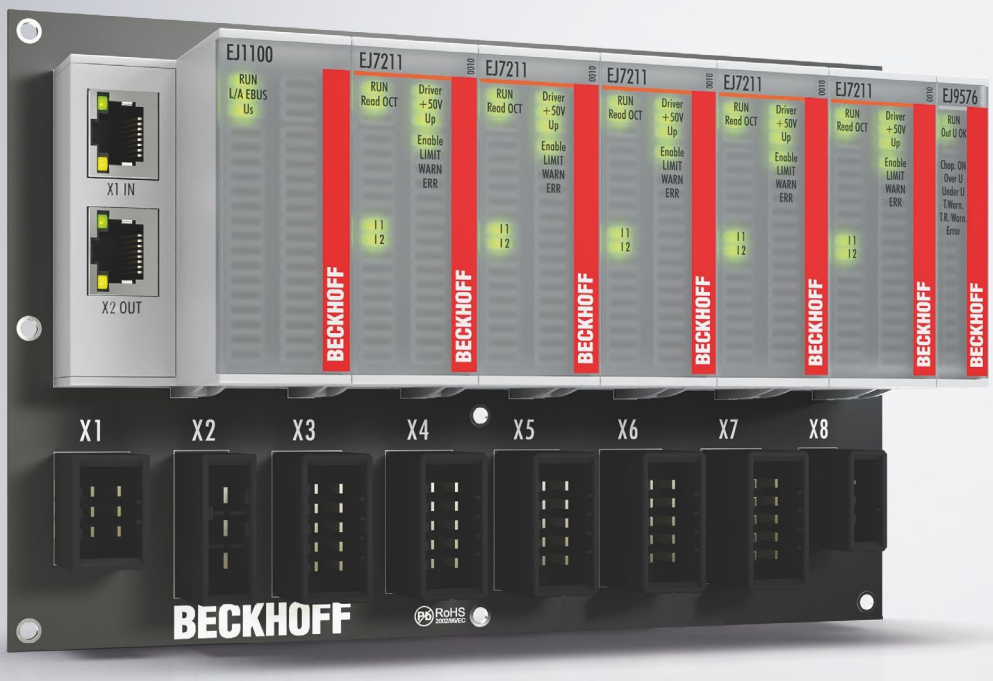
BECKHOFF New Automation Technology

Documentation | EN

# EJ18xx

## EtherCAT plug-in modules, 16-channel digital input, 24 V DC




2026-01-13 | Version: 1.6.0

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# 1 Foreword

## 1.1 Product overview

This documentation covers the following products:

| | |
|---|---|
| EJ1809 [▶ 18] | EtherCAT plug-in-module, 16-channel digital input, 24 $V_{DC}$, 3 ms input filter |
| EJ1819 [▶ 18] | EtherCAT plug-in-module, 16-channel digital input, 24 $V_{DC}$, 10 µs input filter |
| EJ1859 [▶ 22] | EtherCAT plug-in-module, 8-channel digital input +8-channel digital output, 24 $V_{DC}$, 3 ms input filter |
| EJ1889 [▶ 26] | EtherCAT plug-in-module, 16-channel digital input, 24 $V_{DC}$, 3 ms input filter, ground switching |

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

## 1.2 Notes on the documentation

### Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.
The qualified personnel is obliged to always use the currently valid documentation.

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

### Disclaimer

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

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

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

### Trademarks

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https://www.beckhoff.com/trademarks

## 1.3 Safety instructions

### Safety regulations

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

### Exclusion of liability

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

### Personnel qualification

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

### Signal words

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

### Personal injury warnings

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

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

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

### Warning of damage to property or environment

| *NOTICE* |
| --- |
| The environment, equipment, or data may be damaged. |

### Information on handling the product

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

## 1.4 Intended use

**⚠ WARNING**

**Caution - Risk of injury!**

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

## 1.5 Signal distribution board

***NOTICE***

**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.

## 1.6 Guide through documentation

**NOTICE**

**Further components of documentation**

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

| Title | Description |
|---|---|
| **EtherCAT System Documentation** (PDF) | • System overview<br>• EtherCAT basics<br>• Cable redundancy<br>• Hot Connect<br>• EtherCAT devices configuration |
| **Design Guide EJ8xxx - Signal distribution board for standard EtherCAT plug-in modules** (PDF) | Notes on the design of a signal distribution board for standard EtherCAT plug-in modules.<br>• Requirements for the signal distribution board<br>• Backplane mounting guidelines<br>• Module placement<br>• Routing guidelines |
| **Infrastructure for EtherCAT/Ethernet** (PDF) | Technical recommendations and notes for design, implementation and testing |
| **Software Declarations I/O** (PDF) | Open source software declarations for Beckhoff I/O components |

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

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

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

# 1.7 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).

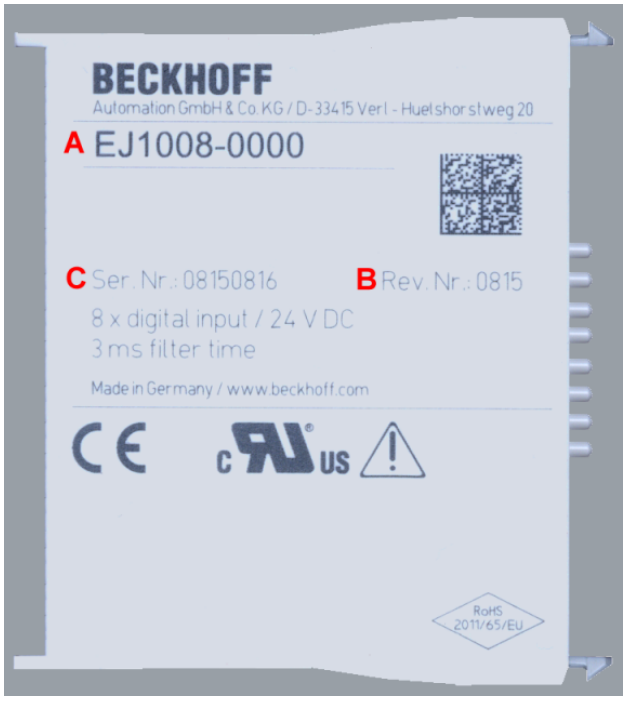



Fig. 1: Order identifier (A), Revision number (B) and serial number (C) using the example of EJ1008

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

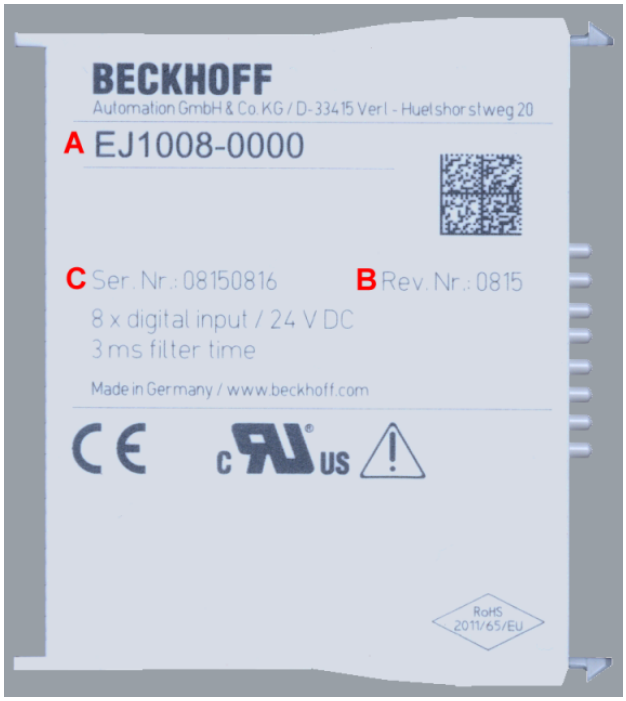



Fig. 2: Order identifier (A), revision number (B) and serial number (C) using the example of EJ1008

| 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.

