User Manual

09/08 MN05002003Z-EN
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CAN digital modules
EC4E-221-6D4T1
EC4E-221-6D4R1

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Original Operating Instructions
The German-language edition of this document is the original operating manual.

Translation of the original operating manual
All editions of this document other than those in German language are translations of the original German manual.

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See revision protocol in the "About this manual" chapter

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Translation: globaldocs GmbH

Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.

- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).

Contents

Introduction

This manual describes how to install, commission and program the CAN digital modules EC4E-221-6D4T1 and EC4E-221-6D4R1.

A specialist knowledge of electrical engineering is needed for commissioning. When controlling active components such as motors or pressure cylinders, parts of the system can be damaged and persons put at risk if the CAN digital modules are connected or programmed incorrectly.

Device designation

Note: In this manual the modules EC4E-221-6D4T1 (with transistor outputs) and EC4E-221-6D4R1 (with relay outputs) are referred to simply as EC4E module or EC4E-221-…

Reading conventions

In this manual he following symbols are used and have the following meanings:

▶ indicates actions to be taken.

For greater clarity, the name of the current chapter is shown in the header of the left-hand page and the name of the current section in the header of the right-hand page. This does not apply to pages at the start of a chapter and empty pages at the end of a chapter.

Caution!
Warns of a hazardous situation that could result in damage to the product or components.

Warning!
Warns of the possibility of serious damage and slight injury.

Danger!
Warns of the possibility of a hazardous situation that could result in major damage and serious or fatal injury or even death.

Draws your attention to interesting tips and supplementary information.

1 EC4E Module

Task

The EC4E modules are remote expansion devices for the Eaton PLCs EC4P, XC100, XC121, XC200 and MFD4 or other CANopen masters. They feature six digital inputs and four digital outputs for 24 V signals. The devices can now also be connected through the CANopen bus system. They also offer local expansion possibilities.

Front view

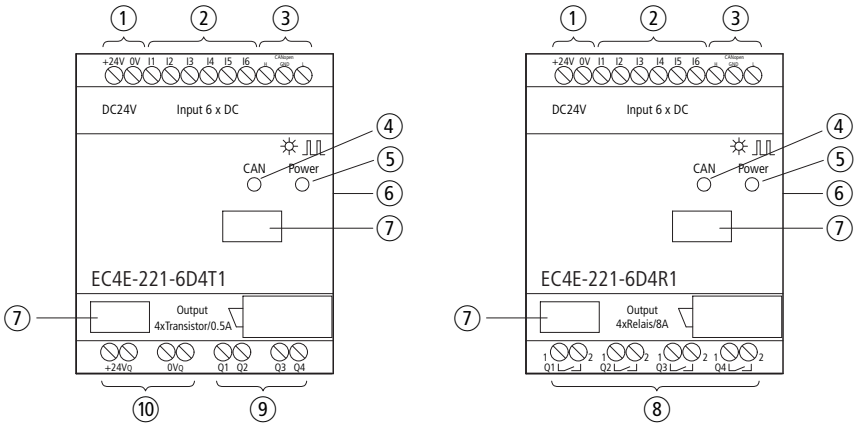

Figure 1: The EC4E modules and their components

① Supply voltage: 24 V DC
② Digital inputs I1 - I6
③ CAN-H, CAN-GND, CAN-LCAN H, CAN GND, CAN L
④ CAN LED
⑤ Power LED
⑥ Main link (easyLink)
⑦ Device label
⑧ Relay outputs Q1 - Q4
⑨ Transistor outputs Q1 - Q4
⑩ Supply voltage 24 V DC for the transistor outputs

Application

The EC4E module can be combined with one of the following Eaton PLCs:

- EC4P
- XC100
- XC121
- XC200
- MFD4

In all, 62 EC4E modules can be used as CAN slaves in combination with a control device, i.e., a CANopen network can contain up to 62 stations.

Removing

The EC4E module can be combined with exactly one easy expansion module per easyLink (plug-in contact on device side). The following expansion modules of the easy series can be used:

- EASY202-RE
- EASY410-…
- EASY618-…
- EASY620-…
- EASY406-…
- EASY411-…

→ See also section „Expansion modules“.

2 Engineering

Expansion modules

The digital module EC4E can be combined with the following easy expansion modules:

Expansion modules with digital inputs and outputs

- EASY202-RE
- EASY410-…
- EASY618-…
- EASY620-…

Expansion modules with analog and digital inputs and outputs

- EASY406-DC-ME
- EASY411-DC-ME

Basic device	Expansion unit
EC4E-221-…	EASY202-RE
	EASY4…
	EASY6…

Local expansion units are connected directly next to the basic unit. The two devices are interconnected through an easyLink connection (EASY-LINK-DS).

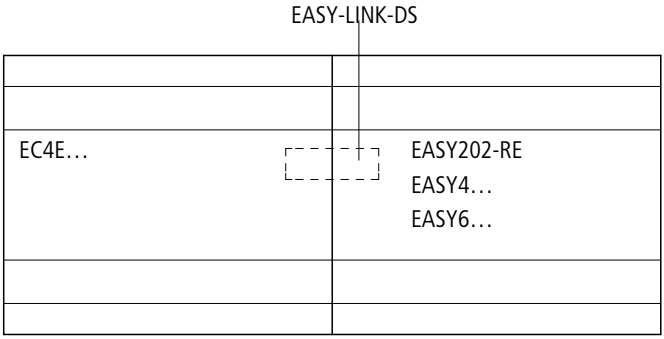

Figure 2: Connecting an expansion module to the EC4E module

EC4E in a CANopen network

The EC4E module is used together with expansion devices in a network. The communication protocol is CANopen (according to ISO 11898). The EC4E module is integrated in a CANopen environment with a standardized EDS (Electronic Data Sheet) file.

EDS files

For the various possible combinations of EC4E and expansion unit corresponding EDS files are available depending on the expansion unit. These are listed in the table below.

Table 1: The EDS files for the various hardware combinations

Basic device	Expansion unit	EDS file
EC4E-221-…	-	EC4E-221-6D4X.eds
EC4E-221-…	EASY202-RE EASY410-… EASY618-… EASY620-…	EC4E-221-6D4X+EASY202+EASY410_EASY6XX.eds
EC4E-221-…	EASY406-…	EC4E-221-6D4X+EASY406.eds
EC4E-221-…	EASY411-…	EC4E-221-6D4X+EASY411.eds

→ For detailed descriptions of the EDS files see chapter "Programming".

Maximum extent of system

A CANopen network consists of a PLC and at least one EC4E module. Up to 62 modules can be connected. Each of these is an active node in the CANopen network.

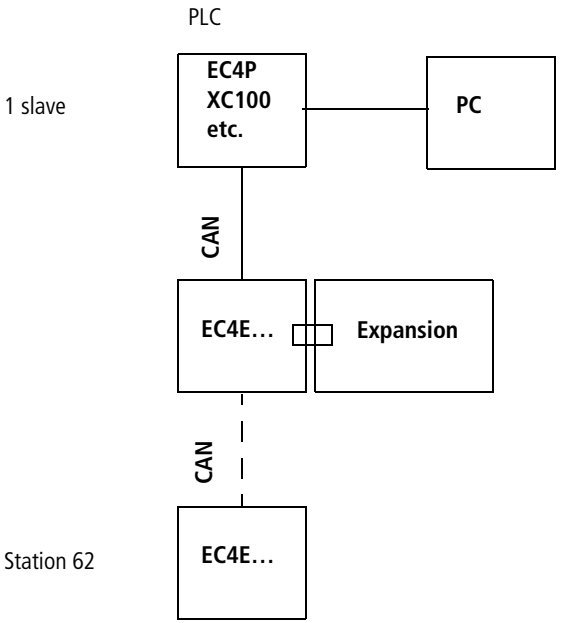

Figure 3: Schematic representation of an example CANopen environment consisting of a PLC and digital modules with an expansion unit

Maximum distances/bus cable lengths

The maximum baud rates that can be achieved with a given cable length are listed in the table below. The length of the CANopen bus cable is dependant on the conductor cross-section and the number of bus users connected.

