

B-Fortis CC-I/O Extensions



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Notes about this handbook

This equipment handbook contains information which is specific to the product and valid at the time of printing.

This equipment handbook is only complete in conjunction with the product-related hardware and software manuals required for the specific application.

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Berghof Automation GmbH is certified to DIN EN ISO 9001:2000.

Revision log

Version	Date	Description
0.9	11/05/2020	Initial version after conversion to S-number system
1.0	18/06/2020	Formatting revised in the document

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1 General information

This user handbook is intended for use by qualified personnel and contains information on the assembly, installation, start-up and maintenance of the device.

1.1 Notes about this handbook

This user handbook is a component of the product and applies to the following devices:

- B-Fortis CC-DIO 16/16P (positive switching), order number S-01020201-0100
- B-Fortis CC-DIO 16/16N (negative switching), order number S-01020201-0200
- B-Fortis CC-AIO 12/6, order number S-01020202-0100


It contains information on the following topics:

- Areas of application
- Safety
- Mechanical design
- Electrical design
- Connections
- Start-up
- Servicing and maintenance
- Decommissioning
- Disposal

- ▶ Keep this user handbook available alongside the product at all times.

1.2 Symbols and visual depictions

The following symbols and visual depictions are used in this user handbook:

Symbol	Meaning
→ ...	List entry
▶ ...	Individual instruction or list of instructions which can be carried out in any order.
1. ... 2. ...	List of instructions which must be carried out in the order given.
	Additional product information

Structure of the warnings:

 WARNING

Optional:	Type and source of the danger
More symbols	Brief description and consequences ▶ Preventive measures

1.3 Hazard categories and indications

The following indications are used for warning messages that must be observed to ensure your personal safety and avoid any damage to property.

The indications have the following meanings:

 DANGER

Serious injury or death

Failure to observe the safety measures will result in death or serious injury.

- ▶ Take preventive measures.
-

 WARNING

Possible serious injury or death

Failure to observe the safety measures may result in death or serious injury.

- ▶ Take preventive measures.
-

 CAUTION

Possible minor injuries

Failure to observe the safety measures may result in minor injuries.

- ▶ Take preventive measures.
-

NOTICE

Possible damage to property

Failure to observe the safety measures may result in damage to property.

- ▶ Take preventive measures.
-

1.4 Qualified personnel

The installation, start-up and maintenance of the machine must be carried out by qualified personnel. For the purposes of this documentation and the safety instructions contained therein, “qualified personnel” means trained staff with the authorisation to assemble, install, start up, earth and identify devices, systems and electrical circuits in accordance with the standards set in safety engineering and who are familiar with safety concepts in automation engineering.

1.5 Duty of care

The user or processor (OEM) must ensure the following:

- The device must only be used for its intended purpose.
- The device must only be used in a perfect, fully functional condition.
- The user handbook must always be kept legible and fully available.
- Only sufficiently qualified and authorised personnel carry out assembly, installation, start-up and maintenance of the device.
- This authorised personnel must receive regular training in all relevant questions of occupational health and safety and environmental protection and must be familiar with the contents of this user handbook, particularly the sections containing safety instructions.
- Any markings or identification labels and safety and warning signs on the device must not be removed and must be kept legible at all times.
- The national and international regulations regarding the operation of machinery and installations where the device is being used must be observed.
- The user must always be kept abreast of any current relevant information regarding the device and its use or operation.

1.6 Intended use

The devices belong to the modular automation system for industrial control applications in the medium to high performance range. They extend the control system (e.g. B-Fortis CC-Prime) to include further digital or analogue inputs and outputs and are connected via EtherCAT.

The automation system is designed for use in overvoltage category I (IEC 364-4-443) for the control and regulation of machinery and industrial processes in low-voltage installations in accordance with the following basic conditions:

- Maximum rated supply voltage of 1,000 V AC (50/60 Hz) or 1,500 V DC
- For use in an environment with max. category 2 level of pollution (EN 60950)
- For use in a maximum altitude of 2,000 m a.s.l.
- For indoor use in areas not exposed to direct UV radiation

Correct and safe operation of the automation system requires qualified project planning, proper transport, storage, installation and use as well as careful maintenance. The automation system may only be used within the scope of the information and applications specified in this documentation and associated user handbooks.

The automation system must only be used as follows:

- As intended
- In technically perfect condition
- Without unauthorised modifications
- By qualified users only

- ▶ Observe the rules of the employers' liability insurance association, the German Technical Inspection Association (TÜV), the Association of German Electrical Engineers (VDE) or corresponding national regulations.

The device is intended for installation within enclosed control cabinets of industrial machines and systems in indoor areas.

- ▶ During installation, make sure that the existing seal profiles are undamaged.
- ▶ For operation, refer to the applicable ambient conditions (see "Technical data").

1.7 Transport and storage

The device is susceptible to impacts, heavy vibrations, moisture and extreme temperatures.

