible to place the C6015 and C6017 IPCs compactly on the signal distribution board.
The EJ system is optimally connected to the IPC via the corresponding EtherCAT Cable (see following Fig. [A]).
The IPC can be supplied directly via the signal distribution board using the enclosed power plug (see Fig. [B] below).

NOTE

Positioning on the signal distribution board

The dimensions and distances for placement and other details can be found in the Design Guide and the documentation for the individual components.

The figure below shows the connection of a C6015 IPC to an EJ system as an example. The components shown are schematic, to illustrate the functionality.

Fig. 26: Example for the connection of a C6015 IPC to an EJ system

4.8 Disassembly of the signal distribution board

⚠ WARNING

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

Bring the module system into a safe, de-energized state before starting installation, disassembly or wiring of the modules.

NOTE

Risk of damage to components through electrostatic discharge!

Observe the regulations for ESD protection.

Each module is secured through latching on the distribution board, which has to be released for disassembly.

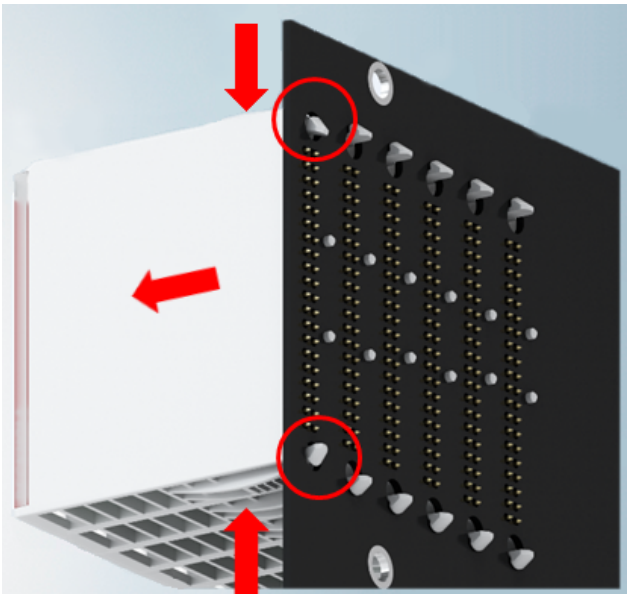


Fig. 27: Disassembly of EJ modules

To disassemble the module from the signal distribution board proceed as follows:

1. Before disassembly, ensure that the signal distribution board is securely connected to the mounting surface. Disassembly of an unsecured signal distribution board may result in damage to the board.
2. Press the upper and lower mounting tabs simultaneously and pull the module from board while gently moving it up and down.

4.9 Disposal

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

5 EtherCAT basics

Please refer to the EtherCAT System Documentation for the EtherCAT fieldbus basics.

6 Commissioning

6.1 Reference to documentation EL600x

Detailed documentation on the commissioning of the EJ6002 module is being prepared.

NOTE

Damage to devices or loss of data

The descriptions and notes on the commissioning of the EL600x EtherCAT Terminals are transferable to the EJ6002 EtherCAT plug-in module.

Before commissioning, read the detailed description of the process data, operation modes and parameterization in the EL600x documentation.

6.2 EJ6002 - 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.

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 during commissioning:
  - Restore object [▶ 40] index 0x1011
  - Configuration data [▶ 40] index 0x80n0
- Profile-specific objects:
  - Input data [▶ 43] index 0x60n0, 0x60n1
  - Output data [▶ 44] 0x70n0, 0x70n1
  - Information and diagnostic [▶ 45] data index 0xA0n0, 0xF000, 0xF008, 0xF010
- Standard objects [▶ 45]

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

6.2.1 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})

6.2.2 Configuration data

Index 80n0 COM Settings Ch.1 (n = 0), Ch.2 (n = 1)