Baud rate [kBit/s]	Bus cable length [m]
500	100
250	250
125	500
100	650
50, 20, 10	10000

→ For cable lengths above about 1000 m repeaters are needed.

Baud rate (data transfer speed)

The EC4E module automatically detects the baud rate. The maximum baud rate is 500 kbit/s.

Bus termination resistor

The bus ends are fitted with bus termination resistors with 120 ohms each. On the EC4E module the bus termination resistor is enabled with DIP switch 1 on the device's underside.

3 Installation

The EC4E-card must only be installed and wired up by qualified electricians or other persons familiar with the installation of electrical equipment.

The EC4E module is installed in the following order:

- Mounting,
- Wiring up the inputs,
- Wiring up the outputs,
- CAN-connect/separate to/from network
- Connecting the power supply.

Mounting

Install the EC4E module in a control panel, distribution board or other enclosure so that the power feed and terminal connections cannot accidentally come into contact during operation.

Snap-fit the EC4E module onto a DIN EN 50022 mounting rail or secure it with fastening brackets. You can fit the EC4E module vertically or horizontally.

Danger of electric shock!
Always disconnect the power supply before performing any electrical work on the device.

Always follow the safety rules:

- Switch off and isolate
- Verify isolation from the supply
- Secure against reclosing
- Short-circuit and ground
- Cover adjacent live parts.

If you are using the EC4E module with an expansion unit, connect the expansion unit before fitting the module. See figure in section „Connecting the expansion device".

Installation

For ease of wiring, leave a gap of at least 3 cm between the terminals and the wall or adjacent devices.

Mounting position

The MFD can be mounted either vertically or horizontally.

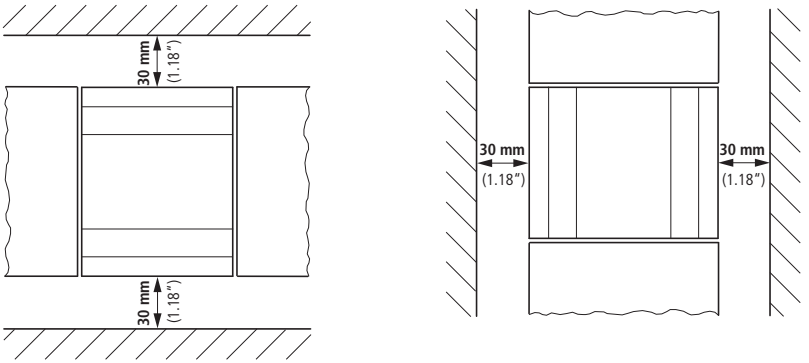

Figure 4: Possible mounting arrangements for the EC4E module (left: horizontal; right: vertical)

Mounting on top-hat rail

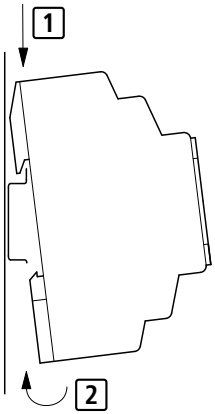

Figure 5: Mounting on top-hat rail

- ▶ Hook the EC4E module to the top edge of the top-hat rail and hinge into place while pressing down slightly. Press down lightly on both the device and the top-hat rail until the unit snaps over the lower edge of the top-hat rail. The EC4E module will clip into place automatically.
- ▶ Check that the device is seated firmly.

You can also mount the device vertically on a top-hat rail.

Screw mounting

For screw mounting on a mounting plate, fastening brackets must be used that can be fixed to the back of the EC4E-card. These brackets are available as an accessory.

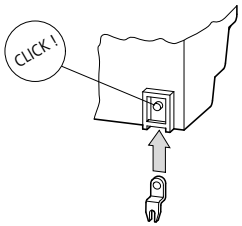

Figure 6: Inserting a fastening bracket

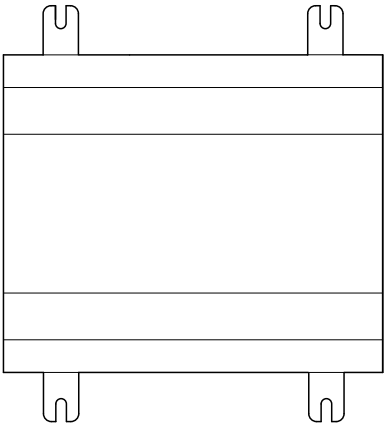

Figure 7: Screw mounting

Connection

To connect the digital module, use the following tools and materials.

Tools

Chase-screwdriver, width: 3.5 mm,
tightening torque: 0.6 Nm.

Cable cross-sections

- Solid: 0.2 to 4 mm²
- Flexible with ferrule: 0.2 to 2.5 mm²

CAN-connection cable

The EC4P (RJ45 connection) and EC4E (screw-type terminals) devices are connected to each other with a CAN connection cable EU4A-RJ45-CAB2.

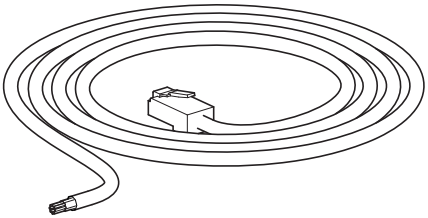

Figure 8: CAN connecting cable EU4A-RJ45-CAB2

Bus termination resistor

The physically first and last stations in the network must each be terminated with a bus termination resistor of 120 ohms. This is done on the device back with DIP switch 1 (→ figure 12 on page 21).

Connecting the power supply

The illustration below shows the default connection for the digital inputs.

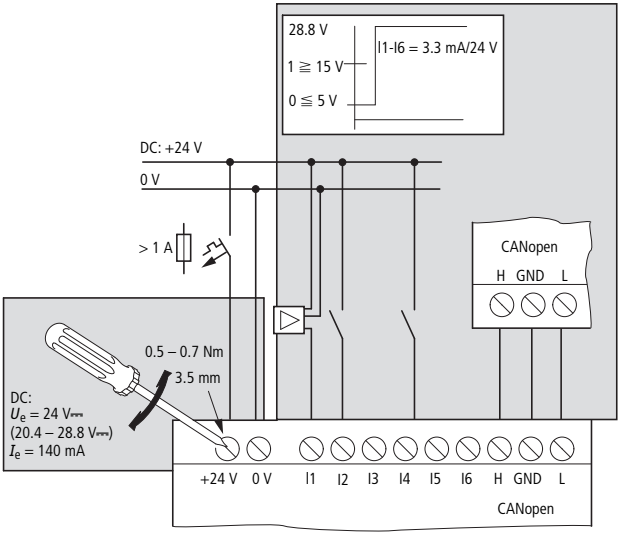

Figure 9: Standard connection of digital inputs

Connecting the relay outputs of EC4E-221-6D4R1

The illustration below shows the connection of the relay outputs of the EC4E-221-6D4R1.