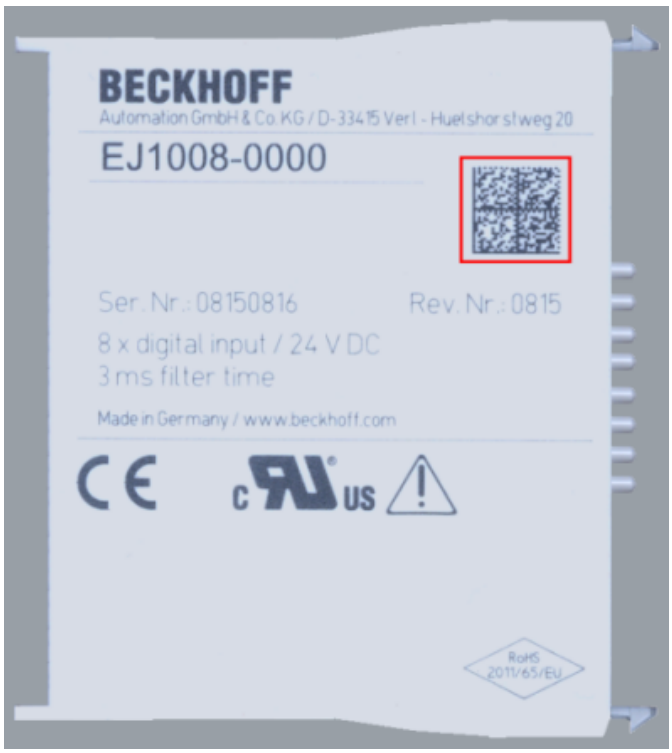



Fig. 3: BIC as data matrix code (DMC, code scheme ECC200)

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 | 12 | 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:

**1P**072222**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.

**NOTICE**

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.

The interface that the product can be electronically addressed by is crucial for the electronic readout.

### K-bus devices (IP20, IP67)

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

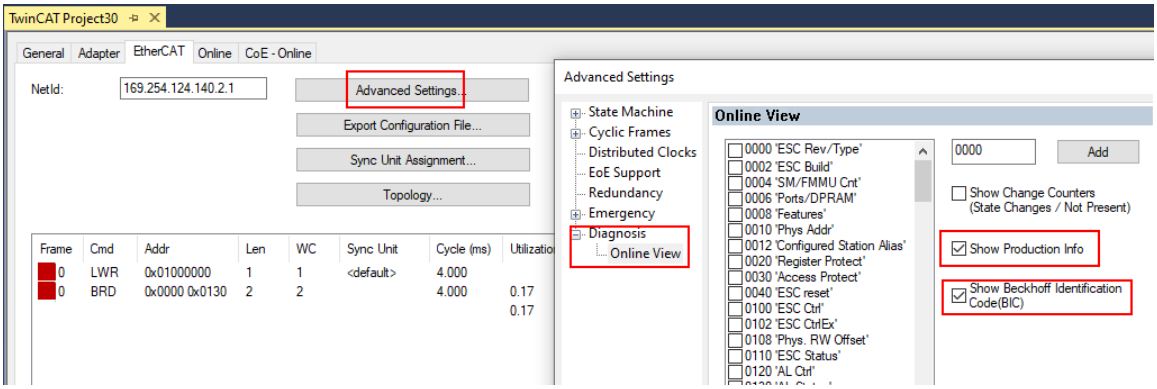
### EtherCAT devices (IP20, IP67)

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

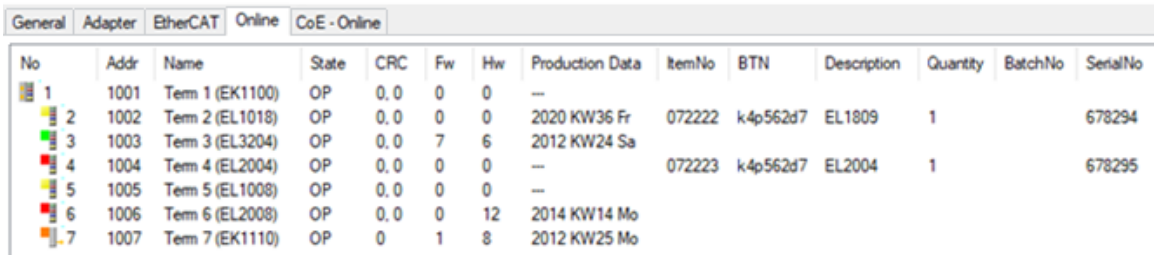
Beckhoff also stores the eBIC in the ESI-EEPROM. The eBIC was introduced into Beckhoff IO production (terminals, box modules) in 2020; as of 2023, implementation is largely complete.

The user can electronically access the eBIC (if present) 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 "Show Beckhoff Identification Code (BIC)" checkbox under EtherCAT → Advanced Settings → Diagnostics:

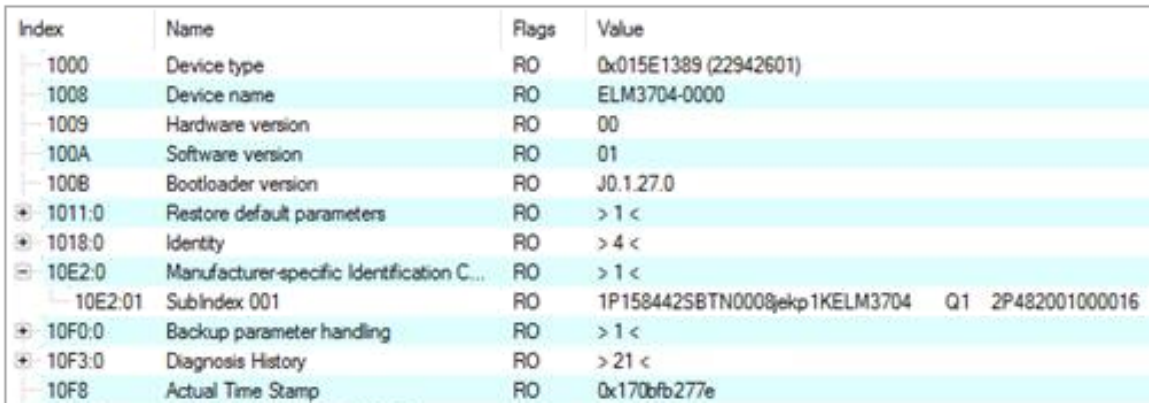



  - The BTN and its contents are then displayed:




  - Note: As shown in the figure, the production data HW version, FW version, and production date, which have been programmed since 2012, can also be displayed with "Show production info".
  - Access from the PLC: From TwinCAT 3.1. build 4024.24, the functions *FB_EcReadBIC* and *FB_EcReadBTN* for reading into the PLC are available in the Tc2_EtherCAT library from v3.3.19.0.
- EtherCAT devices with a CoE directory may also have the object 0x10E2:01 to display their own eBIC, which can also be easily accessed by the PLC:

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



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

  - The object 0x10E2 will be preferentially introduced into stock products in the course of necessary firmware revision.
  - From TwinCAT 3.1. build 4024.24, the functions *FB_EcCoEReadBIC* and *FB_EcCoEReadBTN* for reading into the PLC are available in the Tc2_EtherCAT library from v3.3.19.0
- The following auxiliary functions are available for processing the BIC/BTN data in the PLC in *Tc2_Utilities* as of TwinCAT 3.1 build 4024.24
  - F_SplitBIC: The function splits the Beckhoff Identification Code (BIC) sBICValue into its components using known identifiers and returns the recognized substrings in the ST_SplittedBIC structure as a return value
  - BIC_TO_BTN: The function extracts the BTN from the BIC and returns it as a return value
- Note: If there is further electronic 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 written as an additional category in the ESI-EEPROM during device production. The structure of the ESI content is largely dictated by the ETG specifications, therefore the additional vendor-specific content is stored using a category in accordance with the ETG.2010. ID 03 tells all EtherCAT masters that they may not overwrite these data in the event of an update or restore the data after an ESI update.
  The structure follows the content of the BIC, see here. The EEPROM therefore requires approx. 50..200 bytes of memory.
- 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 which each have 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, and DeviceNet® devices**

Currently, no electronic storage or 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.