Transport and storage

- ▶ Protect the device from heavy mechanical stresses during transport.
- ▶ Always transport the device in its original packaging.
- ▶ For storage, refer to the applicable ambient conditions (see "Technical data").
- ▶ Protect the device from condensation and moisture.

Operation

- ▶ If the device has been stored or transported in cold weather or under conditions of large fluctuations in temperature, do not start to operate it until it has acclimatised to room temperature for the place in which it is used.
- ▶ Wait at least 12 hours after it has reached room temperature before operating the device.

1.8 Unpacking

Upon receipt of the device, make sure that it is undamaged and complete.

- 1st Check the packaging for external damage.
- 2nd If the packaging is seriously damaged or if damage to the contents is evident: do not proceed further with opening the packaging; instead immediately inform the transport company and your supplier.
- 3rd Remove the packaging and keep it safe for subsequent transport.
- 4th Check the contents for evidence of damage in transport.
- 5th Check the contents for completeness against the order documentation and keep all delivery documentation for future reference. The delivery documentation contains important information about the device and is part of the product.
- 6th If you notice any damage in transport or the contents do not match the order: inform the suppliers immediately.

2 Safety

Safety-related systems

The use of PLC controls and additional devices in safety-related systems requires specific measures. If the device is to be used in a safety-related system, the user must be given comprehensive advice by the PLC manufacturer in addition to any available standards or guidelines regarding safety installations.

- ▶ Before starting work on the devices, switch off all power supplies, including those of connected peripherals.
- ▶ Keep all ventilation openings unobstructed.

The failure of certain components in an electronic control system may result in uncontrolled and/or unpredictable operational behaviour.

- ▶ All types of failure must be considered at the system level and the associated preventative measures identified.
- ▶ If necessary, request information from your automation system provider.

2.1 Safety instructions

The device may only be operated in a flawless condition.

Working on the device

Do not start work on the device until all necessary safety precautions have been taken. Take precautions to avoid unforeseeable functional events and movements of the system.

- 1st Bring the system into a safe state.
- 2nd Switch the system and the device off.
- 3rd Secure the system against being switched on again.
- 4th Disconnect the device from the system.

Do not open the device housing.

- ▶ If it is necessary to work on internal parts of the device, contact the manufacturer (see "Addresses").

3 Product description

The B-Fortis-CC-I/O modules are EtherCAT extension modules which extend an automation system to include digital inputs/outputs and analogue channels. The devices are connected to a suitable controller via EtherCat.

All the connections are of the plug-in type and are located on the front of the device. The B-Fortis CC-I/O series is intended for installation on a mounting rail in the control cabinet.

3.1 Overview

3.1.1 Overview of B-Fortis CC-DIO 16/16 (P/N)



The CC-DIO 16/16 is installed on a mounting rail.

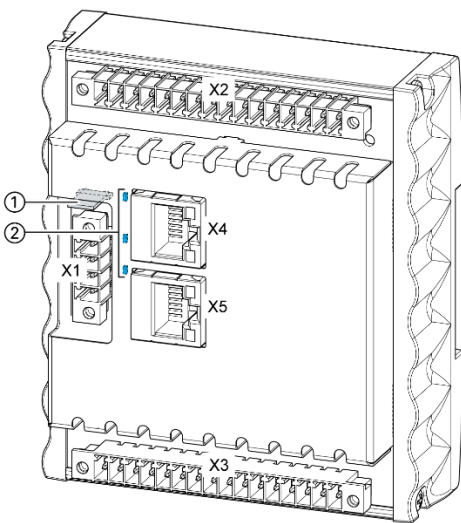


Fig. 1: Overview of B-Fortis CC-DIO 16/16 (positive or negative switching)

No.	Designation	No.	Designation
X1	Power supply	X5	EtherCAT input
X2	Digital inputs	1	Functional earth (FE)
X3	Digital outputs	2	LEDs: EtherCAT Run, +24 V, +24 V I/O
X4	EtherCAT output		

3.1.2 Overview of B-Fortis CC-AIO 12/6

i The CC-AIO 12/6 is installed on a mounting rail.

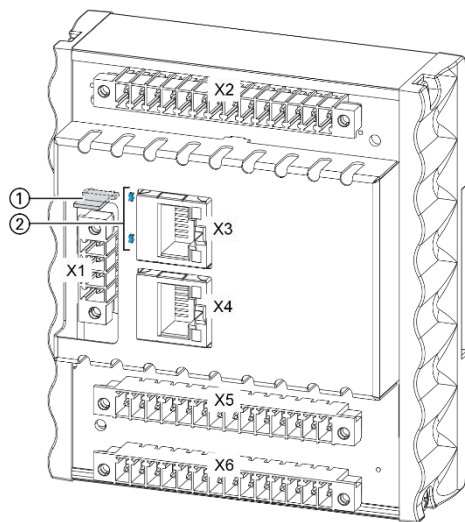


Fig. 2: Overview of B-Fortis CC-AIO 12/6

No.	Designation	No.	Designation
X1	Power supply	X5	Analogue inputs/outputs
X2	Analogue inputs/outputs	X6	Analogue inputs/outputs
X3	EtherCAT output	1	Functional earth (FE)
X4	EtherCAT input	2	LEDs: EtherCAT Run, +24 V