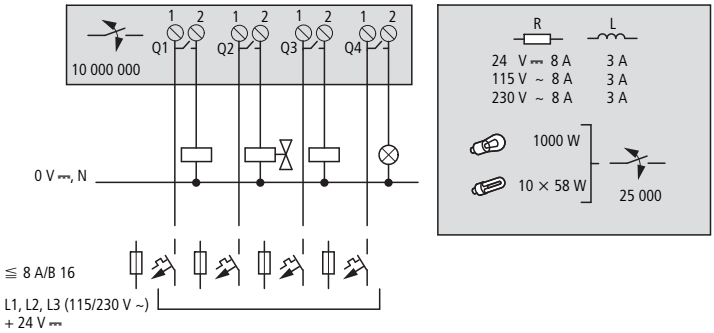

Figure 10: Connecting the relay outputs of EC4E-221-6D4R1

Connecting the transistor outputs of EC4E-221-6D4T1

The illustration below shows the connection of the transistor outputs of the EC4E-221-6D4T1.

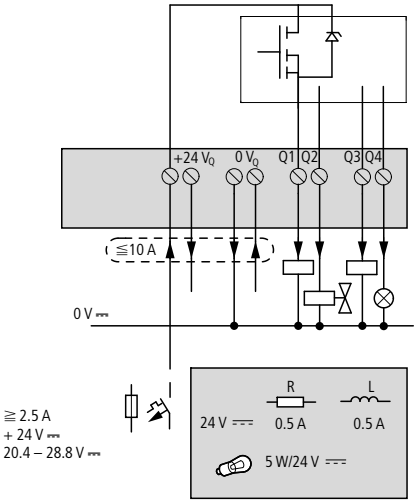

Figure 11: Connecting the transistor outputs of EC4E-221-6D4T1

Setting the station addresses (CAN addresses)

With the DIP switches at the rear of the EC4P module you set the station (CAN) addresses. The highest address is 63, i.e. a total of 62 devices can be connected, the remaining address being needed by the CAN master.

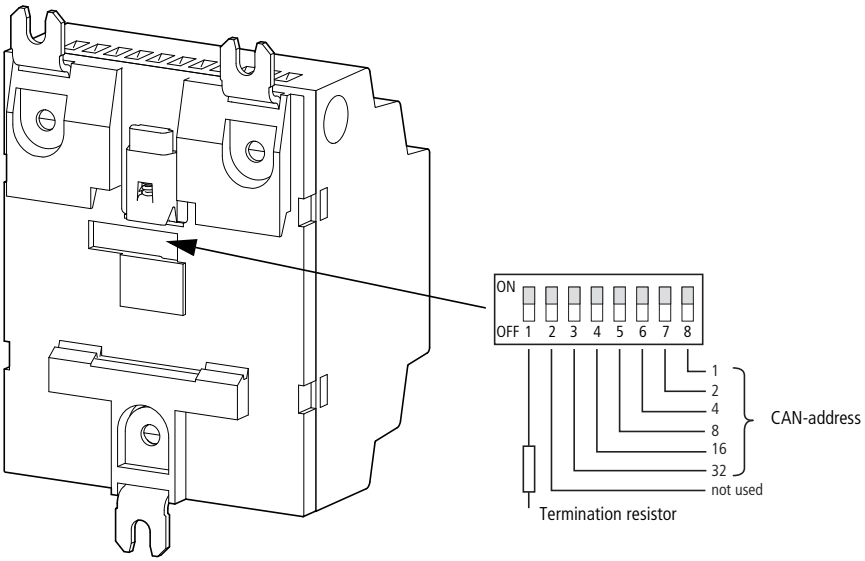

Figure 12: Setting the CAN addresses with the DIP switches

Baud rate

The baud rate does not have to be set on the EC4E-card as it is detected automatically.

Expansion

You can connect further devices to the EC4E module. These are interconnected through easyLink. Possible devices are listed above in section „Expansion modules“.

→ The expansion modules have their own power supply. Because the basic unit EC4E detects connected expansion modules when it is powered up, the expansion modules must also be connected to their power supply.

Connecting the expansion device

The following illustration shows how the digital module is connected to an expansion unit with easyLink and disconnected again.

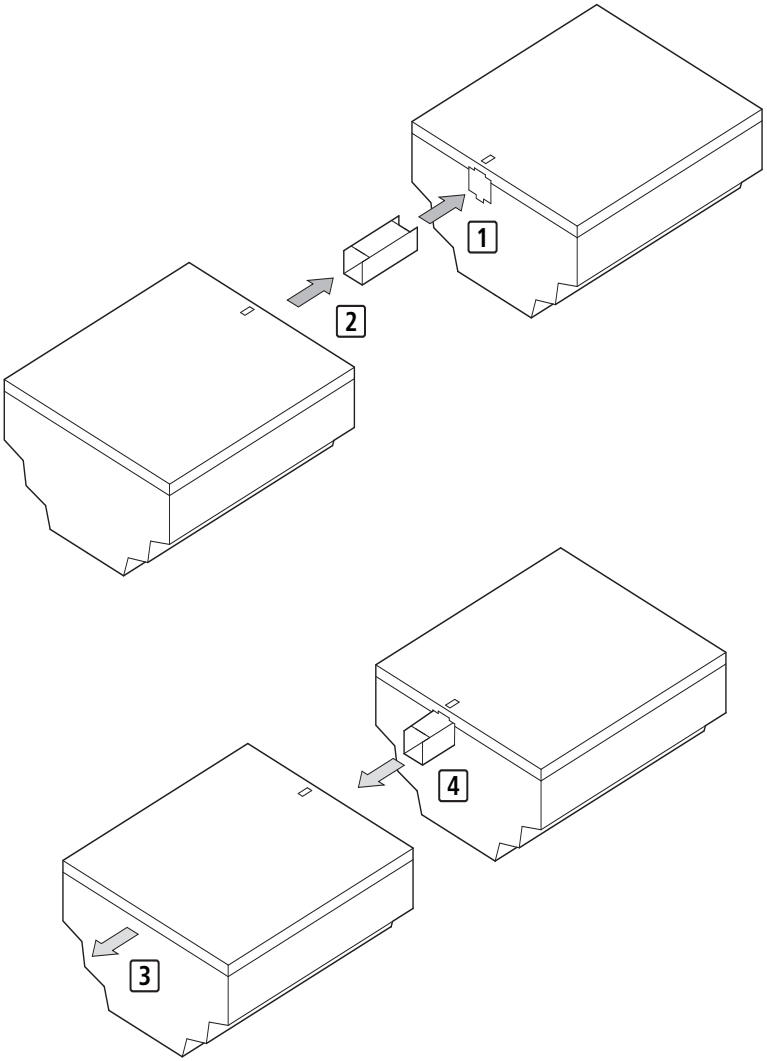

Figure 13: Fitting (1 and 2) and removing (3 and 4) am expansion unit

4 Programming

Digital module EC4E can be used in a CANopen environment together with expansion modules. With the easySoft CoDeSys software the associated Eaton PLC can be programmed. Depending on the used expansion unit, and its inputs and outputs various existing control files are available. These are in the EDS format.

Below is a description of how the digital and analog inputs and outputs of the EC4E modules and expansion units can be integrated in an easySoft CoDeSys project.

The individual steps are:

- Inserting CAN libraries.
- Creating a CAN master.
- Setting the CAN master's parameters.
- Selecting an EDS file.
- Setting the EC4E module's CAN parameters.

In the case of an expansion unit with analog inputs:

- Changing the value in "Service Data Objects"

CAN-libraries paste

▶ With the Library Manager, insert the library file 3S_CANopenMaster.lib into your project. The two library files 3S_CANopenManager.lib and 3S_CanDrv.lib are automatically inserted as well.

Creating a CAN master

▶ In your easySoft CoDeSys project in the Object Organizer under object category "Resources" double-click the item "Control Configuration". In the right window (working area) the PLC is then shown. Right-click the PLC and select "Attach subelement > CanMaster…" to create a CAN master.