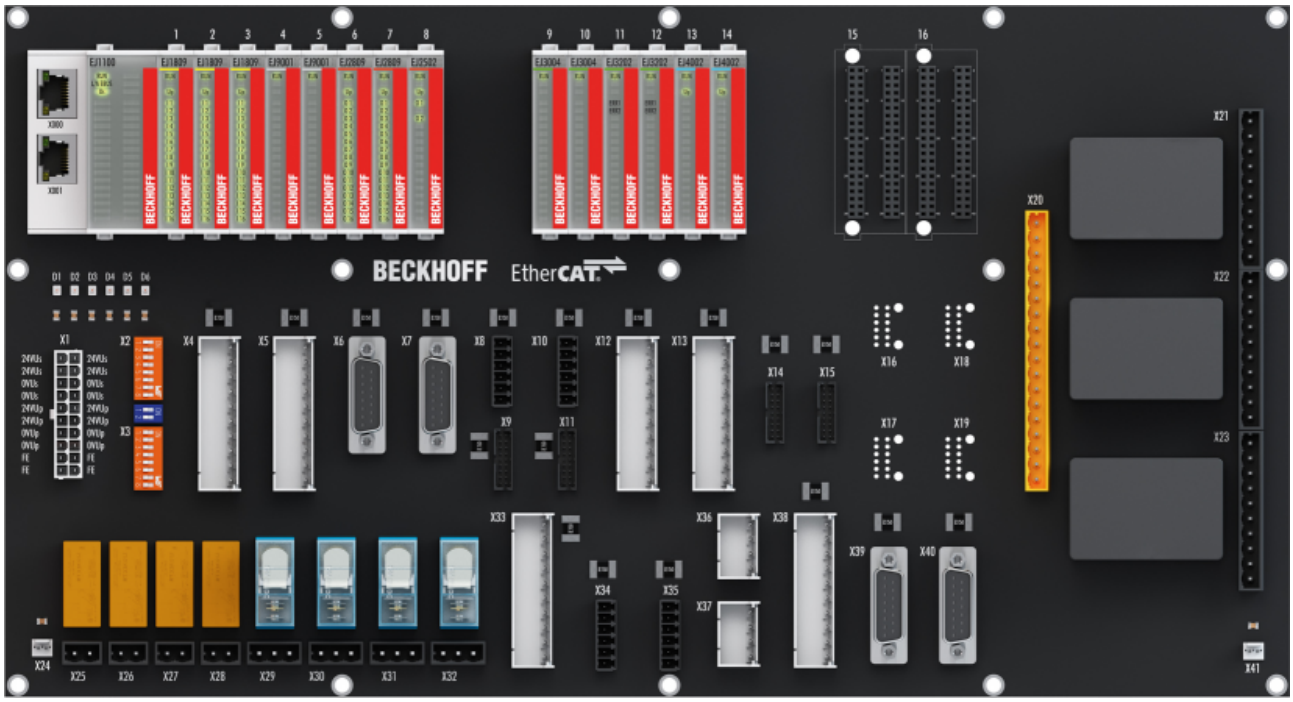



Fig. 6: EJ system sample

### 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 EJ1809, EJ1819 - Product description

## 3.1 Introduction

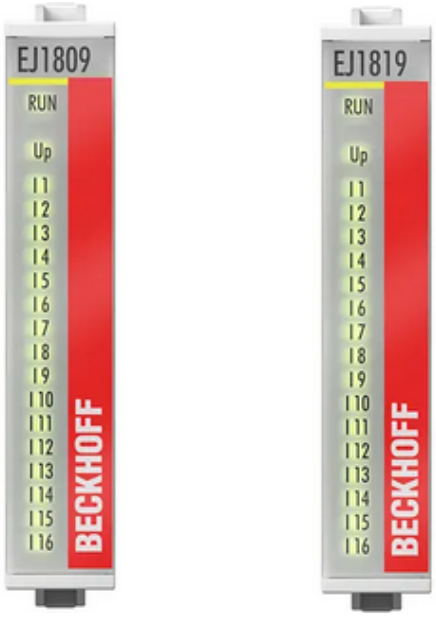



Fig. 7: EJ1809, EJ1819

**EtherCAT plug-in module, 16-channel digital input, 24 $V_{DC}$**

The digital input modules EJ1809 and EJ1819 log the binary control signals from the process level and transmit them, electrically isolated, to the higher-level automation device. The EtherCAT plug-in modules have 16 channels. LEDs indicate the signal states.
The reference ground for all inputs is the 0 V power contact pin.

The digital inputs of the module EJ1809 have a 3 ms input filter.
The digital inputs of the module EJ1819 have a 10 µs input filter.

## 3.2 Technical data

| Technical data | EJ1809 | EJ1819 |
|---|---|---|
| Number of inputs | 16 | |
| Nominal voltage of the inputs | 24 $V_{DC}$ (-15% / +20%) | |
| Signal voltage “0” | -3 V ... 5 V (EN 61131-2, type 1/3) | |
| Signal voltage “1” | 11 V ... 30 V (EN 61131-2, type 3) | |
| Input current | typically 3 mA (EN 61131-2, type 3) | |
| Input filter | 3.0 ms typ. | 10 µs typ. |
| Distributed clocks | - | |
| Current consumption via E-bus | 80 mA typ. | |
| Electrical isolation | 500 V (E-bus/field voltage) | |
| Permissible ambient temperature range during operation | -25°C ... +60°C | |
| Permissible ambient temperature range during storage | -40°C ... +85°C | |
| Permissible relative 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 | |
| Installation position | Standard [▶ 35] | |
| Position of the coding pins [▶ 38] | 1 and 3 | |
| Color coding | yellow | |
| Vibration/shock resistance | conforms to EN 60068-2-6 / EN 60068-2-27<br>(with corresponding signal distribution board) | |
| EMC immunity/emission | conforms to EN 61000-6-2/EN 61000-6-4<br>(with corresponding signal distribution board) | |
| Protection class | EJ module: IP20,<br>EJ system: dependent on signal distribution board and housing | |
| Approvals/markings* | CE, EAC, UKCA,<br>cURus | |

*) 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

| EJ1809, EJ1819 | | | | |
|---|---|---|---|---|
| Pin# | | Signal | | |
| 1 | 2 | $U_{EBUS}$ | $U_{EBUS}$ | **E-bus contacts**<br>The power supply $U_{EBUS}$ is provided by the coupler and supplied from the supply voltage $U_S$ of the EtherCAT coupler. |
| 3 | 4 | GND | GND | |
| 5 | 6 | RX0+ | TX1+ | |
| 7 | 8 | RX0- | TX1- | |
| 9 | 10 | GND | GND | |
| 11 | 12 | TX0+ | RX1+ | |
| 13 | 14 | TX0- | RX1- | |
| 15 | 16 | GND | GND | |
| 17 | 18 | DI 9 | DI 1 | **Signals** |
| 19 | 20 | DI 10 | DI 2 | |
| 21 | 22 | DI 11 | DI 3 | |
| 23 | 24 | DI 12 | DI 4 | |
| 25 | 26 | DI 13 | DI 5 | |
| 27 | 28 | DI 14 | DI 6 | |
| 29 | 30 | DI 15 | DI 7 | |
| 31 | 32 | DI 16 | DI 8 | |
| 33 | 34 | 0V Up | 0V Up | **$U_P$ contacts**<br>The peripheral voltage $U_P$ supplies the electronics on the field side. |
| 35 | 36 | 0V Up | 24V Up | |
| 37 | 38 | 24V Up | 24V Up | |
| 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 |
| DI1 ... DI16 | Digital inputs 1 ... 16 |
| 0V Up | GND signal field side |
| 24V Up | Power supply field side 24 V |
| SGND | Shield Ground |

Fig. 8: EJ1809, EJ1819 - Pinout

The PCB footprint can be downloaded from the Beckhoff homepage (EJ1809, EJ1819).

**NOTICE**

**Damage to devices possible!**

Before installation and commissioning read the chapters Installation of EJ modules [▶ 30] and Commissioning [▶ 47]!

## 3.4 LEDs

| LED No. | EJ1809 |
|---|---|
| A | RUN |
| B | |
| C | Up |
| | |
| 1 | I 1 |
| 2 | I 2 |
| 3 | I 3 |
| 4 | I 4 |
| 5 | I 5 |
| 6 | I 6 |
| 7 | I 7 |
| 8 | I 8 |
| 9 | I 9 |
| 10 | I 10 |
| 11 | I 11 |
| 12 | I 12 |
| 13 | I 13 |
| 14 | I 14 |
| 15 | I 15 |
| 16 | I 16 |

| LED No. | EJ1819 |
|---|---|
| A | RUN |
| B | |
| C | Up |
| | |
| 1 | I 1 |
| 2 | I 2 |
| 3 | I 3 |
| 4 | I 4 |
| 5 | I 5 |
| 6 | I 6 |
| 7 | I 7 |
| 8 | I 8 |
| 9 | I 9 |
| 10 | I 10 |
| 11 | I 11 |
| 12 | I 12 |
| 13 | I 13 |
| 14 | I 14 |
| 15 | I 15 |
| 16 | I 16 |

Fig. 9: EJ1809, EJ1819 - 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 standard-settings set |
| | | Single flash | Safe-Operational | State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync-Manager channels and the distributed clocks.<br>Outputs remain in safe state |
| | | on | Operational | State of the EtherCAT State Machine: **OP** = normal operating state; mailbox and process data communication are possible |
| | | flickering | Bootstrap | State of the EtherCAT State Machine:<br>**BOOTSTRAP** = function for firmware updates of the plug-in module |
| Up | green | off | - | No 24 $V_{DC}$ power supply connected |
| | | on | - | 24 $V_{DC}$ power supply connected |
| I1 ... I16 | green | off | - | Signal voltage "0" (-3 V ... 5 V) |
| | | on | - | Signal voltage "1" (11 V ... 30 V) |

# 4 EJ1859 - Product description

## 4.1 Introduction

Fig. 10: EJ1859

**EtherCAT plug-in module, 8-channel digital input + 8-channel digital output, 24 $V_{DC}$, 3 ms, 0.5 A**

The digital EtherCAT plug-in module EJ1859 combines eight digital inputs and eight digital outputs in a single device. The inputs have typically a 3.0 ms filter. The outputs handle load currents of up to 0.5 A, are short-circuit proof and protected against inverse polarity. The signal state of the channels is indicated by LEDs.