Index (hex)	Name	Meaning	Data type	Flags	Default
80n0:0	COM Settings Ch.(n+1)	Max. Subindex (hex)	UINT8	RO	0x1D (29_{dec})
80n0:01	Enable RTS/CTS	FALSE: RTS/CTS not enabled TRUE: enabled	BOOLEAN	RW	0x01 (1_{dec})
80n0:02	Enable XON/XOFF supported tx data	FALSE: XON/XOFF is not supported for send data TRUE: XON/XOFF is supported for send data	BOOLEAN	RW	0x00 (0_{dec})
80n0:03	Enable XON/XOFF supported rx data	FALSE: XON/XOFF is not supported for input data TRUE: XON/XOFF is supported for input data	BOOLEAN	RW	0x00 (0_{dec})
80n0:04	Enable send FIFO data continuous	FALSE: No continuous sending of data from the FIFO TRUE: Continuous sending of data from the FIFO enabled: • The send buffer is filled (up to 128 bytes) by the controller. • The filled buffer content is sent with a rising edge of the bit "Send continuous" (0x70n0:04). • The module acknowledges the data transfer to the controller by setting the bit "Init accepted" (0x60n0:03). "Init accepted" is reset with "Send continuous".	BOOLEAN	RW	0x00 (0_{dec})
80n0:05	Enable transfer rate optimization	FALSE: Transfer rate optimization switched off TRUE: Transfer rate optimization switched on: The content of the input buffer is automatically transferred into the process image if • no further byte was received for approx. 16 bit times (the time it would have taken to receive 2 bytes) after receiving data. • the process image is filled	BOOLEAN	RW	0x01 (1_{dec})
80n0:06	Enable half duplex	FALSE: Full-duplex mode TRUE: Half-duplex mode	BOOLEAN	RW	0x00 (0_{dec})

Index (hex)	Name	Meaning	Data type	Flags	Default
80n0:11	Baud rate	Configurable baud rates: 1_{dec}: 300 baud 2_{dec}: 600 baud 3_{dec}: 1200 baud 4_{dec}: 2400 baud 5_{dec}: 4800 baud 6_{dec}: 9600 baud (default) 7_{dec}: 19.2 kbaud 8_{dec}: 38.4 kbaud 9_{dec}: 57.6 kbaud 10_{dec}: 115.2 kbaud	BIT4	RW	0x06 (6_{dec})
80n0:15	Data frame	Available coding 1_{dec}: 7E1 2_{dec}: 701 3_{dec}: 8N1 (default) 4_{dec}: 8E1 5_{dec}: 801 8_{dec}: 7N2 9_{dec}: 7E2 10_{dec}: 702 11_{dec}: 8N2 12_{dec}: 8E2 13_{dec}: 802	BIT4	RW	0x03 (3_{dec})
80n0:1A	Rx buffer full notification	The value specifies the number of data in the receive FIFO from which the bit in index 0x60n0:04 "buffer full" is set.	UINT16	RW	0x0360 (864_{dec})
80n0:1B	Explicit baud rate	The desired baud rate can be entered here as a number Only the baud rates specified in index 0x80n0:11 are supported. The settings in this index are also adopted in 0x80n0:11.	UINT32	RW	0x00000384 (9600_{dec})
80n0:1D	Mode of operation	Selection of the communication standard:	UINT32	RW	0x00000010 (16_{dec})
		16_{dec} *RS232* (default) Rx, Tx, RTS, CTS are controlled automatically.			
		17_{dec} *RS232, manual operation* The input of Rx and CTS can be read from the ext. status (0x60n1 [▶ 43]). The outputs Tx and RTS can be written by the ext. controlword (0x70n1 [▶ 44]). Sending and receiving data is not handled by the firmware.			
		18_{dec} *RS232, manual flow control* Sending and receiving data is controlled by the firmware. The input state of CTS can be read from the ext. status (0x60n1 [▶ 43]). The state of the RTS output can be set in the ext. controlword (0x70n1 [▶ 44]).			
		32_{dec} *RS422 (Busdevice)* RS422 is typically used as point to point connection between two devices. In this mode, this module can listen to one of the devices. Transmitting data is possible but not recommended. This could interfere an ongoing communication. Termination and BIAS/Failsafe resistors should be handled by the two main devices. So they are disabled in this mode.			
		33_{dec} *RS422, Terminated RX* Point to point connection between two devices. The termination resistor on the receiver is enabled.			
		34_{dec} *RS422, BIAS/Failsafe RX* Point to point connection between two devices. The BIAS/Failsafe resistors on the receiver are enabled.			

Index (hex)	Name	Meaning		Data type	Flags	Default
80n0:1D	Mode of operation	35_{dec}	*RS422, Terminated and BIAS/Failsafe RX (End-device)* Point to point connection between two devices. The termination resistor and the BIAS/Failsafe resistors on the receiver are enabled. This should be the default mode for a RS422 configuration.	UINT32	RW	0x00000010 (16_{dec})
		64_{dec}	*RS485 (Busdevice)* This configuration will not enable the termination or the BIAS/Failsafe resistors. It is designed for devices which are connected in between of the two terminating devices.			
		65_{dec}	*RS485, Terminated* RS485 configuration with enabled termination resistor			
		66_{dec}	*RS485, BIAS/Failsafe* RS485 configuration with enabled termination resistor			
		67_{dec}	*RS485, Terminated and BIAS/Failsafe (Enddevice)* RS485 configuration with enabled termination resistor and enabled BIAS/Failsafe resistors. This should be the default configuration for both endpoints of the RS485 network.			