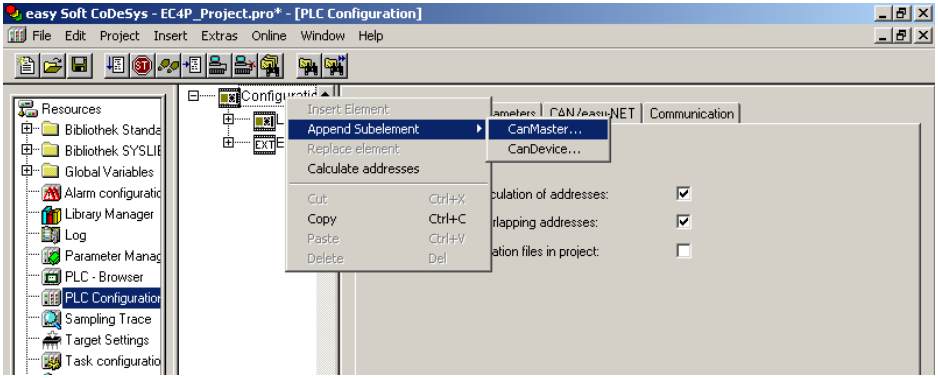

Figure 14: Creating the CAN master

In the "CAN parameters" tab you can set the master's baud rate and CAN address (field: Node-Id). To do this, click the CAN master you have created and select the "CAN parameters" tab.

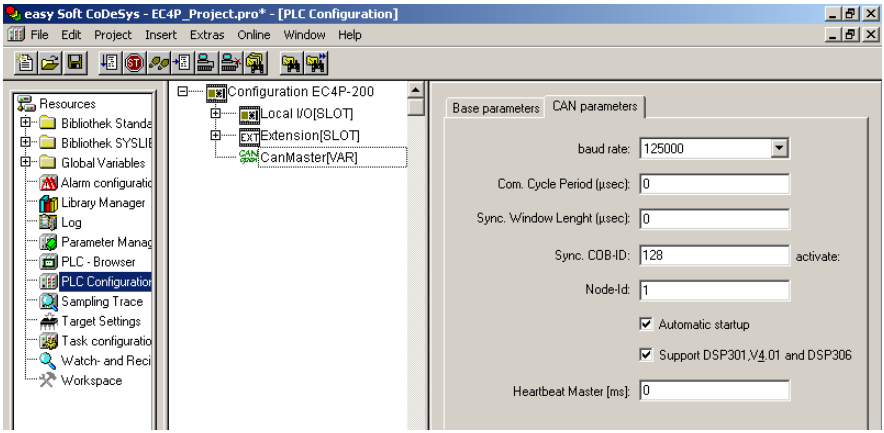

Figure 15: Setting the baud rate and the CAN address (Node-Id) of the CAN master

Setting the CAN master's parameters

On the two tabs "Base parameters" and "CAN parameters" you can define the CAN master's input and output address as well as further parameters.

Selecting an EDS file

To select the right EDS file for your project, do the following:

▶ Right-click the CAN master and select "Attach subelement". All EDS files in directory PLCConf are then displayed. The directory PLCConf was created automatically during the installation of easySoft CoDeSys.

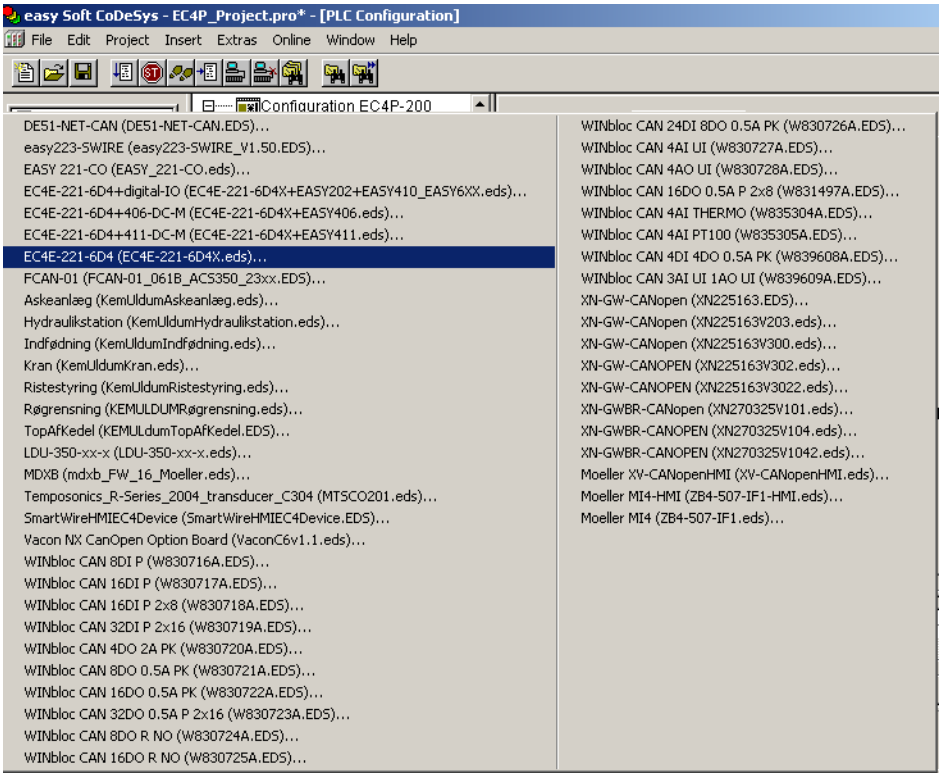

Figure 16: List of existing EDS files

▶ Click the EDS file for your hardware combination (EC4E module with or without expansion unit) to select it. In the working area the EDS file then appears as a node below the CAN master. Below the EDS file a list of input and output addresses ("Can-Input" and "Can-Output") appears.

The EDS files for the EC4E module

The EDS files that can be used with an EC4E module with or without a fitted expansion unit are listed in the table below.

Table 2: The EDS files for the EC4E module without and with expansion unit

Basic device	Expansion unit	EDS file
EC4E-221-…	-	EC4E-221-6D4X.eds
EC4E-221-…	EASY202-RE EASY410-… EASY618-… EASY620-…	EC4E-221-6D4X+EASY202+EASY410_EASY6XX.eds
EC4E-221-…	EASY406-…	EC4E-221-6D4X+EASY406.eds
EC4E-221-…	EASY411-…	EC4E-221-6D4X+EASY411.eds

Setting the EC4E module's CAN parameters

▶ Click the attached EDS file. In the "CAN parameters" tab set the CAN address (Node-Id) for the EC4E module.

The EC4E module can be monitored by setting up node guarding. To do this, select the field "Nodeguarding" in the "Nodeguard" section; under "Guard Time" enter a time interval and under "Life Time Factor" a suitable value.

You can ignore the tabs "PDO-Mapping Receive" and "PDO-Mapping Send".