The reference ground for all inputs is the 0 V power contact, the outputs are supplied via the 24 V power contact.

## 4.2 Technical data

| Technical data | EJ1859 |
|---|---|
| Number of channels | 8 inputs + 8 outputs |
| Nominal voltage of the inputs | 24 $V_{DC}$ (-15% / +20%) |
| Signal voltage “0” | -3 V ... 5 V (EN 61131-2, type 1/3) |
| Signal voltage “1” | 11 V ... 30 V (EN 61131-2, type 3) |
| Input current | 3 mA typ. (EN 61131-2, type 3) |
| Input filter | 3.0 ms typ. |
| Distributed Clocks | - |
| Load type | ohmic, inductive, lamp load |
| Output current | max. 0.5 A per channel |
| Reverse voltage protection | yes |
| Breaking energy (ind.) max. | < 150 mJ/channel |
| Switching times | $T_{ON}$: 60 µs, $T_{OFF}$: 300 µs typ. |
| Current consumption via E-bus | typ. 90 mA |
| Electrical isolation | 500 V (E-bus/field voltage) |
| Permissible ambient temperature range during operation | -25°C ... +60°C |
| Permissible ambient temperature range during storage | -40°C ... +85°C |
| Permissible relative 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 |
| Installation position | Standard [▶ 35] |
| Position of the coding pins [▶ 38] | 2 and 3 |
| Color coding | yellow |
| Vibration/shock resistance | conforms to EN 60068-2-6 / EN 60068-2-27<br>(with corresponding signal distribution board) |
| EMC immunity/emission | conforms to EN 61000-6-2/EN 61000-6-4<br>(with corresponding signal distribution board) |
| Protection class | EJ module: IP20,<br>EJ system: dependent on signal distribution board and housing |
| Approvals/markings* | CE, EAC, UKCA,<br>cURus |

*) 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.

## 4.3 Pinout

| EJ1859 | | | | |
|---|---|---|---|---|
| Pin# | | Signal | | |
| 1 | 2 | $U_{EBUS}$ | $U_{EBUS}$ | **E-bus contacts**<br>The power supply $U_{EBUS}$ is provided by the coupler and supplied from the supply voltage $U_S$ of the EtherCAT coupler. |
| 3 | 4 | GND | GND | |
| 5 | 6 | RX0+ | TX1+ | |
| 7 | 8 | RX0- | TX1- | |
| 9 | 10 | GND | GND | |
| 11 | 12 | TX0+ | RX1+ | |
| 13 | 14 | TX0- | RX1- | |
| 15 | 16 | GND | GND | |
| 17 | 18 | DO 1 | DI 1 | **Signals** |
| 19 | 20 | DO 2 | DI 2 | |
| 21 | 22 | DO 3 | DI 3 | |
| 23 | 24 | DO 4 | DI 4 | |
| 25 | 26 | DO 5 | DI 5 | |
| 27 | 28 | DO 6 | DI 6 | |
| 29 | 30 | DO 7 | DI 7 | |
| 31 | 32 | DO 8 | DI 8 | |
| 33 | 34 | 0V Up | 0V Up | **$U_P$ contacts**<br>The peripheral voltage $U_P$ supplies the electronics on the field side. |
| 35 | 36 | 0V Up | 24V Up | |
| 37 | 38 | 24V Up | 24V Up | |
| 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 |
| DO1 ... DO8 | Digital outputs 1 ... 8 |
| DI1 ... DI8 | Digital inputs 1 ... 8 |
| 0V Up | GND signal field side |
| 24V Up | Power supply field side 24 V |
| SGND | Shield Ground |

Fig. 11: EJ1859 - Pinout

The PCB footprint can be downloaded from the Beckhoff homepage.

**NOTICE**

**Damage to devices possible!**

Before installation and commissioning read the chapters Installation of EJ modules [▶ 30] and Commissioning [▶ 47]!

## 4.4 LEDs

| LED No. | EJ1859 |
|---|---|
| A | RUN |
| B | |
| C | Up |
| | |
| 1 | I 1 |
| 2 | I 2 |
| 3 | I 3 |
| 4 | I 4 |
| 5 | I 5 |
| 6 | I 6 |
| 7 | I 7 |
| 8 | I 8 |
| 9 | O1 |
| 10 | O2 |
| 11 | O3 |
| 12 | O4 |
| 13 | O5 |
| 14 | O6 |
| 15 | O7 |
| 16 | O8 |

Fig. 12: EJ1859 - 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 standard-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 are possible |
| | | flickering | Bootstrap | State of the EtherCAT State Machine: **BOOTSTRAP** = function for firmware updates of the plug-in module |
| Up | green | off | - | No 24 $V_{DC}$ power supply connected |
| | | on | - | 24 $V_{DC}$ power supply connected |
| I1 ... I8 | green | off | - | Signal voltage "0" (-3 V ... 5 V) |
| | | on | - | Signal voltage "1" (11 V ... 30 V) |
| O1 ... O8 | green | off | - | no output voltage |
| | | on | - | +24 $V_{DC}$ output voltage |

# 5 EJ1889 - Product description

## 5.1 Introduction

Fig. 13: EJ1889

**EtherCAT plug-in module, 16-channel digital input, 24 $V_{DC}$, 3 ms input filter, ground switching**

The digital input module EJ1889 logs the binary control signals from the process level and transmits them, electrically isolated, to the higher-level automation device.

The EtherCAT plug-in module has 16 channels, whose signal states are indicated by LEDs.
The digital inputs have a 3 ms input filter.

The EJ1889 EtherCAT plug-in module has the 24 V-$U_P$-contact as reference point for all inputs.

## 5.2 Technical data

| Technical data | EJ1889 |
|---|---|
| Number of inputs | 16 (ground switching) |
| Nominal voltage of the inputs | 24 $V_{DC}$ (-15% / +20%) |
| Signal voltage “0” | 18 V ... 30 V |
| Signal voltage “1” | 0 V ... 7 V |
| Input current | typ. 3 mA |
| Input filter | typical 3,0 ms |
| Distributed Clocks | - |
| Current consumption via E-bus | typ. 80 mA |
| Electrical isolation | 500 V (E-bus/field voltage) |
| Permissible ambient temperature range during operation | -25°C ... +60°C |
| Permissible ambient temperature range during storage | -40°C ... +85°C |
| Permissible relative 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 |
| Installation position | Standard [▶ 35] |
| Position of the coding pins [▶ 38] | 1 and 3 |
| Color coding | yellow |
| Vibration/shock resistance | conforms to EN 60068-2-6 / EN 60068-2-27<br>(with corresponding signal distribution board) |
| EMC immunity/emission | conforms to EN 61000-6-2/EN 61000-6-4<br>(with corresponding signal distribution board) |
| Protection class | EJ module: IP20,<br>EJ system: dependent on signal distribution board and housing |
| Approvals/markings* | CE, EAC, UKCA,<br>cURus |

*) 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.