6.2.3 Input data

Index 60n0 COM Inputs Ch. 1 (n = 0), Ch. 2 (n = 1)

Index (hex)	Name	Meaning	Data type	Flags	Default
60n0:0	COM Inputs Ch. (n+1)	Length of this object	UINT8	RO	0x26 (38_{dec})
60n0:01	Transmit accepted	The module acknowledges the receipt of data with a change of state of this bit. Only then are new data transferred from the controller to the module.	BOOLEAN	RO	0x00 (0_{dec})
60n0:02	Receive request	By changing the state of this bit, the module notifies the controller that the number of bytes indicated in index 0x60n0:09 "Input length" are located in the DataIn bytes. The controller must acknowledge receipt of the data with a change of state of the "Receive accepted" bit (index 0x70n0:02). Only then is new data transferred from the module to the controller.	BOOLEAN	RO	0x00 (0_{dec})
60n0:03	Init Accepted	FALSE: The module is once again ready for serial data exchange. TRUE: The initialization was executed by the module.	BOOLEAN	RO	0x00 (0_{dec})
60n0:04	Buffer full	The receive FIFO is full. **Note All incoming data will be lost from this point on!**	BOOLEAN	RO	0x00 (0_{dec})
60n0:05	Parity error	A parity error has occurred.	BOOLEAN	RO	0x00 (0_{dec})
60n0:06	Framing error	A framing error has occurred.	BOOLEAN	RO	0x00 (0_{dec})
60n0:07	Overrun error	An overrun error has occurred.	BOOLEAN	RO	0x00 (0_{dec})
60n0:09	Input length	Number of input bytes ready for transfer from the module to the controller.	UINT8	RO	0x00 (0_{dec})
60n0:11	Data In 0	Input byte 0	UINT8	RO	0x00 (0_{dec})
…	…	…	…	…	…
60n0:26	Data In 21	Input byte 21	UINT8	RO	0x00 (0_{dec})

Index 60n1 Com Ext. Inputs Ch. 1 (n = 0), Ch.2 (n = 1)

Index (hex)	Name	Meaning	Data type	Flags	Default
60n1:0	Com Ext. Inputs Ch.(n+1)	Length of this object	UINT8	RO	0x02 (2_{dec})
60n1:01	Rx	In operation mode “RS232, manual operation” (CoE 0x80n0:1D [▶ 40] = 17_{dec}) or “RS232, manual flow control” (CoE 0x80n0:1D [▶ 40] = 18_{dec}) the level of Rx input is displayed here.	BOOLEAN	RO	0x00 (0_{dec})
60n1:02	CTS	In operation mode “RS232, manual operation” (CoE 0x80n0:1D [▶ 40] = 17_{dec}) or “RS232, manual flow control” (CoE 0x80n0:1D [▶ 40] = 18_{dec}) the level of CTS input is displayed here.	BOOLEAN	RO	0x00 (0_{dec})

6.2.4 Output data

Index 0x70n0 COM Outputs Ch. 1 (n = 0), Ch. 2 (n = 1)

Index (hex)	Name	Meaning	Data type	Flags	Default
70n0:0	COM Outputs Ch. 1 + Ch. 2	Max. SubIndex (hex)	UINT8	RO	0x26 (38_{dec})
70n0:01	Transmit request	By changing the state of this bit, the controller informs the module that the DataOut bytes contain the number of bytes displayed in index 0x70n0:099 “Output length”. The module acknowledges receipt of the data by changing the state of the index 0x60n0:01 “TransmitAccepted [▶ 43]” bit. Only now new data can be transferred from the controller to the module.	BOOLEAN	RO	0x00 (0_{dec})
70n0:02	Receive accepted	The controller acknowledges receipt of data by changing the state of this bit. Only then new data can be transferred from the terminal to the controller.	BOOLEAN	RO	0x00 (0_{dec})
70n0:03	Init request	0: The controller once again requests the module to prepare for serial data exchange. 1: The controller requests the module for initialization. The transmit and receive functions will be blocked The FIFO pointer will be reset and the interface will be initialized with the values of the responsible Settings object. The execution of the initialization will be acknowledged by the module with the “Init accepted [▶ 43]” bit in index 0x60n0:03.	BOOLEAN	RO	0x00 (0_{dec})
70n0:04	Send continuous	Continuous sending of data from the FIFO. The send buffer is filled (up to 128 bytes) by the controller. The filled buffer contents will be sent on the rising edge of the bit. If the data has been transmitted, the module informs the controller by setting the “Init accepted [▶ 43]” bit in index 0x60n0:03. “Init accepted” is cleared with “Send continuous”.	BOOLEAN	RO	0x00 (0_{dec})
70n0:09	Output length	Number of output bytes available for transfer from the controller to the module.	UINT8	RO	0x00 (0_{dec})
70n0:11	Data Out 0	Output byte 0	UINT8	RO	0x00 (0_{dec})
...	...	....	...	...	...
70n0:26	Data Out 21	Output byte 21	UINT8	RO	0x00 (0_{dec})