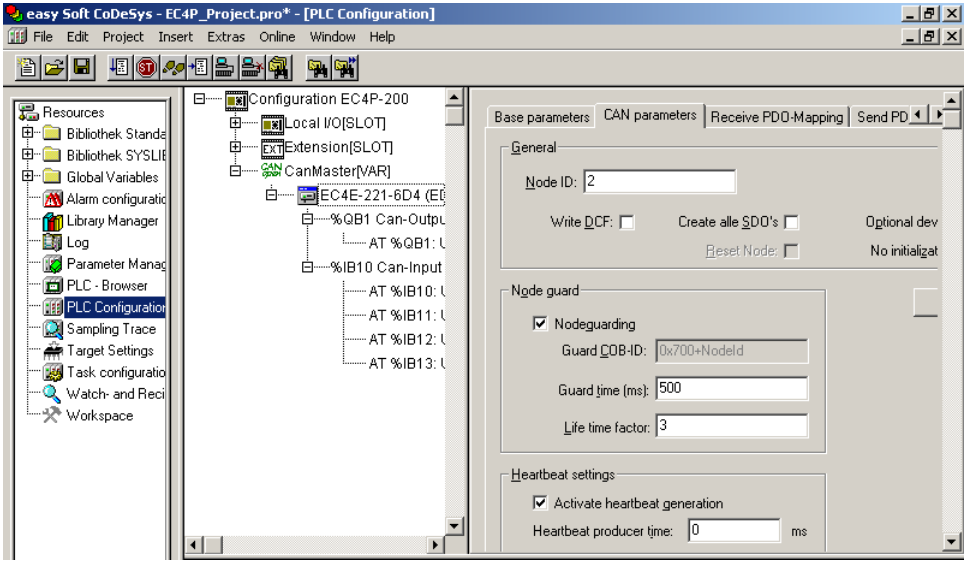

Figure 17: Setting the CAN address (Node-Id) and Nodeguarding for the EC4E module

Below the input and output addresses for the various EDS files are described.

Changing the value in "Service Data Objects"

▶ To use analog inputs of the expansion unit, select the "Service Data Objects" tab and set "Analogue input global interrupt enable" to "1". Otherwise no values are transmitted for analog inputs!

You have now made all required settings. The following section contains information about the CAN input and output addresses.

Input and output addresses

Depending on your hardware combination (i.e. with or without expansion unit and digital or analog inputs and outputs) various CAN input and output addresses must be observed.

EC4E-card without expansion unit (EC4E-221-6D4X.eds)

EDS file EC4E-221-6D4X.eds is used for the EC4E module without expansion unit.

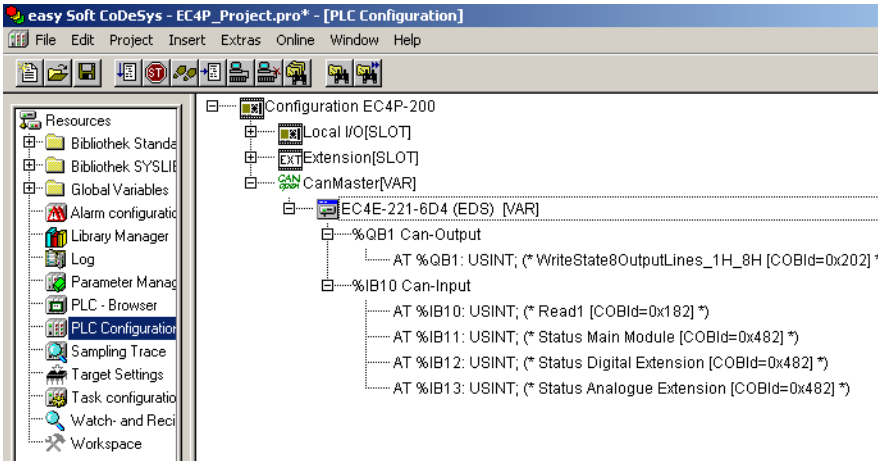

Figure 18: Input and output addresses for the EC4E module without expansion unit

WriteState8OutputLines_1H_8H:
The digital outputs Q1 to Q4 of EC4E-card

READ1:
The digital inputs I1 to I6 of EC4E-card

Status bits
The meaning of the status bits are listed below.

Basic device: "Status Main Module"

Bit	7	6	5	4	3	2	1	0
Meaning							Overload, digital outputs 1-4	Expansion present

Digital expantion: "status extension"

Bit	7	6	5	4	3	2	1	0
Meaning							Overload, digital outputs 1-4	Overload, digital outputs 5-8

Analog expansion: "Analog Extension Status"

Bit	7	6	5	4	3	2	1	0
Meaning					Overload, digital outputs 1-2	short-circuit analog outputs	Cable break PT100	Open circuit, current measurement

→ The appendix contains a programming example.

EC4E module and expansion unit with digital inputs and outputs (EC4E-221-6D4X+EASY202+EASY410_EASY6XX.eds)

EDS file EC4E-221-6D4X+EASY202+EASY410_EASY6XX.eds is used for the EC4E module with an expansion unit with digital inputs and outputs.

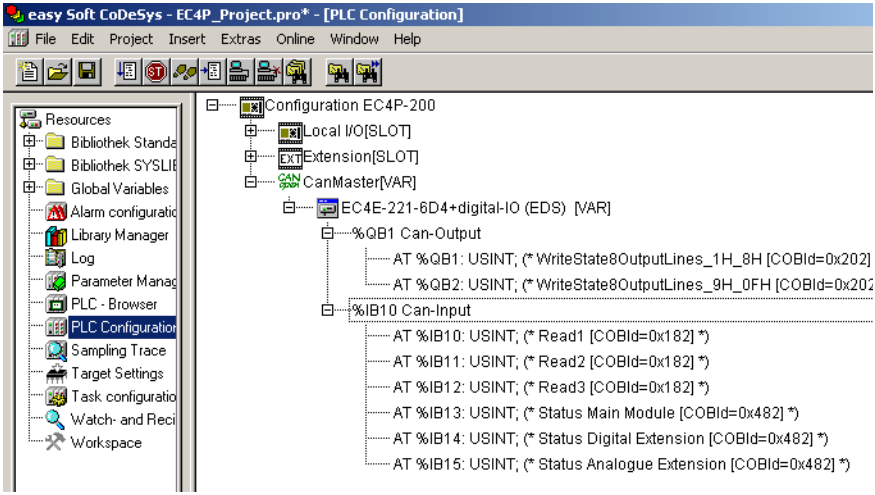

Figure 19: Input and output addresses of the EC4E module with the expansion unit with digital inputs and outputs

WriteState8OutputLines_9H_0FH:
Digital outputs S1 to S8 of the Expansion Devices

Only the physically present digital outputs on the expansion unit can be assigned and written to, as the expansion unit may contain fewer than eight digital outputs.

READ2:
Digital inputs R1 to R8 of the expansion module.

Only the physically present digital inputs on the expansion unit can be read, as the expansion unit may contain fewer than eight digital inputs.

READ3:
Digital inputs R9 to R12 of the expansion module.

Only the physically present digital inputs on the expansion unit can be read, as the expansion unit may contain fewer than twelve digital inputs.

→ The status bytes and the bytes of the digital inputs and outputs of the EC4E module are described above under section „EC4E-card without expansion unit (EC4E-221-6D4X.eds)".

EC4E-card with expansion unit EASY406-DC-ME (EC4E-221-6D4X+EASY406.eds)

EDS file EC4E-221-6D4X+EASY406.eds is used for the EC4E module with expansion unit EASY406-DC-ME.