3.1.3 Scope of delivery and accessories

Scope of delivery

B-Fortis CC-DIO 16/16P (S-01020201-0100):

B-Fortis CC-DIO 16/16N (S-01020201-0200):

B-Fortis CC-AIO 12/6 (S-01020202-0100):

→ the respective device

Accessories

The following accessories can be ordered directly as an option or separately via your own order number:

Plug kit for CC-DIO 16/16:

Order option: H001

Note: the appropriate plug kit for the respective device is supplied

Order number: S-02020103-0100

Packaged plug kit for the CC-D I/O module with 1 x 4-pin plug for the power supply and 2 x 16-pin digital I/O plug.
2 x 16-pin plugs, black (Weidmüller 1972070000)
1 x 4-pin plug, black (Weidmüller 1971590000)

Plug kit for CC-AIO 12/6:

Order option: H001

Note: the appropriate plug kit for the respective device is supplied

Order number: S-02020103-0200

Packaged plug kit for the CC-A I/O module with 1 x 4-pin plug for the power supply and 3 x 14-pin analogue I/O plug.
3 x 14-pin plugs, black (Weidmüller 1972000000)
1 x 4-pin plug, black (Weidmüller 1971590000)

3.2 Product features

3.2.1.1 Assembly

The device is designed for installation in a control cabinet on a DIN mounting rail (35 mm) in pollution degree 2 industrial environments.

3.2.1.2 EtherCAT

The device has two EtherCAT interfaces. The first EtherCAT interface is used as the input, and the second as the output.

3.2.2 Summary of features

3.2.2.1 CC-DIO 16/16 (N/P):

- 2 EtherCAT RJ-45 interfaces (1 input, 1 output)
- 16 digital inputs (N- or P-switching)
- 16 digital outputs (N- or P-switching)

3.2.2.2 CC-AIO 12/6:

- 2 EtherCAT RJ-45 interfaces (1 input, 1 output)
- 12 analogue inputs
- 6 analogue outputs

4 Assembly

The B-Fortis CC-I/O modules are intended for installation on mounting rails according to DIN EN 60715:2001, 35 x 7.5 mm.

⚠ CAUTION

Danger of burns!

The surface of the device can get hot.

- ▶ Ensure that there is sufficient convectional cooling.
- ▶ There must be at least 50 mm clearance above and below the device.

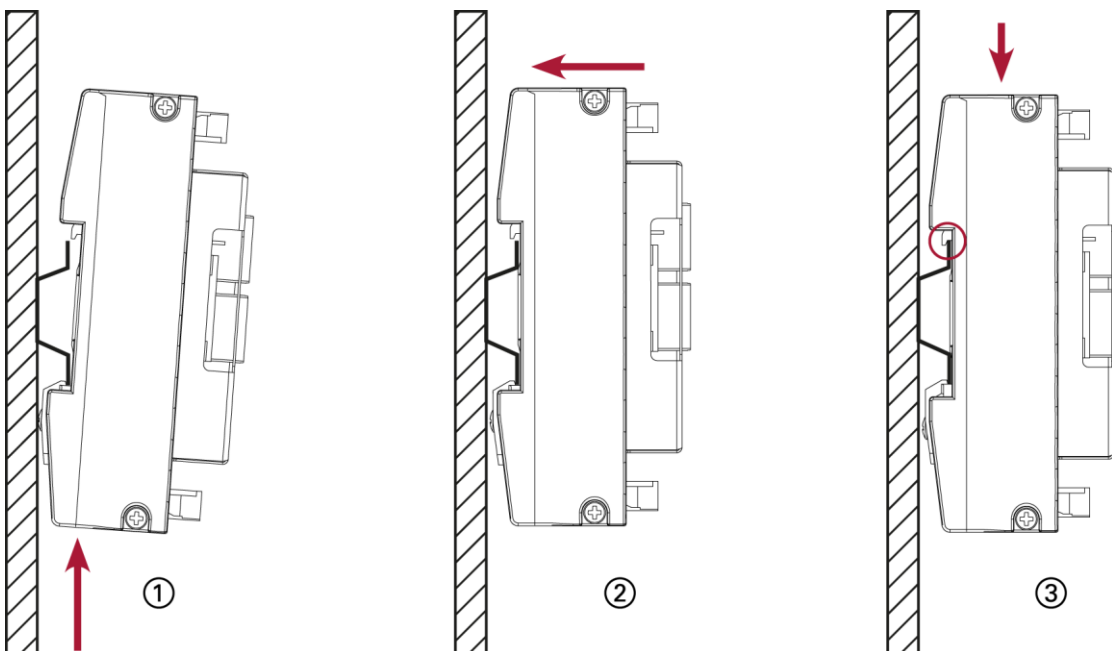


Fig. 3: Installing the device

- 1st Guide the device from below towards the mounting rail as shown in the image so that the spring hooks in between the mounting rail and the mounting surface.
- 2nd Push the device at the top towards the mounting wall.
- 3rd Push the device down until the profile on the top of the rail guide is resting on the mounting rail.