Index 0x70n1 COM Ext. Outputs Ch. 1 (n = 0), Ch. 2 (n = 1)

Index (hex)	Name	Meaning	Data type	Flags	Default
70n1:0	COM Ext. Outputs Ch. 1 + Ch. 2	Max. SubIndex (hex)	UINT8	RO	0x02 (2_{dec})
70n1:01	Tx	Transmit signal In operation mode “RS232, manual operation” (CoE 0x80n0:1D [▶ 40] = 17_{dec}) the level of Tx output can be set manually here. Sending and receiving data is not handled by the firmware in this operation mode.	BOOLEAN	RO	0x00 (0_{dec})
70n1:02	RTS	Request to send signal In operation mode “RS232, manual operation” (CoE 0x80n0:1D [▶ 40] = 17_{dec}) or “RS232, manual flow control” (CoE 0x80n0:1D [▶ 40] = 18_{dec}) the level of RTS output can be set manually here. Sending and receiving data is not handled by the firmware in “RS232, manual operation” mode.	BOOLEAN	RO	0x00 (0_{dec})

6.2.5 Information and diagnostic data

Index 0xA0n0 COM Diag data Ch. 1 (n = 0), Ch. 2 (n = 1)

Index (hex)	Name	Meaning	Data type	Flags	Default
A0n0:0	COM Diag data Ch. 1 + Ch. 2	Max. SubIndex (hex)	UINT8	RO	0x21 (33_{dec})
A0n0:01	Buffer overflow	A buffer overflow has occurred.	BOOLEAN	RO	0x00 (0_{dec})
A0n0:02	Parity error	A parity error has occurred.	BOOLEAN	RO	0x00 (0_{dec})
A0n0:03	Framing error	A framing error has occurred	BOOLEAN	RO	0x00 (0_{dec})
A0n0:04	Overrun error	An overrun error has occurred.	BOOLEAN	RO	0x00 (0_{dec})
A0n0:05	Buffer full	The reception FIFO is full. **Note All incoming data will be lost from this point on!**	BOOLEAN	RO	0x00 (0_{dec})
A0n0:06	Power supply overload	Overload of the internal power supply	BOOLEAN	RO	0x00 (0_{dec})
A0n0:11	Data bytes in send buffer	Number of data bytes in the send FIFO	UINT16	RO	0x0000 (0_{dec})
A0n0:21	Data bytes in receive buffer	Number of data bytes in the receive FIFO	UINT16	RO	0x0000 (0_{dec})

Index F000 Modular device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	General information for the modular device profile	UINT8	RO	0x02 (2_{dec})
F000:01	Module index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0002 (2_{dec})

Index F008 Code word

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

Index F010 Module list

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Length of this object	UINT8	RW	0x02 (2_{dec})
F010:01	SubIndex 001	Revision	UINT32	RW	0x00000258 (600_{dec})
F010:02	SubIndex 002	-	UINT32	RW	0x00000258 (600_{dec})

Index F081 Download revision

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list	Max. Subindex	UINT8	RW	0x01 (1_{dec})
F010:01	SubIndex 001	Configured module revision	UINT32	RW	0x00000258 (600_{dec})

6.2.6 Standard objects (0x1000-0x1FFF)

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

Index 1000 Device type

Index (hex)	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT slave: The Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x02581389 (39326601_{dec})

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EJ6002

Index 1009 Hardware version

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

Index 100A Software version

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

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x177222852 (393357394_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10F0 Backup parameter handling