## 5.3 Pinout

| EJ1889 | | | | |
|---|---|---|---|---|
| Pin# | | Signal | | |
| 1 | 2 | $U_{EBUS}$ | $U_{EBUS}$ | **E-bus contacts**<br>The power supply $U_{EBUS}$ is provided by the coupler and supplied from the supply voltage $U_S$ of the EtherCAT coupler. |
| 3 | 4 | GND | GND | |
| 5 | 6 | RX0+ | TX1+ | |
| 7 | 8 | RX0- | TX1- | |
| 9 | 10 | GND | GND | |
| 11 | 12 | TX0+ | RX1+ | |
| 13 | 14 | TX0- | RX1- | |
| 15 | 16 | GND | GND | |
| 17 | 18 | DI 9 | DI 1 | **Signals** |
| 19 | 20 | DI 10 | DI 2 | |
| 21 | 22 | DI 11 | DI 3 | |
| 23 | 24 | DI 12 | DI 4 | |
| 25 | 26 | DI 13 | DI 5 | |
| 27 | 28 | DI 14 | DI 6 | |
| 29 | 30 | DI 15 | DI 7 | |
| 31 | 32 | DI 16 | DI 8 | |
| 33 | 34 | 0V Up | 0V Up | **$U_P$ contacts**<br>The peripheral voltage $U_P$ supplies the electronics on the field side. |
| 35 | 36 | 0V Up | 24V Up | |
| 37 | 38 | 24V Up | 24V Up | |
| 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 |
| DI1 ... DI16 | Digital inputs 1 ... 16 |
| 0V Up | GND signal field side |
| 24V Up | Power supply field side 24 V |
| SGND | Shield Ground |

Fig. 14: EJ1889 - Pinout

The PCB footprint can be downloaded from the Beckhoff homepage (EJ1889).

**NOTICE**

**Damage to devices possible!**

Before installation and commissioning read the chapters Installation of EJ modules [▶ 30] and Commissioning [▶ 47]!

## 5.4 LEDs

| LED No. | EJ1889 |
|---|---|
| A | RUN |
| B | |
| C | Up |
| | |
| 1 | I 1 |
| 2 | I 2 |
| 3 | I 3 |
| 4 | I 4 |
| 5 | I 5 |
| 6 | I 6 |
| 7 | I 7 |
| 8 | I 8 |
| 9 | I 9 |
| 10 | I 10 |
| 11 | I 11 |
| 12 | I 12 |
| 13 | I 13 |
| 14 | I 14 |
| 15 | I 15 |
| 16 | I 16 |

Fig. 15: EJ1889 - 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 standard-settings set |
| | | Single flash | Safe-Operational | State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync-Manager channels and the distributed clocks.<br>Outputs remain in safe state |
| | | on | Operational | State of the EtherCAT State Machine: **OP** = normal operating state; mailbox and process data communication are possible |
| | | flickering | Bootstrap | State of the EtherCAT State Machine:<br>**BOOTSTRAP** = function for firmware updates of the plug-in module |
| Up | green | off | - | No 24 $V_{DC}$ power supply connected |
| | | on | - | 24 $V_{DC}$ power supply connected |
| I1 ... I16 | green | off | - | Signal voltage "0" (18 V ... 30 V) |
| | | on | - | Signal voltage "1" (0 V ... 7 V) |

# 6 Installation of EJ modules

## 6.1 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 supply provides safe electrical isolation and limitation of the voltage without a connection to the protective conductor, a PELV supply also requires a safe connection to the protective conductor.

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:

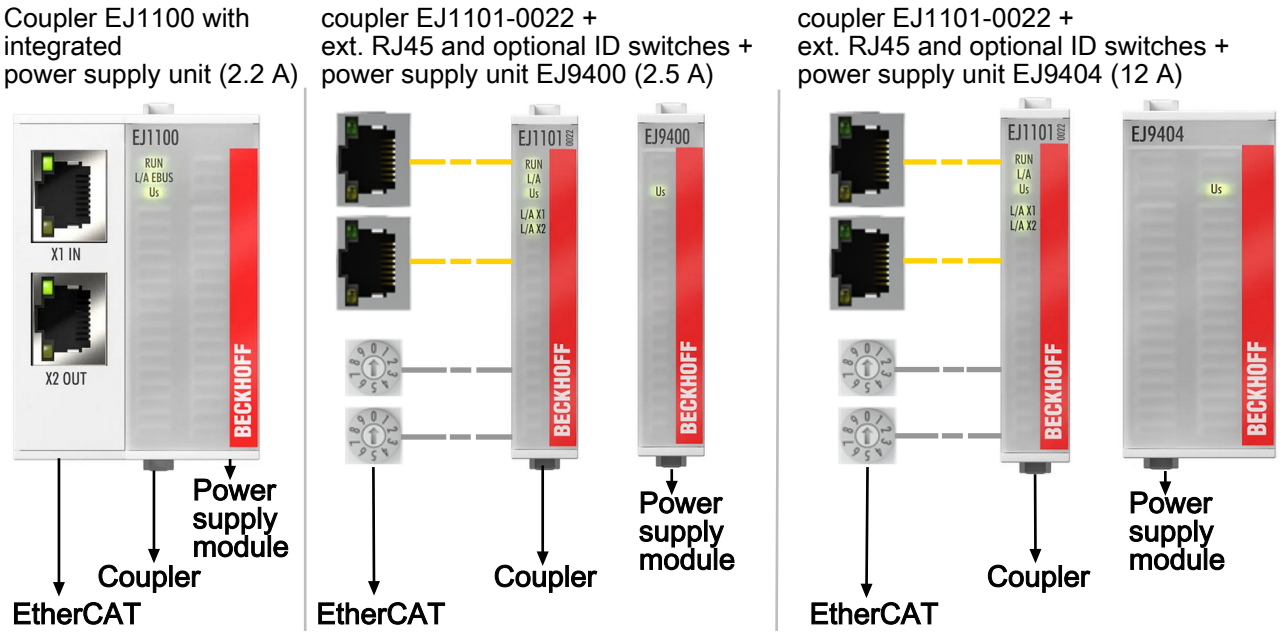



Fig. 16: E-bus power supply with EJ1100 or EJ1101-0022 + EJ940x

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

## 6.2 Note on load voltage supply

**⚠ WARNING**

**Load voltage supply**

Some devices permit an additional load voltage, e.g. 48 V DC, to be connected for the operation of a motor. In order to avoid stray currents on the protective conductor during operation, EN 60204-1:2018 provides for the possibility that the negative pole of the load voltage does not necessarily have to be connected to the protective conductor system (SELV).
Therefore, the load voltage supply should be designed as an SELV supply.