The device is engaged in the rail guide.

5 Connection

WARNING

Uncontrolled and unpredictable operational behaviour!

The failure of certain components in electronic control systems may result in uncontrolled and unpredictable operational behaviour.

- ▶ All types of failure and the associated fuse systems are to be taken into account at system level.
- ▶ Follow the automation system manufacturer's instructions.

5.1 Power supply

The device is powered by an external 24 V DC power supply.

- ▶ Before plugging in the device, make sure that the external power supply meets the required specifications (type K to DIN EN 61131-2).

External power supply (24 V DC)

Supply voltage	+24 V DC SELV (-15% / +20%)
AC voltage component	Max. 5% The DC voltage level must not fall below 20.4 V.
Power consumption	Total max. 0.25 A at +24 V DC (typ. 0.05 A electronics)
Power buffering	10 ms

Internal power supply

A power supply for the system electronics for an input voltage of 24 V DC (-15% / +20%) is integrated into the device. The power supply unit has built-in reverse polarity protection and surge current protection (0.5 A).

Installation

- ▶ All connections and cables should be set up in a way that prevents interference and capacitive interference to the device.
- ▶ Make sure that the current and voltage resistance of the supply cables are sufficient.

5.1.1 Connecting the power supply

⚠ WARNING

Uncontrolled and unpredictable operational behaviour!

If both ground connections of the device are not connected, this may result in unpredictable behaviour of the inputs and outputs.

- ▶ Make sure that both ground connections - GND and GND IO - are connected to the general GND of the machine/system.

⚠ CAUTION

Live parts!

- ▶ Before starting any work on the device, switch off all power supplies, including those of connected peripherals.

Connect the power supply to plug X1 according to the following table.



Fig. 4: Power supply plug X1 with power LEDs

Power supply plug X1					
Pin	CC-DIO 16/16		CC-AIO 12/6		
	Des.	Assignment	Des.	Assignment	
1	GND IO	Ground digital inputs/outputs	GND	Device ground	
2	+24 V IO	Power supply 24 V DC digital I/O	+24 V	Power supply 24 V DC device	
3	GND	Device ground	GND	Device ground	
4	+24 V	Power supply 24 V DC device	+24 V	Power supply 24 V DC device	
-	L+	LED power supply device	L+	LED power supply device	
-	L1+	LED power supply digital out.	-	-	

The following counterparts have been tested for the SC-SMT 3.81 plug-in connector (Weidmüller), and may be used with the device:

- Weidmüller BCZ 3.81/04/180 (F, LH)
- Weidmüller BCF 3.81/04/180 (F, LH)

i CC-DIO 16/16: L+ and GND as well as L1+ and GND IO are two separate networks that are not connected internally. Both networks must be connected or bridged externally.

5.2 Earthing

The functional earth discharges HF currents and supports the device's interference immunity. HF interference is diverted internally from the electronic circuit board to the metal housing. The metal housing requires a suitable connection to a functional earth.

Earthing the device

Prerequisites:

- The mounting rail is conductively connected to the control cabinet.
- The control cabinet is earthed.
- ▶ Make sure that the device housing is conductively connected to the mounting rail.
- ▶ If required at the place of use, connect an additional protective earth conductor for the current-carrying earthing of all metal parts to the bottom of the device (PE connection).

The device is earthed.

i If necessary, the earth can be connected directly to the device's functional earth (FE).