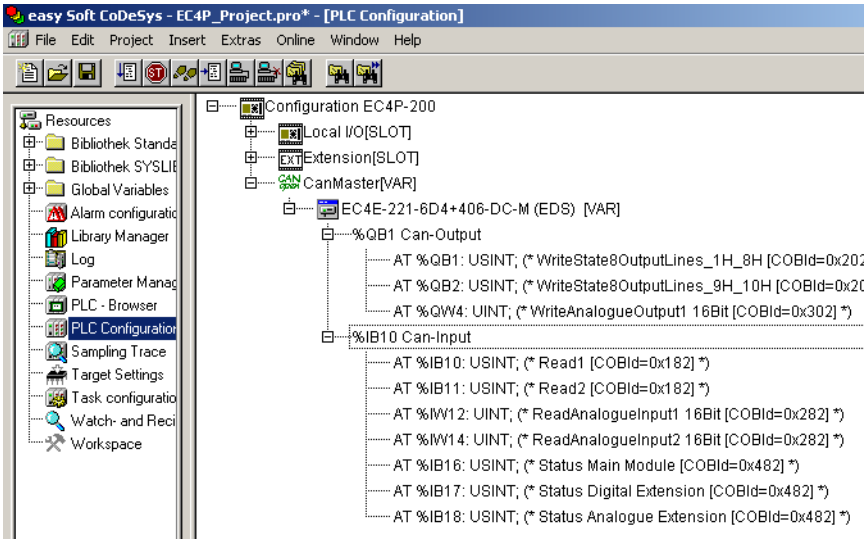

Figure 20: Input and output addresses of the EC4E module with expansion unit EASY406-DC-ME

WriteState8OutputLines_9H_10H:
Digital outsputs S1 to S2 of Expansion Devices EASY406-DC-ME

WriteAnalogueOutput1 16Bit:
Analog output QA1 of expansion unit EASY406-DC-ME.
Value range of the analog output: 0 to 65472

READ2:
Digital inputs R1 to R3 of Expantion Devices EASY406-DC-ME

ReadAnalogueInput1:
Analog input IA1 of expansion unit EASY406-DC-ME.
Value range of analog input: 0 to 65472

ReadAnalogueInput2:
Analog input IA2 of expansion unit EASY406-DC-ME.
Value range of analog input: 0 to 65472

→ The status bytes and the bytes of the digital inputs and outputs of the EC4E module are described above under section „EC4E-card without expansion unit (EC4E-221-6D4X.eds)".

→ **Analog inputs:**

To use analog inputs of the expansion unit, select the "Service Data Objects" tab and set "Analogue input global interrupt enable" to "1".

With the value of "Analogue configuration word" you can change the configuration of the expansion unit. By default analog inputs IA1 and IA2 are set to "0 to 10 V" and the analog output is enabled.

The illustration below shows the mask with the set value for an analog input.

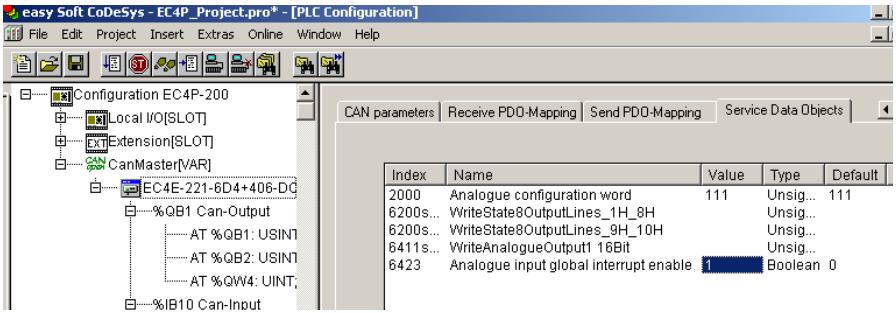

Figure 21: Setting "Analogue input global interrupt enable" to "1" to enable the analog inputs.

EC4E-card with expansion unit EASY411-DC-ME (EC4E-221-6D4X+EASY411.eds)

EDS file EC4E-221-6D4X+EASY411.eds is used for the EC4E module with expansion unit EASY411-DC-ME.

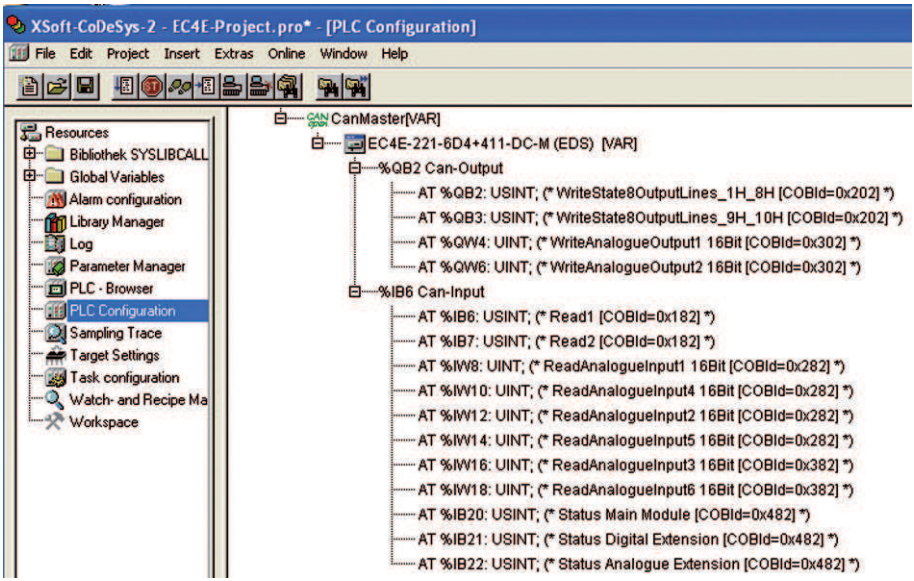

Figure 22: Input and output addresses of the EC4E module with expansion unit EASY411-DC-ME

WriteState8OutputLines_9H_10H:
Digital outputs S1 to S2 of Expansion Devices EASY411-DC-ME

WriteAnalogueOutput1 16Bit:
Analog output QA1 of expansion unit EASY411-DC-ME.
Value range of the analog output: 0 to 65472

WriteAnalogueOutput2 16Bit:
Analog output QA2 of expansion unit EASY411-DC-ME.
Value range of analog output: 0 to 65472

READ2:
Digital inputs R1 to R3 of Expantion Devices EASY411-DC-ME

ReadAnalogueInput1:
Analog input IA1 of expansion unit EASY411-DC-ME.
Value range of analog input: 0 to 65472

ReadAnalogueInput2:
Analog input IA2 of expansion unit EASY411-DC-ME.
Value range of analog input: 0 to 65472

ReadAnalogueInput3:
Analog input IA3 of expansion unit EASY411-DC-ME.
Value range of analog input: 0 to 65472

ReadAnalogueInput4:
Analog input IA4 of expansion unit EASY411-DC-ME.
Value range of analog input: 0 to 65472

ReadAnalogueInput5:
Analog input IA5 of expansion unit EASY411-DC-ME.
Value range of analog input: 0 to 65472

ReadAnalogueInput6:
Analog input IA6 of expansion unit EASY411-DC-ME.
Value range of analog input: 0 to 65472

The status bytes and the bytes of the digital inputs and outputs of the EC4E module are described above under section „EC4E-card without expansion unit (EC4E-221-6D4X.eds)".

Analog inputs:

To use analog inputs of the expansion unit, select "Service Data Objects" and set "Analogue input global interrupt enable" to "1".

With the value of "Analogue configuration word" you can change the configuration of the expansion unit. By default all analog inputs and outputs are enabled.

The next illustration shows the entries in the "Service Data Objects" tab

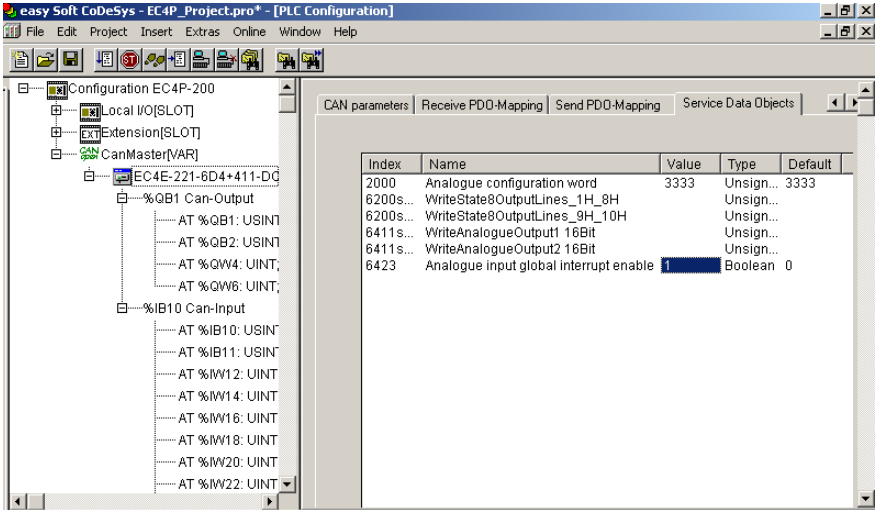

Figure 23: Setting "Analogue input global interrupt enable" to "1" to enable the analog inputs.