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

Index 1600 COM RxPDO-Map Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	COM RxPDO-Map Outputs Ch.1	PDO Mapping RxPDO 1	UINT8	RO	0x1C (28_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1), entry 0x01 (Transmit request))	UINT32	RO	0x7000:01, 1
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1), entry 0x02 (Receive accepted))	UINT32	RO	0x7000:02, 1
1600:03	SubIndex 003	3. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1), entry 0x03 (Init request))	UINT32	RO	0x7000:03, 1
1600:04	SubIndex 004	4. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1), entry 0x04 (Send continuous))	UINT32	RO	0x7000:04, 1
1600:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1600:06	SubIndex 006	6. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1), entry 0x09 (Output length))	UINT32	RO	0x7000:09, 8
1600:07	SubIndex 007	7. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x11 (Data Out 0))	UINT32	RO	0x7000:11, 8
1600:08	SubIndex 008	8. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x12 (Data Out 1))	UINT32	RO	0x7000:12, 8
1600:09	SubIndex 009	9. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x13 (Data Out 2))	UINT32	RO	0x7000:13, 8
1600:0A	SubIndex 010	10. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x14 (Data Out 3))	UINT32	RO	0x7000:14, 8
1600:0B	SubIndex 011	11. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x15 (Data Out 4))	UINT32	RO	0x7000:15, 8
1600:0C	SubIndex 012	12. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x16 (Data Out 5))	UINT32	RO	0x7000:16, 8
1600:0D	SubIndex 013	13. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x17 (Data Out 6))	UINT32	RO	0x7000:17, 8
1600:0E	SubIndex 014	14. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x18 (Data Out 7))	UINT32	RO	0x7000:18, 8
1600:0F	SubIndex 015	15. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x19 (Data Out 8))	UINT32	RO	0x7000:19, 8
1600:10	SubIndex 016	16. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x1A (Data Out 9))	UINT32	RO	0x7000:1A, 8
1600:11	SubIndex 017	17. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x1B (Data Out 10))	UINT32	RO	0x7000:1B, 8
1600:12	SubIndex 018	18. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x1C (Data Out 11))	UINT32	RO	0x7000:1C, 8
1600:13	SubIndex 019	19. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x1D (Data Out 12))	UINT32	RO	0x7000:1D, 8
1600:14	SubIndex 020	20. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x1E (Data Out 13))	UINT32	RO	0x7000:1E, 8
1600:15	SubIndex 021	21. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x1F (Data Out 14))	UINT32	RO	0x7000:1F, 8
1600:16	SubIndex 022	22. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x20 (Data Out 15))	UINT32	RO	0x7000:20, 8
1600:17	SubIndex 023	23. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x21 (Data Out 16))	UINT32	RO	0x7000:21, 8
1600:18	SubIndex 024	24. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x22 (Data Out 17))	UINT32	RO	0x7000:22, 8
1600:19	SubIndex 025	25. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x23 (Data Out 18))	UINT32	RO	0x7000:23, 8
1600:1A	SubIndex 026	26. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x24 (Data Out 19))	UINT32	RO	0x7000:24, 8
1600:1B	SubIndex 027	27. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x25 (Data Out 20))	UINT32	RO	0x7000:25, 8
1600:1C	SubIndex 028	28. PDO Mapping entry (object 0x7000 (COM Outputs Ch.1) entry 0x26 (Data Out 21))	UINT32	RO	0x7000:26, 8

Index 1601 COM RxPDO-Map Ext. Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	COM RxPDO-Map Ext. Outputs Ch.1	PDO Mapping RxPDO 2	UINT8	RO	0x03 (03_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7001 (COM Ext. Outputs Ch.1), entry 0x01 (Tx))	UINT32	RO	0x7001:01, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7001 (COM Ext. Outputs Ch.1), entry 0x02 (RTS))	UINT32	RO	0x7001:02, 1
1601:03	SubIndex 003	3. PDO Mapping entry (14 bits align)	UINT32	RO	0x0000:00, 14