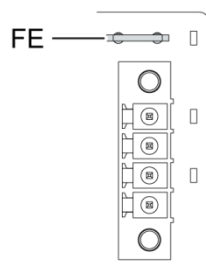


Fig. 5: Functional earth (FE) on the device

5.3 Data connections

5.3.1 Block diagram of CC-DIO 16/16 (P/N)

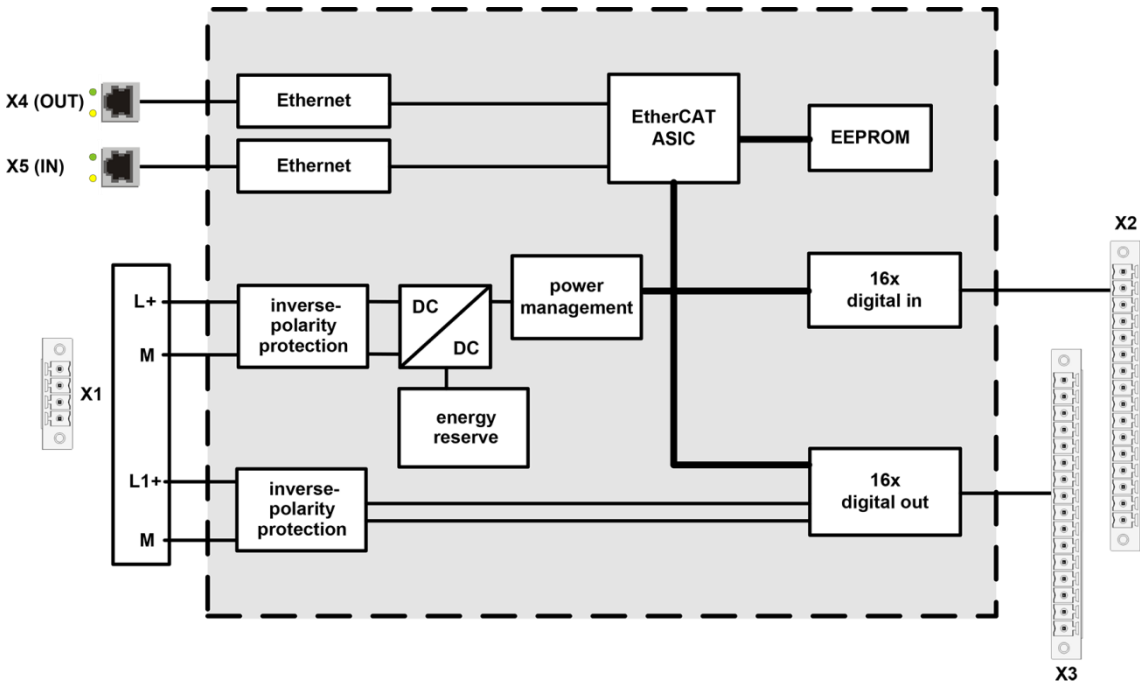


Fig. 6: Block diagram of CC-DIO 16/16 (P/N)

5.3.2 Block diagram of CC-AIO 12/6

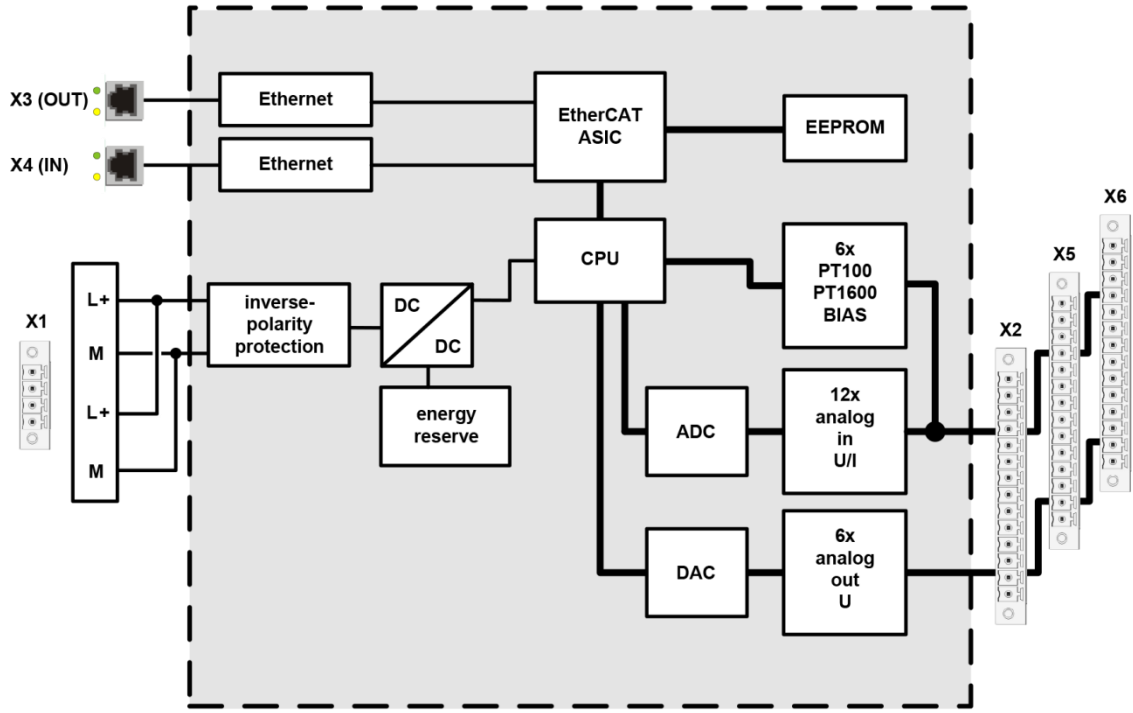


Fig. 7: Block diagram of CC-AIO 12/6

5.3.3 Digital inputs CC-DIO 16/16 (P/N)

NOTICE

Damage to the inputs or the device!

Voltages above ± 32 V can damage the inputs or the device.

- ▶ Do not apply a voltage exceeding ± 32 V to the inputs.

Depending on the device version, the digital inputs are positive or negative switching inputs, type 1 (IEC 61131-2). They are designed for nominal input voltages of 24 V. The input signals are transmitted internally on a cyclical basis for process data processing. An open input is always interpreted as logical 0 (LOW) in the programming system (level: 0 V at P, +24 V at N). The inputs also have a common reference potential (GND).