## 6.3 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) |

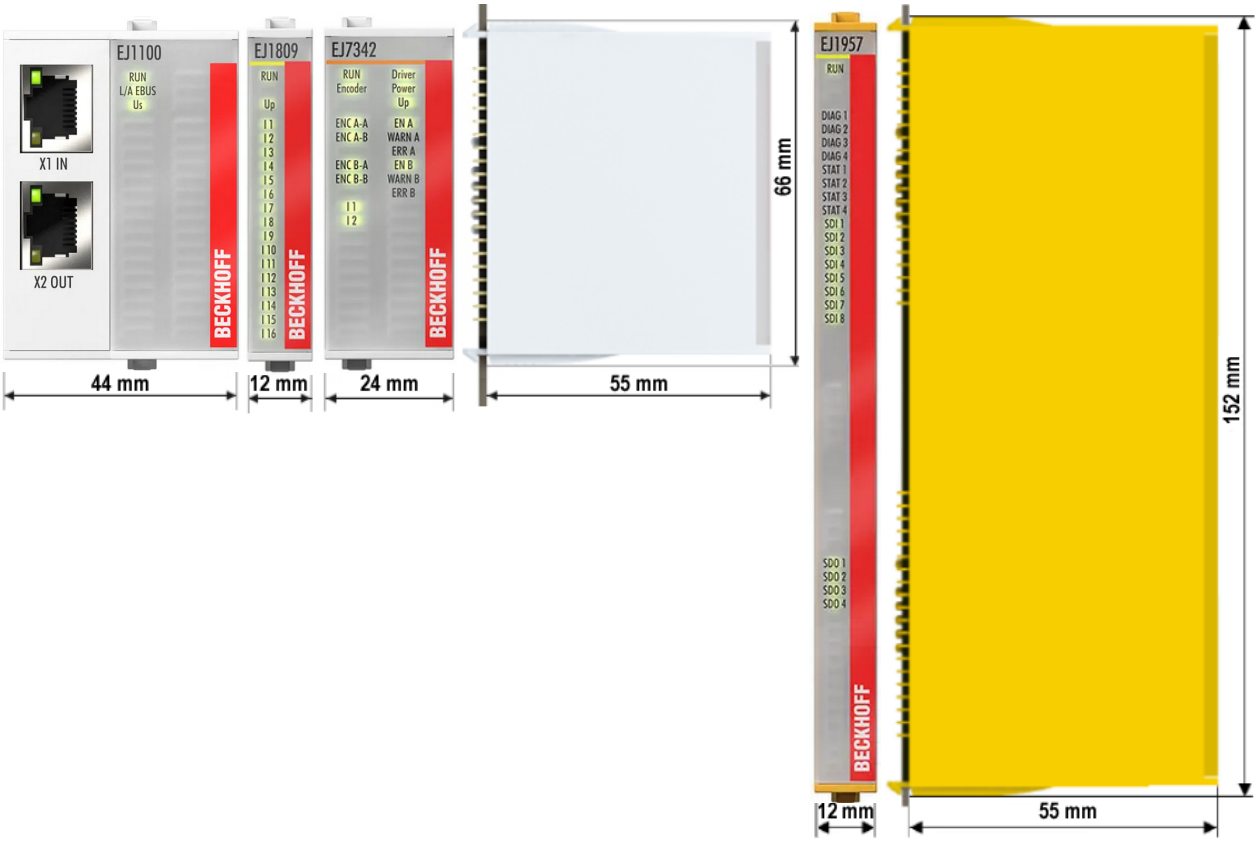



Fig. 18: EJxxxx - Dimensions

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

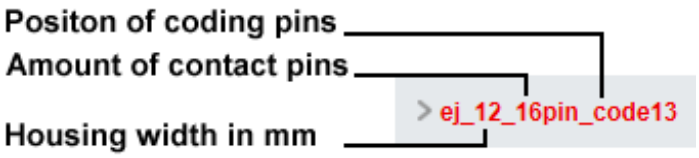



Fig. 19: Naming of the technical drawings

# 6.4 Installation positions and minimum distances

## 6.4.1 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.

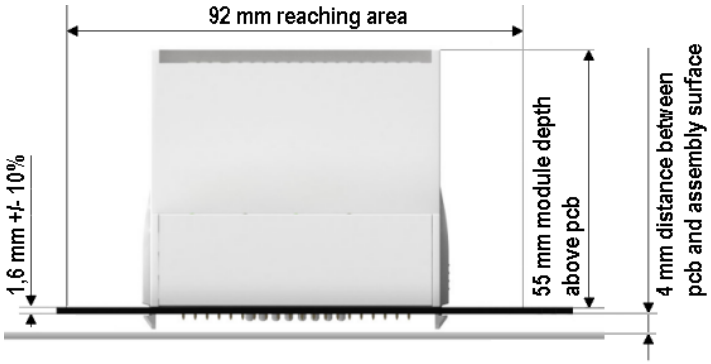



Fig. 20: Mounting distances EJ module - PCB

**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 [▶ 35]) 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.

## 6.4.2 Installation positions

**NOTICE**

**Constraints regarding installation position and operating temperature range**

Please refer to the technical data [▶ 27] 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.

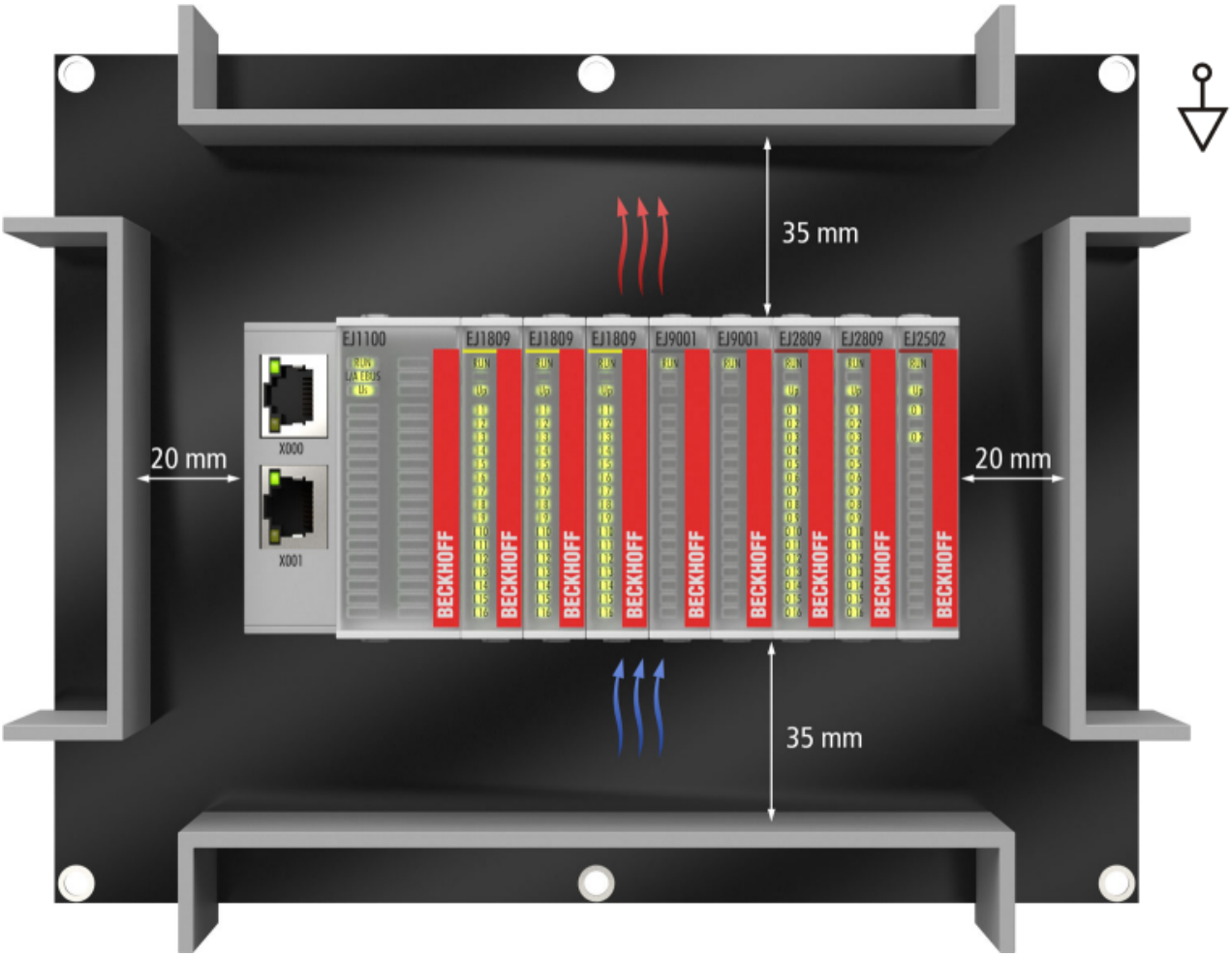



Fig. 21: Recommended distances for standard installation position

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.