5 Operation

The device's operating state is indicated by two LEDs on the device front. Their meaning is described in the tables below.

Table 3: CAN-LED-status indicator

CAN LED	Colour	Meaning
OFF	Red	Device is operational (no fault).
Single flash	Red	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
Flashing	Red	Auto Baudrate detection inprogress or LSS services in progress (Alternately flashing with RUN-LED)
Double flash	Red	A guard event (NMT-Slave or NMT-master) or a heartbeat event (Heartbeat consumer) has occurred.
Triple flash	Red	The SYNC message has not been received within the configured communication cycle period time out (see Object Dictionary Entry 0x1006).
Illuminated	Red	The CAN controller is bus off
Flashing	Green	Auto baudrate detection in progress or LSS services in progress (Alternately flashing with ERROR LED)
Single flash	Green	Device is in STOPPED state
Flashing	Green	Device is in PREOPERATIONAL state
Illuminated	Green	Device is in OPERATIONAL state

→ The CAN LED flashes orange if operational and fault states occur at the same time. This is the case, for example, when the device is operational (green light) and has reached an error count limit (flashing red). This results in an orange flashing alternating with green.

Table 4: Power LED status indicator

Power LED	Colour	Meaning
OFF	Green	The supply voltage is not switched on.
Illuminated	Green	The supply voltage is switched on.

Appendix

Programming for example

An application example for the control configuration from figure 18.

```
PROGRAM PLC_PRG
VAR
     byEC4E_DigitalInputs AT %IB10 : USINT;
     byEC4E_DigitalOutputs AT %QB1 : USINT;

     byEC4E_StatusMainModule AT %IB11 : USINT;
     byEC4E_StatusDigitalExtension AT %IB12 : USINT;
     byEC4E_StatusAnalogueExtension AT %IB13 : USINT;
END_VAR

(*6 digital inputs of EC4E*)
byEC4E_DigitalInputs.0;
byEC4E_DigitalInputs.1;
byEC4E_DigitalInputs.2;
byEC4E_DigitalInputs.3;
byEC4E_DigitalInputs.4;
byEC4E_DigitalInputs.5;

(*4 digital outputs of EC4E*)
byEC4E_DigitalOutputs.0;
byEC4E_DigitalOutputs.1;
byEC4E_DigitalOutputs.2;
byEC4E_DigitalOutputs.3;

(*2 bits: status main module*)
byEC4E_StatusMainModule.0;
byEC4E_StatusMainModule.1;
```

```
(*2 bits: status digital extension*)
byEC4E_StatusDigitalExtension.0;
byEC4E_StatusDigitalExtension.1;

(*4 bits: status analogue extension*)
byEC4E_StatusAnalogueExtension.0;
byEC4E_StatusAnalogueExtension.1;
byEC4E_StatusAnalogueExtension.2;
byEC4E_StatusAnalogueExtension.3;
```

Dimensions EC4E

Dimensions B × H × T	
	71,5 × 90 × 58 mm
	2,79 × 3,54 × 2,28 inch
Space units (SU) width	4
Weight	
	200 g
	0.44 lb
Mounting	IEC/EN 60715 top-hat rail, 35 mm or screw using fastening brackets ZB4-101-GF1 (accessories)

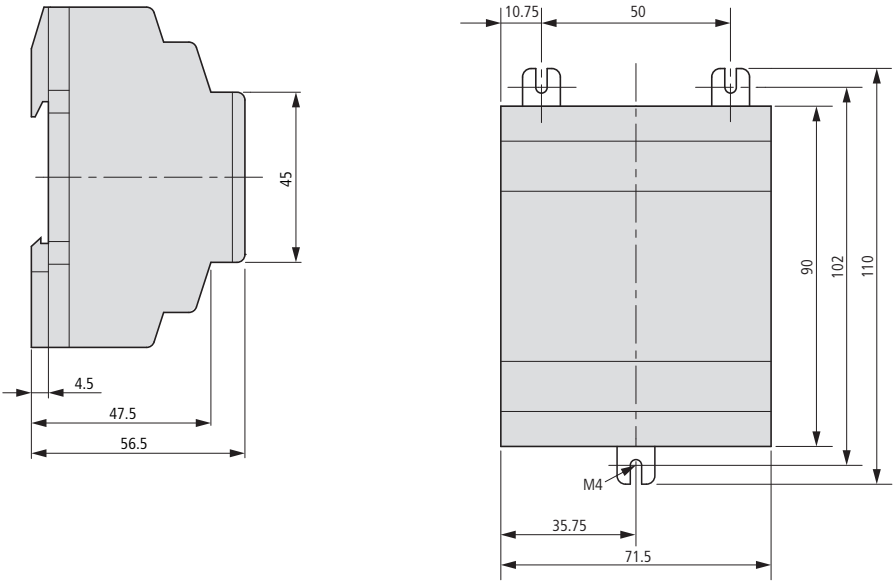

Figure 24: Dimensions of the EC4E-card in mm

Table 5: Dimensions in inches (rounded to two decimal places)

mm	inch	mm	inch
4.5	0.18	56.5	2.22
10.75	0.42	71.5	2.81
35.75	1.41	90	3.54
45	1.77	102	4.02
47.5	1.87	110	4.33
50	1.97		

Technical data EC4E

General			
Standards and regulations			EN 55011, EN 55022, IEC/EN 61000-4, IEC 60068-2-6, IEC 60068-2-27
Dimensions (B x H x T)		mm	71.5 × 90 × 58 (4 space units)
Weight		kg	0.2
Mounting			Top-hat rail IEC/EN 60715, 35 mm or screw with fastening brackets ZB4-101-GF1 (accessories)
Terminal capacity			
Solid		mm^2	0.2 – 4 (AWG 22 – 12)
Flexible with ferrule		mm2	0.2 – 2.5 (AWG 22 – 12)
Standard screwdriver		mm	3.5 × 0.8
Max. tightening torque		Nm	0.6
Ambient climatic conditions			
Operational ambient temperature		°C	-25 to 55, low temperatures to IEC 60068-2-1, high temperatures to IEC 60068-2-2
Condensation			Prevent condensation with suitable measures
LCD display (clearly legible)		°C	0 – 55
Storage		°C	–40 – 70
Relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 – 95
Air pressure (in operation)		hPa	795 – 1080

Ambient mechanical conditions			
Degree of protection, IEC/EN 60529			IP20
Vibrations (IEC/EN 60068-2-6)			
Constant amplitude 0.15 mm		Hz	10 – 57
Constant acceleration 2 g		Hz	57 – 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms		Shocks	18
Drop to IEC/EN 60068-2-31	Drop height	mm	50
Free fall, packaged (IEC/EN 60068-2-32)		m	1
Mounting position			horizontal/vertical
Electromagnetic compatibility (EMC)			
Overvoltage category/degree of pollution			II/2
Electrostatic discharge (IEC/EN 61000-4-2, Level 3, ESD)			
Air discharge		kV	8
Contact discharge		kV	6
Electromagnetic fields (IEC/EN 61000-4-3, RFI)		V/m	10
Radio interference suppression (EN 55011)			EN 55011 Class B, EN 55022 Class B
Burst pulses (IEC/EN 61000-4-4, level 3)			
Power cables		kV	2
Signal cables		kV	2
High-energy pulses (surge) (IEC/EN 61000-4-5, level 2)		kV	0.5 (supply cables, symmetrical)
Immunity to line-conducted interference to (IEC/EN 61000-4-6)		V	10