Index 1602 COM RxPDO-Map Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	COM RxPDO-Map Outputs Ch.2	PDO Mapping RxPDO 3	UINT8	RO	0x1C (28_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2), entry 0x01 (Transmit request))	UINT32	RO	0x7010:01, 1
1602:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2), entry 0x02 (Receive accepted))	UINT32	RO	0x7010:02, 1
1602:03	SubIndex 003	3. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2), entry 0x03 (Init request))	UINT32	RO	0x7010:03, 1
1602:04	SubIndex 004	4. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2), entry 0x04 (Send continuous))	UINT32	RO	0x7010:04, 1
1602:05	SubIndex 005	5. PDO Mapping entry (4 bits align)	UINT32	RO	0x0000:00, 4
1602:06	SubIndex 006	6. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2), entry 0x09 (Output length))	UINT32	RO	0x7010:09, 8
1602:07	SubIndex 007	7. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x11 (Data Out 0))	UINT32	RO	0x7010:11, 8
1602:08	SubIndex 008	8. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x12 (Data Out 1))	UINT32	RO	0x7010:12, 8
1602:09	SubIndex 009	9. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x13 (Data Out 2))	UINT32	RO	0x7010:13, 8
1602:0A	SubIndex 010	10. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x14 (Data Out 3))	UINT32	RO	0x7010:14, 8
1602:0B	SubIndex 011	11. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x15 (Data Out 4))	UINT32	RO	0x7010:15, 8
1602:0C	SubIndex 012	12. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x16 (Data Out 5))	UINT32	RO	0x7010:16, 8
1602:0D	SubIndex 013	13. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x17 (Data Out 6))	UINT32	RO	0x7010:17, 8
1602:0E	SubIndex 014	14. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x18 (Data Out 7))	UINT32	RO	0x7010:18, 8
1602:0F	SubIndex 015	15. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x19 (Data Out 8))	UINT32	RO	0x7010:19, 8
1602:10	SubIndex 016	16. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x1A (Data Out 9))	UINT32	RO	0x7010:1A, 8
1602:11	SubIndex 017	17. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x1B (Data Out 10))	UINT32	RO	0x7010:1B, 8
1602:12	SubIndex 018	18. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x1C (Data Out 11))	UINT32	RO	0x7010:1C, 8
1602:13	SubIndex 019	19. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x1D (Data Out 12))	UINT32	RO	0x7010:1D, 8
1602:14	SubIndex 020	20. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x1E (Data Out 13))	UINT32	RO	0x7010:1E, 8
1602:15	SubIndex 021	21. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x1F (Data Out 14))	UINT32	RO	0x7010:1F, 8
1602:16	SubIndex 022	22. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x20 (Data Out 15))	UINT32	RO	0x7010:20, 8
1602:17	SubIndex 023	23. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x21 (Data Out 16))	UINT32	RO	0x7010:21, 8
1602:18	SubIndex 024	24. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x22 (Data Out 17))	UINT32	RO	0x7010:22, 8
1602:19	SubIndex 025	25. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x23 (Data Out 18))	UINT32	RO	0x7010:23, 8
1602:1A	SubIndex 026	26. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x24 (Data Out 19))	UINT32	RO	0x7010:24, 8
1602:1B	SubIndex 027	27. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x25 (Data Out 20))	UINT32	RO	0x7010:25, 8
1602:1C	SubIndex 028	28. PDO Mapping entry (object 0x7010 (COM Outputs Ch.2) entry 0x26 (Data Out 21))	UINT32	RO	0x7010:26, 8

Index 1603 COM RxPDO-Map Ext. Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	COM RxPDO-Map Ext. Outputs Ch.2	PDO Mapping RxPDO 4	UINT8	RO	0x03 (03_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (object 0x7011 (COM Ext. Outputs Ch.2), entry 0x01 (Tx))	UINT32	RO	0x7011:01, 1
1603:02	SubIndex 002	2. PDO Mapping entry (object 0x7011 (COM Ext. Outputs Ch.2), entry 0x02 (RTS))	UINT32	RO	0x7011:02, 1
1603:03	SubIndex 003	3. PDO Mapping entry (14 bits align)	UINT32	RO	0x0000:00, 14