The following counterparts have been tested for the SC-SMT 3.81 plug-in connector (Weidmüller), and may be used with the device:

- Weidmüller BCZ 3.81/16/180 (F, LH)
- Weidmüller BCF 3.81/16/180 (F, LH)

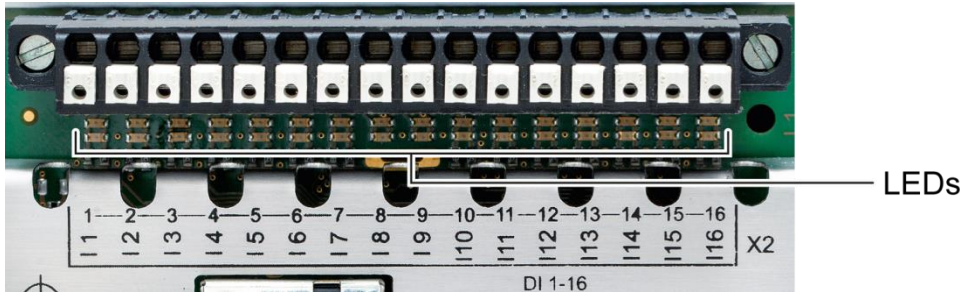


Fig. 8: Digital inputs CC-DIO 16/16, plug X2 with LEDs 1 to 16

Digital inputs plug X2					
Pin	Des.	Assignment N-switching		Assignment P-switching	
		logical 0	logical 1	logical 0	logical 1
1	I 1	+24 V DC	0 V DC	0 V DC	+24 V DC
2	I 2	+24 V DC	0 V DC	0 V DC	+24 V DC
3	I 3	+24 V DC	0 V DC	0 V DC	+24 V DC
4	I 4	+24 V DC	0 V DC	0 V DC	+24 V DC
5	I 5	+24 V DC	0 V DC	0 V DC	+24 V DC

Digital inputs plug X2					
Pin	Des.	Assignment N-switching		Assignment P-switching	
		logical 0	logical 1	logical 0	logical 1
6	I 6	+24 V DC	0 V DC	0 V DC	+24 V DC
7	I 7	+24 V DC	0 V DC	0 V DC	+24 V DC
8	I 8	+24 V DC	0 V DC	0 V DC	+24 V DC
9	I 9	+24 V DC	0 V DC	0 V DC	+24 V DC
10	I 10	+24 V DC	0 V DC	0 V DC	+24 V DC
11	I 11	+24 V DC	0 V DC	0 V DC	+24 V DC
12	I 12	+24 V DC	0 V DC	0 V DC	+24 V DC
13	I 13	+24 V DC	0 V DC	0 V DC	+24 V DC
14	I 14	+24 V DC	0 V DC	0 V DC	+24 V DC
15	I 15	+24 V DC	0 V DC	0 V DC	+24 V DC
16	I 16	+24 V DC	0 V DC	0 V DC	+24 V DC

Data from the digital inputs		
Feature	Value	Description
Type of input	Type 1	Positive switching (to IEC 61131-2) or negative switching
Cable length	max. 30 m	For unshielded connection cables Cables over 30 m in length must be shielded.
Cable cross-section in the control cabinet	0.14–1.5 mm ² (26-16 AWG)	Aim for plug connector limits to UL specifications.
Field wiring	comply with regulations and standards	Comply with all applicable local regulations and the requirements of DIN EN 61131-2.
Rated load voltage	24 V DC (SELV)	–
Delay time	1 ms	Applies to transitions from 0 to 1 and from 1 to 0
Signal evaluation	cyclical	Depends on the cycle time set in the programming system
Protection against reverse polarity	Yes	–
Potential isolation	No	–
Status display	Yes	One orange LED per input Lights up at logical 1