Dielectric strength			
Dimensions of air and creepage distances			EN 50178, UL 508, CSA C22.2, No. 142
Insulation resistance			EN 50178
Power supply			
Rated operational voltage	U_e	V	24 DC (-15/+20%)
Permissible range		V DC	20.4 - 28.8
Residual ripple		%	≦ 5
Input current			
At rated voltage		mA	Normally 140
Voltage dips (IEC/EN 61131-2)		ms	10
Power loss		W	Normally 3.4
Interfaces			
CANopen/easyNet			
Data transfer rate/distance			500 kBit/s, 25 m 250 kBit/s, 60 m 125 kBit/s, 125 m 50 kBit/s, 300 m 20 kBit/s, 700 m 10 kBit/s, 1000 m
Potential isolation			Yes
Bus termination (first and last station)			Via integrated Dip switch
Connection type			2 terminals (see terminal capacity)
CANopen operating mode			
Station		Number	Max. 62
PDO type			Asynchronous, cyclic, acyclic
Device profile			To DS 301 V4

Digital inputs 24 V DC			
Number			6
Potential isolation			
To power supply			No
Between each other			No
To the outputs			Yes
Rated operational voltage	U_e	V DC	24
At signal "0"	U_e	V DC	< 5 (R1 - R6)
At signal "1"	U_e	V DC	> 15 (R1 - R6)
Input current at signal "1"			
R1 to R6 (R12)		mA	3.3 (at 24 V DC)
Delay time from 0 to 1			
Debounce ON		ms	20
Debounce OFF		ms	Normally 0.25 (R1 – R12)
Delay time from 1 to 0			
Debounce ON		ms	20
Cable length (unscreened)		m	100
Relay outputs			
Number			4
Outputs in groups of			1
Parallel switching of outputs to increase performance			Not permissible
Protection of an output relay			Miniature circuit-breaker B16 or fuse 8 A (slow)
Potential isolation			
To power supply			Yes
From the inputs			Yes
Electrical isolation in groups			Yes
Safe isolation		V AC	300
Basic insulation		V AC	600
Lifespan, mechanical	Operations	$\times 10^6$	10

Contacts			
Conventional thermal current (10 A UL)		A	8
Recommended for load: 12 V AC/DC		mA	> 500
Short-circuit proof cos φ = 1, characteristic B16 at 600 A		A	16
Short-circuit proof cos φ = 0.5 - 0.7; characteristic B16 at 900 A		A	16
Rated impulse withstand voltage U_{imp} contact coil		kV	6
Rated operational voltage	U_e	V AC	250
Rated insulation voltage	U_i	V AC	250
Safe isolation to EN 50178 between coil and contact		V AC	300
Safe isolation to EN 50178 between two contacts		V AC	300
Making capacity			
AC–-15, 250 V AC, 3 A (600 ops./h)	Operations		300000
DC-13, L/R ≦ 150 ms, 24 V DC, 1 A (500 S/h)	Operations		200000
Breaking capacity			
AC–-15, 250 V AC, 3 A (600 ops./h)	Operations		300000
DC-13, L/R ≦ 150 ms, 24 V DC, 1 A (500 ops./h)	Operations		200000
Filament bulb load			
1000 W at 230/240 V AC	Operations		25000
500 W at 115/120 V AC	Operations		25000
Fluorescent lamp load			
Fluorescent lamp load 10 × 58 W at 230/240 V AC			
With series-connected electrical device	Operations		25000

Uncompensated	Operations		25000
Fluorescent lamp load 1 × 5 W at 230/240 V AC, conventionally compensated	Operations		25000
Switching frequency			
Mechanical operations		× 10^6	10
Switching frequency		Hz	10
Resistive load/lamp load		Hz	2
Inductive load		Hz	0.5
UL/CSA			
Uninterrupted current at 240 V AC		A	10
Uninterrupted current at 24 V DC		A	8
AC			
Control circuit rating codes (utilization category)			B 300 Light Pilot Duty
Max. rated operational voltage		V AC	300
Max. uninterrupted thermal current cos φ = 1 at B 300		A	5
Max. make/break capacity cos φ ≠ 1 at B 300		VA	3600/360
DC			
Control circuit rating codes (utilization category)			R 300 Light Pilot Duty
Max. rated operational voltage		V DC	300
Max. thermal uninterrupted current at R 300		A	1
Max. make/break capacity at R 300		VA	28/28

Transistor outputs			
Number			4
Rated operational voltage	U_e	V DC	24
Permissible range	U_e	V DC	20.4 – 28.8
Residual ripple		%	≦ 5
Supply current			
At signal "0"	Normally/max.	mA	9/16
At signal "1"	Normally/max.	mA	12/22
Reverse polarity protection			Yes (Caution: A short circuit will result if voltage is applied to the outputs in the event that the supply voltage is connected to the wrong poles.)
Potential isolation			
To power supply			Yes
From the PC interface, memory card, NET network, EASY-Link			Yes
Rated operational current at signal "1" DC	I_e	A	Max. 0.5
Lamp load without Rv		W	5
Residual current at signal "0" per channel		mA	< 0.1
Max. output voltage			
With condition "0" at external load < 10 MΩ		V	2.5
with condition "1" at I_e = 0.5 A		V	U = U_e - 1 V
Short-circuit protection			Yes, thermal (analysis via diagnostics input I16, I 15, R15, R16)
Short-circuit tripping current for R_a ≦ 10 mΩ		A	0.7 ≦ I_e ≦ 2 per output
Total short-circuit current		A	8
Peak short-circuit current		A	16
Thermal cutout			Yes

Max. operating frequency at constant resistive load R_L < 100 kΩ (dependant on program and load)		ops/h	40000
Parallel connection of outputs			
With resistive load, inductive load with external suppressor circuit, combination within a group			Group 1: Q1 to Q4
Number of outputs	max.		4
Max. total current		A	2 (Caution: Outputs must be actuated simultaneously and for the same time duration)
Status indication of the outputs			LCD display (if provided)
Inductive load			
Without external suppressor circuit[1)]			
$T_{0.95}$ = 1 ms, R = 48 Ω, L = 16 mH			
Utilization factor		g	0.25
Duty factor		% DF	100
Max. operating frequency f = 0.5 Hz (max. DF = 50 %)	Operations		1500
DC-13, $T_{0.95}$ = 72 ms, R = 48 Ω, L = 1.15 H			
Utilization factor		g	0.25
Duty factor		% DF	100
Max. operating frequency f = 0.5 Hz (max. DF = 50 %)	Operations		1500
$T_{0.95}$ = 15 ms, R = 48 Ω, L = 0.24 H			
Utilization factor		g	0.25
Duty factor		% DF	100
Max. operating frequency f = 0.5 Hz (max. DF = 50 %)	Operations		1500

With external suppressor circuit				
	Utilization factor		g	1
	Duty factor		% DF	100
	Max. switching frequency, max. duty factor	Operations		Depending on the suppressor circuit

$T_{0.95}$ = Time in ms, until 95 % of the steady-state current has been reached. $T_{0.95} \approx 3 \times T_{0.65} = 3 \times L/R$.

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