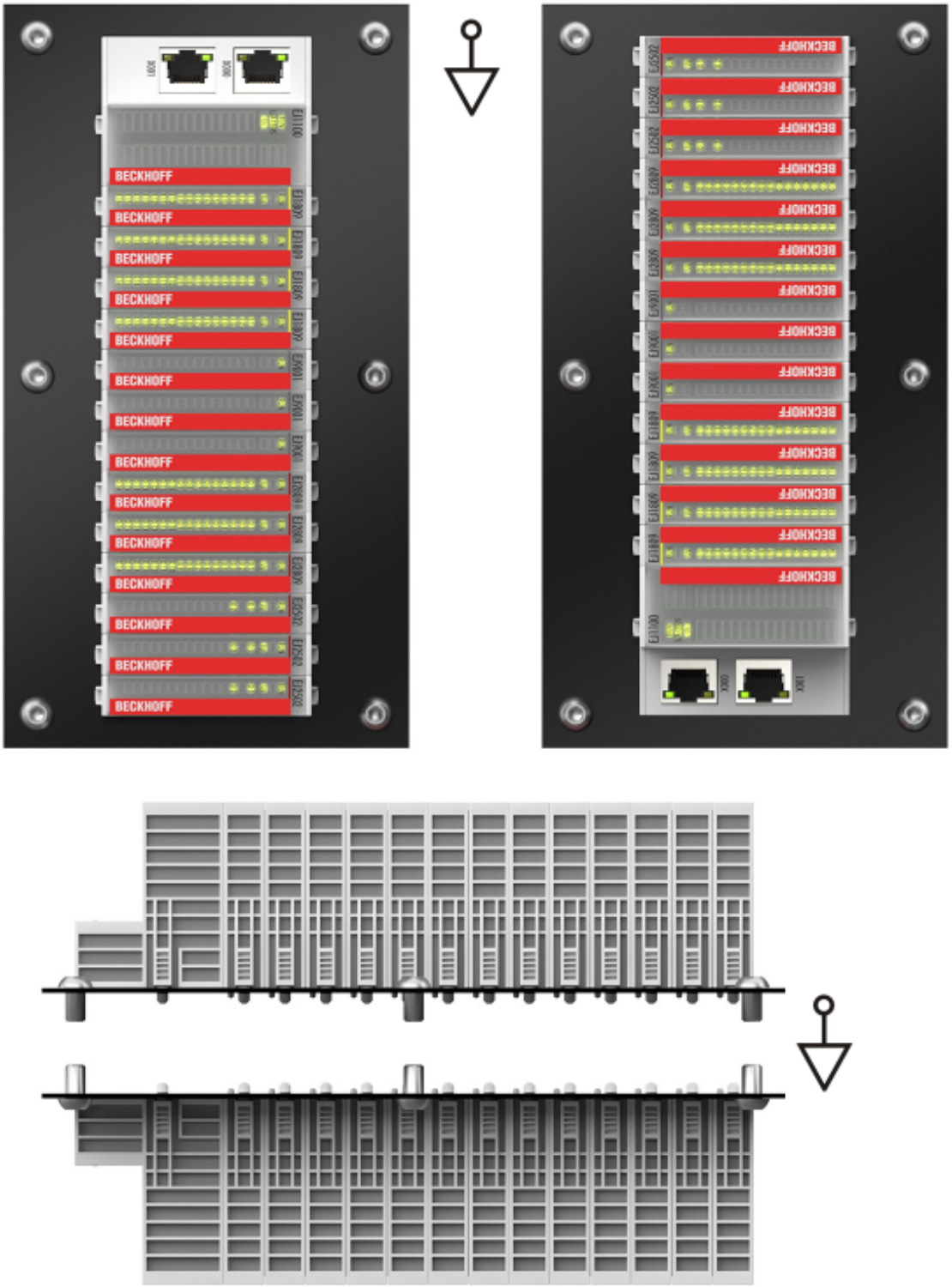


Fig. 22: Other installation positions

# 6.5 Codings

## 6.5.1 Color coding

Fig. 23: 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 |

## 6.5.2 Mechanical 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.

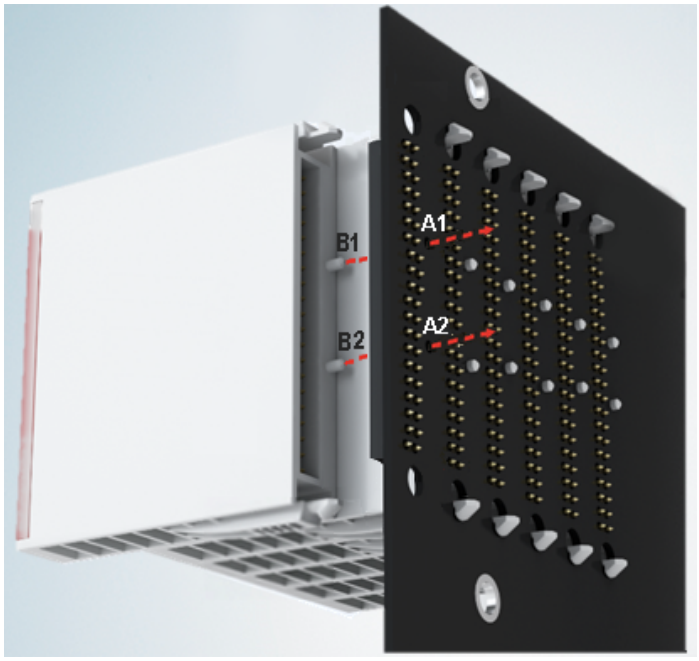



Fig. 24: Mechanical position coding with coding pins (B1 and B2) and coding holes (A1 and A2)

The following diagram shows the position of the 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.

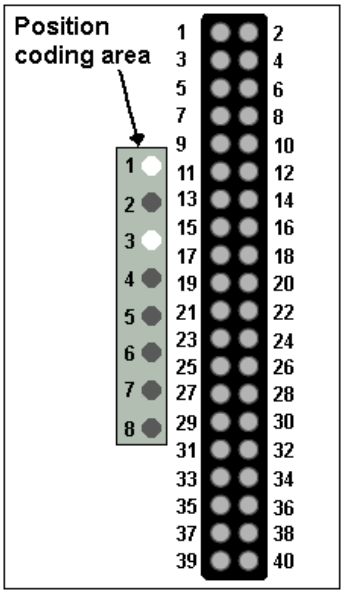



Fig. 25: Pin coding; sample: digital input modules

## 6.6 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**

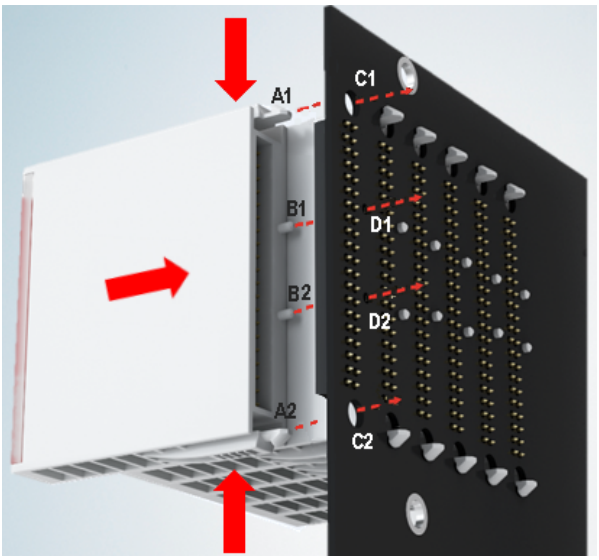
**Risk of injury through electric shock and damage to the device!**

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

***NOTICE***

**Risk of damage to components through electrostatic discharge!**

Observe the regulations for ESD protection.




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

Installation of EJ modules

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.

***NOTICE***

**Ensure safe latching of the modules on the signal distribution board**

- 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.