Index 1A00 COM TxPDO-Map Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	COM TxPDO-Map Inputs Ch.1	PDO Mapping TxPDO 1	UINT8	RO	0x1F (31_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (COM Inputs Ch.1), entry 0x01 (Transmit accepted))	UINT32	RO	06000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (COM Inputs Ch.1), entry 0x02 (Receive request))	UINT32	RO	06000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (COM Inputs Ch.1), entry 0x03 (Init accepted))	UINT32	RO	06000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (COM Inputs Ch.1), entry 0x04 (Buffer full))	UINT32	RO	06000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (COM Inputs Ch.1), entry 0x05 (Parity error))	UINT32	RO	06000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6000 (COM Inputs Ch.1), entry 0x06 (Framing error))	UINT32	RO	06000:06, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x07 (Overrun error))	UINT32	RO	06000:07, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x09 (Input length))	UINT32	RO	06000:09, 8
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x11 (Data In 0))	UINT32	RO	06000:11, 8
1A00:0B	SubIndex 011	11. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x12 (Data In 1))	UINT32	RO	06000:12, 8
1A00:0C	SubIndex 012	12. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x13 (Data In 2))	UINT32	RO	06000:13, 8
1A00:0D	SubIndex 013	13. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x14 (Data In 3))	UINT32	RO	06000:14, 8
1A00:0E	SubIndex 014	14. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x15 (Data In 4))	UINT32	RO	06000:15, 8
1A00:0F	SubIndex 015	15. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x16 (Data In 5))	UINT32	RO	06000:16, 8
1A00:10	SubIndex 016	16. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x17 (Data In 6))	UINT32	RO	06000:17, 8
1A00:11	SubIndex 017	17. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x18 (Data In 7))	UINT32	RO	06000:18, 8
1A00:12	SubIndex 018	18. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x19 (Data In 8))	UINT32	RO	06000:19, 8
1A00:13	SubIndex 019	19. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x1A (Data In 9))	UINT32	RO	06000:1A, 8
1A00:14	SubIndex 020	20. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x1B (Data In 10))	UINT32	RO	06000:1B, 8
1A00:15	SubIndex 021	21. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x1C (Data In 11))	UINT32	RO	06000:1C, 8
1A00:16	SubIndex 022	22. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x1C (Data In 12))	UINT32	RO	06000:1D, 8
1A00:17	SubIndex 023	23. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x1E (Data In 13))	UINT32	RO	06000:1E, 8
1A00:18	SubIndex 024	24. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x1F (Data In 14))	UINT32	RO	06000:1F, 8
1A00:19	SubIndex 025	25. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x20 (Data In 15))	UINT32	RO	06000:20, 8
1A00:1A	SubIndex 026	26. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x21 (Data In 16))	UINT32	RO	06000:21, 8
1A00:1B	SubIndex 027	27. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x22 (Data In 17))	UINT32	RO	06000:22, 8
1A00:1C	SubIndex 028	28. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x23 (Data In 18))	UINT32	RO	06000:23, 8
1A00:1D	SubIndex 029	29. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x24 (Data In 19))	UINT32	RO	06000:24, 8
1A00:1E	SubIndex 030	30. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x25 (Data In 20))	UINT32	RO	06000:25, 8
1A00:1F	SubIndex 031	31. PDO Mapping entry (object 0x0x6000 (COM Inputs Ch.1), entry 0x26 (Data In 21))	UINT32	RO	06000:26, 8

Index 1A01 COM TxPDO-Map Ext. Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	COM TxPDO-Map Ext. Inputs Ch.1	PDO Mapping TxPDO 2	UINT8	RO	0x03 (3_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (COM Ext. Inputs Ch.1), entry 0x01 (Rx))	UINT32	RO	0x6001:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6001 (COM Ext. Inputs Ch.1), entry 0x02 (CTS))	UINT32	RO	0x6001:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (14 bits align)	UINT32	RO	0x0000:00, 14

Index 1A02 COM TxPDO-Map Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	COM TxPDO-Map Inputs Ch.2	PDO Mapping TxPDO 3	UINT8	RO	0x1F (31_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (COM Inputs Ch.2), entry 0x01 (Transmit accepted))	UINT32	RO	06010:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (COM Inputs Ch.2), entry 0x02 (Receive request))	UINT32	RO	06010:02, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (COM Inputs Ch.2), entry 0x03 (Init accepted))	UINT32	RO	06010:03, 1
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (COM Inputs Ch.2), entry 0x04 (Buffer full))	UINT32	RO	06010:04, 1
1A02:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (COM Inputs Ch.2), entry 0x05 (Parity error))	UINT32	RO	06010:05, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (COM Inputs Ch.2), entry 0x06 (Framing error))	UINT32	RO	06010:06, 1
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x07 (Overrun error))	UINT32	RO	06010:07, 1
1A02:08	SubIndex 008	8. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A02:09	SubIndex 009	9. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x09 (Input length))	UINT32	RO	06010:09, 8
1A02:0A	SubIndex 010	10. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x11 (Data In 0))	UINT32	RO	06010:11, 8
1A02:0B	SubIndex 011	11. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x12 (Data In 1))	UINT32	RO	06010:12, 8
1A02:0C	SubIndex 012	12. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x13 (Data In 2))	UINT32	RO	06010:13, 8
1A02:0D	SubIndex 013	13. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x14 (Data In 3))	UINT32	RO	06010:14, 8
1A02:0E	SubIndex 014	14. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x15 (Data In 4))	UINT32	RO	06010:15, 8
1A02:0F	SubIndex 015	15. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x16 (Data In 5))	UINT32	RO	06010:16, 8
1A02:10	SubIndex 016	16. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x17 (Data In 6))	UINT32	RO	06010:17, 8
1A02:11	SubIndex 017	17. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x18 (Data In 7))	UINT32	RO	06010:18, 8
1A02:12	SubIndex 018	18. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x19 (Data In 8))	UINT32	RO	06010:19, 8
1A02:13	SubIndex 019	19. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x1A (Data In 9))	UINT32	RO	06010:1A, 8
1A02:14	SubIndex 020	20. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x1B (Data In 10))	UINT32	RO	06010:1B, 8
1A02:15	SubIndex 021	21. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x1C (Data In 11))	UINT32	RO	06010:1C, 8
1A02:16	SubIndex 022	22. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x1D (Data In 12))	UINT32	RO	06010:1D, 8
1A02:17	SubIndex 023	23. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x1E (Data In 13))	UINT32	RO	06010:1E, 8
1A02:18	SubIndex 024	24. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x1F (Data In 14))	UINT32	RO	06010:1F, 8
1A02:19	SubIndex 025	25. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x20 (Data In 15))	UINT32	RO	06010:20, 8
1A02:1A	SubIndex 026	26. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x21 (Data In 16))	UINT32	RO	06010:21, 8
1A02:1B	SubIndex 027	27. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x22 (Data In 17))	UINT32	RO	06010:22, 8
1A02:1C	SubIndex 028	28. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x23 (Data In 18))	UINT32	RO	06010:23, 8
1A02:1D	SubIndex 029	29. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x24 (Data In 19))	UINT32	RO	06010:24, 8
1A02:1E	SubIndex 030	30. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x25 (Data In 20))	UINT32	RO	06010:25, 8
1A02:1F	SubIndex 031	31. PDO Mapping entry (object 0x0x6010 (COM Inputs Ch.2), entry 0x26 (Data In 21))	UINT32	RO	06010:26, 8