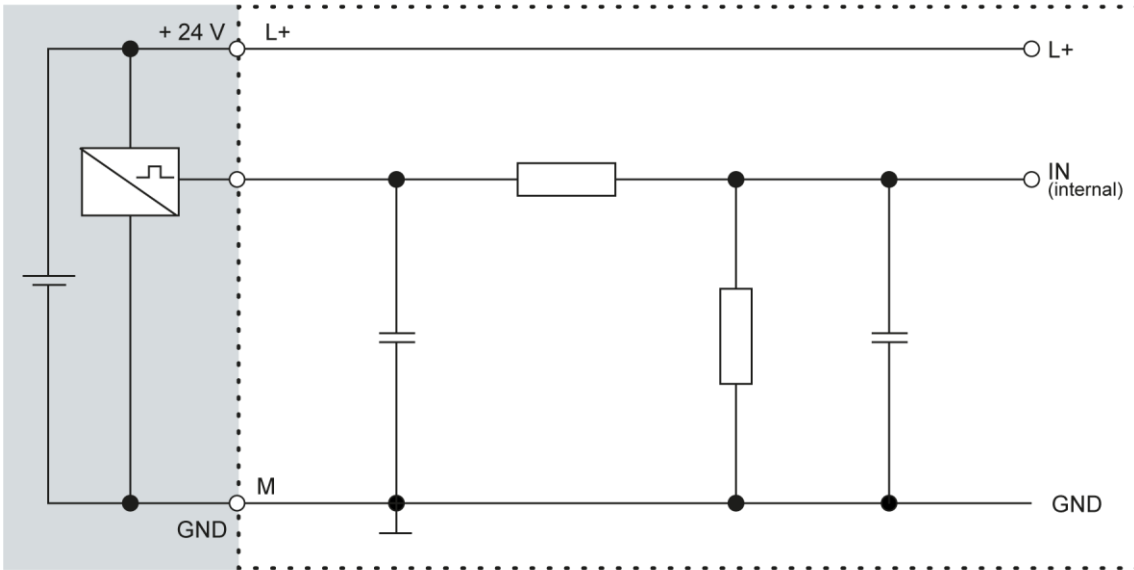


Fig. 9: CC-DIO 16/16: Circuit diagram of the principles of positive switching (P) input

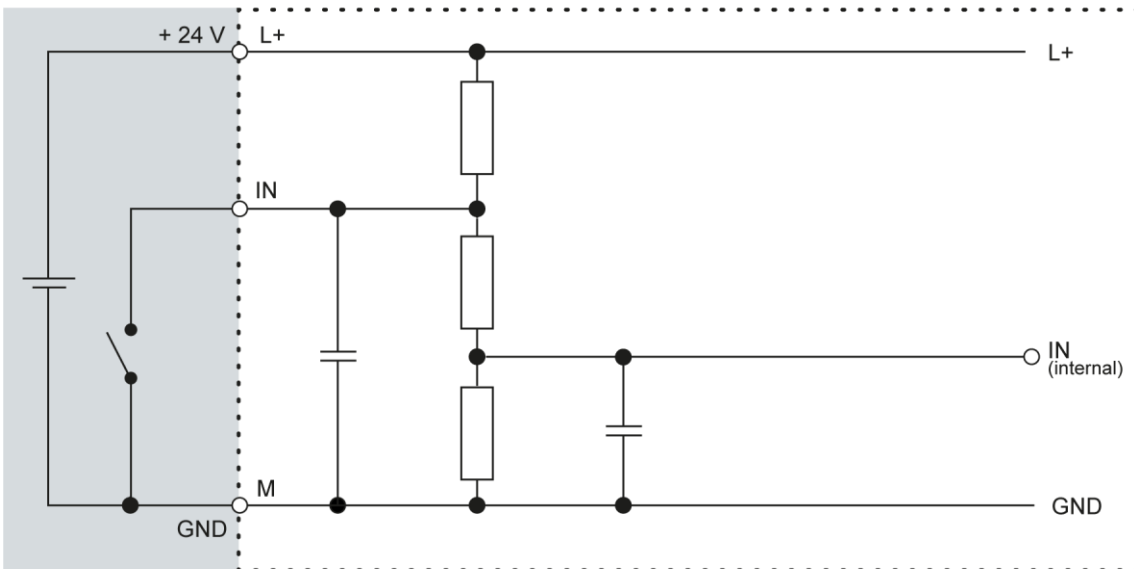


Fig. 10: CC-DIO 16/16: Circuit diagram of the principles of negative switching (N) input

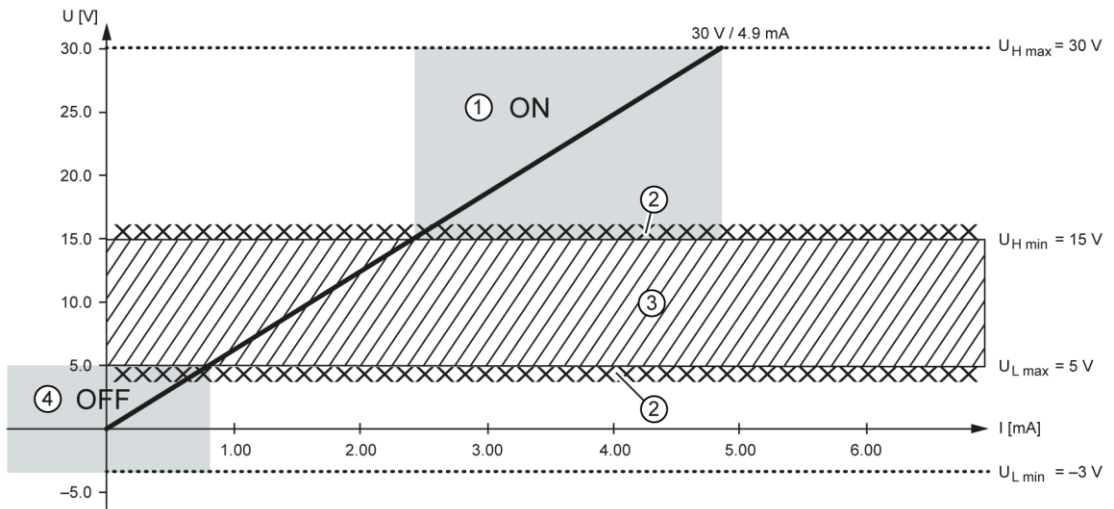


Fig. 11: CC-DIO 16/16: Operating ranges of digital inputs (type 1), positive switching (P)