## 6.7 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

### 6.7.1 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.

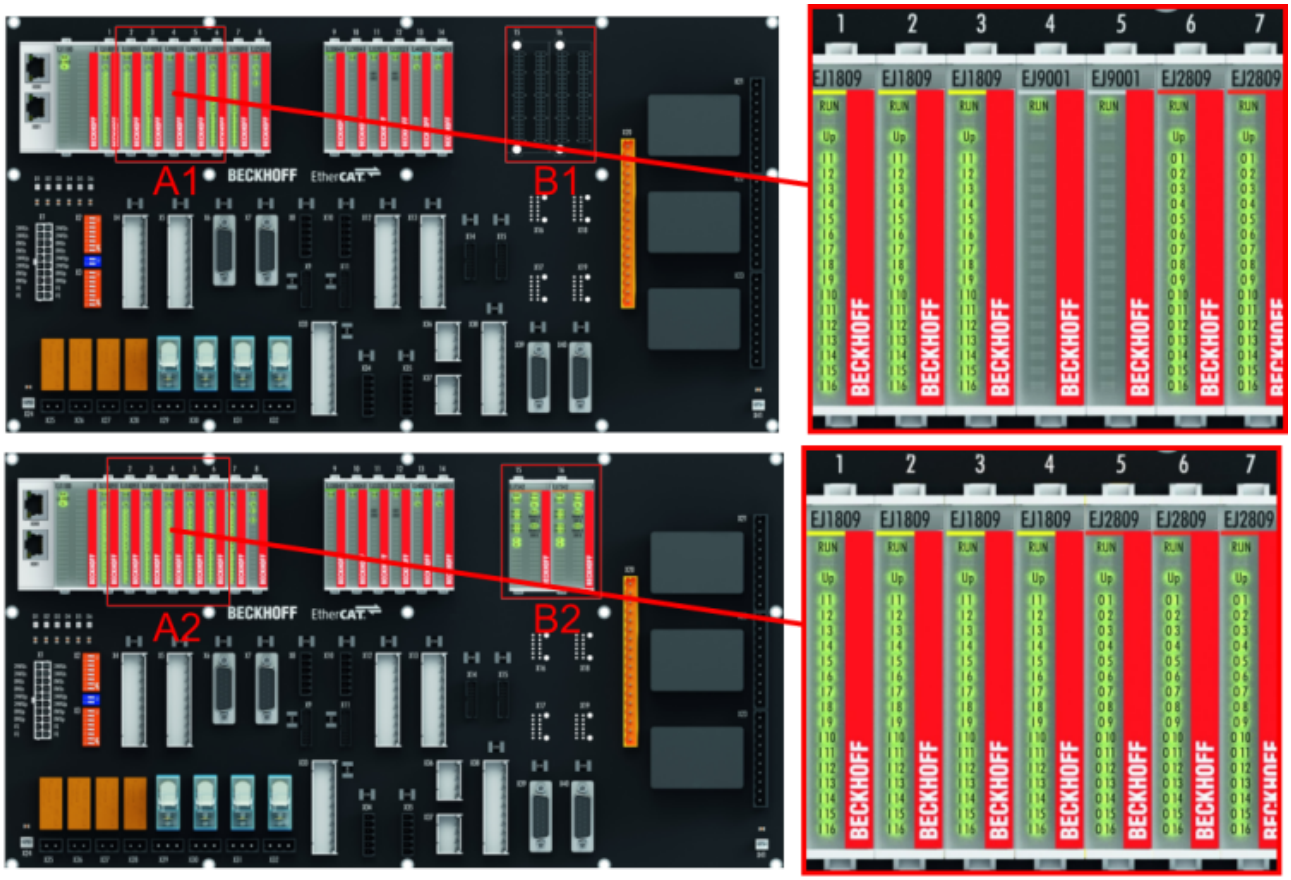



Fig. 26: Sample: Exchanging placeholder modules and assigning reserve slots

**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.

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

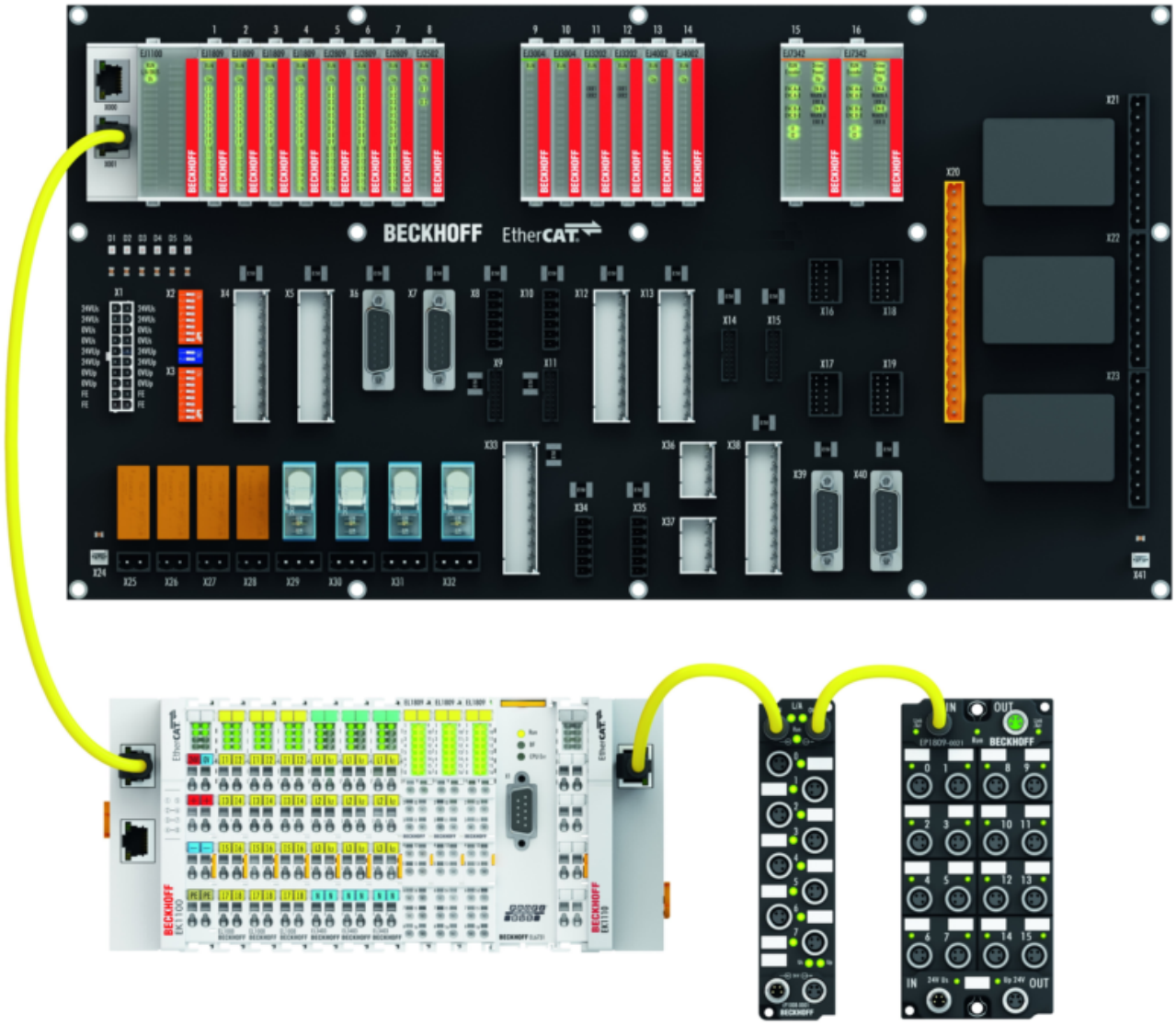



Fig. 27: Example of extension via an Ethernet/EtherCAT connection

## 6.8 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. 28: 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).

**NOTICE**

**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. 29: Example for the connection of a C6015 IPC to an EJ system

## 6.9 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.

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

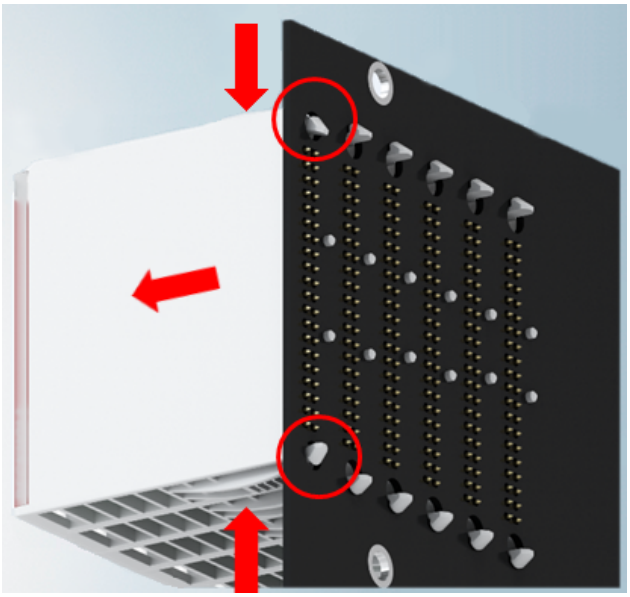


Fig. 30: Disassembly of EJ modules

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.

## 6.10 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.

# 7 EtherCAT basics

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

# 8 Commissioning

| NOTICE | |
|---|---|
| | **Damage to devices or loss of data**<br>Please refer to the EtherCAT System Documentation for commissioning basics of EtherCAT devices. |

# 9 Appendix

## 9.1 Documentation issue status

| Version | Comment |
|---|---|
| 1.6.0 | • Update chapter *Introduction*<br>• Update Technical data<br>• Update chapter *Installation of EJ modules*<br>• Update structure |
| 1.5 | • Update chapter *Marking of EtherCAT plug-in modules*<br>• Update Technical Data<br>• Chapter *Disposal* added<br>• Update structure |
| 1.4 | • New title page<br>• Update chapter *Pinout*<br>• 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*<br>• Update structure |
| 1.3 | • Note *Signal distribution board* added<br>• Chapter *Version identification of EtherCAT devices* replaced by chapter *Marking of EtherCAT plug-in modules*<br>• Update chapter *Pinout*<br>• Update chapter *Technical data* |
| 1.2 | • Chapter *Intended use* added<br>• Update Technical data<br>• Update chapter *Pinout*<br>• Update chapter *Installation of EJ modules*<br>• Update structure |
| 1.1 | • 1st publication EJ18xx<br>• EJ1819 added<br>• Update technical data<br>• Pinouts added<br>• Consolidation of EJ1809, EJ1859, EJ1889 -> EJ18xx |

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