Index 1A03 COM TxPDO-Map Ext. Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	COM TxPDO-Map Ext. Inputs Ch.2	PDO Mapping TxPDO 2	UINT8	RO	0x03 (3_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6011 (COM Ext. Inputs Ch.2), entry 0x01 (Rx))	UINT32	RO	0x6011:01, 1
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0x6011 (COM Ext. Inputs Ch.2), entry 0x02 (CTS))	UINT32	RO	0x6011:02, 1
1A03:03	SubIndex 003	3. PDO Mapping entry (14 bits align)	UINT32	RO	0x0000:00, 14

Index 1C00 Sync manager type

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

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x00 (0_{dec})

Index 1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RO	0x00 (0_{dec})

Index 1C32 SM output parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	Current synchronization mode: • 0: Free Run • 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	0x0000 (0_{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	0x0003D090 (250000_{dec})
1C32:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000384 (900_{dec})
1C32:04	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 0x1C33:08)	UINT16	RO	0x0001 (1_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x00002710 (10000_{dec})
1C32:06	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})
1C32:07	Minimum delay time	Min. time between SYNC1 event and the reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000384 (900_{dec})
1C32:08	Command	With this entry the real required process data provision time can be measured. • 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C33:03, 0x1C33:06, 0x1C33:09 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 reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000384 (900_{dec})
1C32:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)	UINT16	RO	0x0000 (0_{dec})
1C32:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	BOOLEAN	RO	0x00 (0_{dec})

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: 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	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	0x0003D090 (250000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000384 (900_{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 0x1C33:08)	UINT16	RO	0x0001 (1_{dec})
1C33:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x00002710 (10000_{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	Min. time between SYNC1 event and the reading of the inputs (in ns, DC mode only)	UINT32	RO	0x00000384 (900_{dec})
1C33:08	Command	With this entry the real required process data provision time can be measured. • 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 0x1C33:03, 0x1C33:06, 0x1C33:09 are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum Delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000384 (900_{dec})
1C33:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C33:0C	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})
1C33:0D	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})
1C33:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	BOOLEAN	RO	0x00 (0_{dec})

6.2.7 Command object (0xFB00)

Index FB00 CMD command

Index (hex)	Name	Meaning	Data type	Flags	Default
FB00:0	CMD command	Max. Subindex (hex)	UINT8	RO	0x03 (03_{dec})
FB00:01	Request	The Object command can be used to trigger various actions. No commands are available at this time.	OCTET-STRING [16 bit]	RW	
FB00:02	Status	Status of the command currently being executed 0: Command executed without error and without response 1: Command executed without error and with response 2: Command executed with error and without response 3: Command executed with error and with response 255: Command is being executed	UINT8	RO	0x00 (0_{dec})
FB00:03	Response	Optional return value of the command Response: up to 48 bit	OCTET-STRING [48 bit]	RO	

7 Appendix

7.1 Support and Service

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

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products!

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages: https://www.beckhoff.com

You will also find further documentation for Beckhoff components there.

Beckhoff Support

Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

Hotline:	+49 5246 963 157
Fax:	+49 5246 963 9157
e-mail:	support@beckhoff.com

Beckhoff Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

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