No.	Designation	No.	Designation
1	“ON” range	3	Transition range
2	Signal-to-noise ratio < 1 V	4	“OFF” range

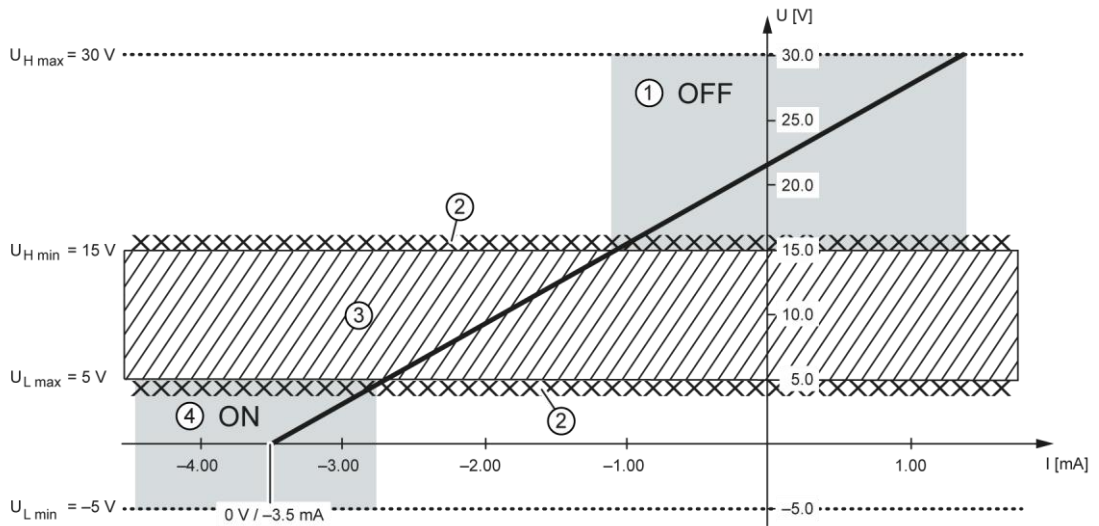


Fig. 12: CC-DIO 16/16: Operating ranges of digital inputs (type 1), negative switching (N)

No.	Designation	No.	Designation
1	“OFF” range	3	Transition range
2	Signal-to-noise ratio < 1 V	4	“ON” range

5.3.4 Digital outputs CC-DIO 16/16 (P/N)

Depending on the device version, the digital outputs are positive or negative switching 24 V outputs with an output current of max. 500 mA. They have a common reference potential (GND) with the supply voltage.

The following counterparts have been tested for the SC-SMT 3.81 plug-in connector (Weidmüller), and may be used with the device:

- Weidmüller BCZ 3.81/16/180 (F, LH)
- Weidmüller BCF 3.81/16/180 (F, LH)

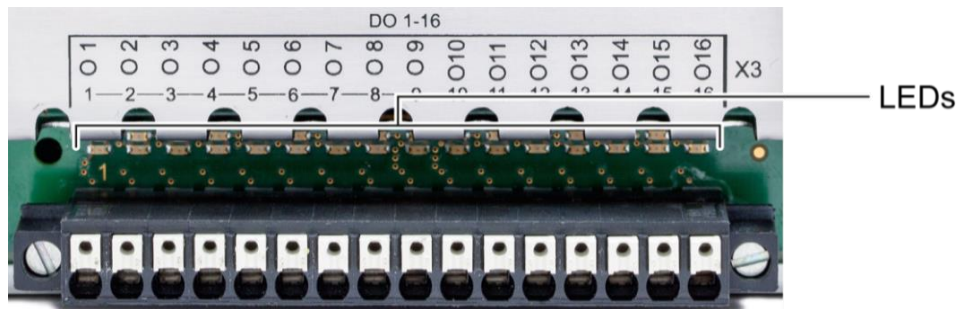


Fig. 13: Digital outputs CC-DIO 16/16, plug X3 with LEDs 1 to 16

Digital outputs, plug X3					
Pin	Des.	Assignment N-switching		Assignment P-switching	
		logical 0	logical 1	logical 0	logical 1
1	O 1	+24 V DC	0 V DC	0 V DC	+24 V DC
2	O 2	+24 V DC	0 V DC	0 V DC	+24 V DC
3	O 3	+24 V DC	0 V DC	0 V DC	+24 V DC
4	O 4	+24 V DC	0 V DC	0 V DC	+24 V DC
5	O 5	+24 V DC	0 V DC	0 V DC	+24 V DC
6	O 6	+24 V DC	0 V DC	0 V DC	+24 V DC
7	O 7	+24 V DC	0 V DC	0 V DC	+24 V DC
8	O 8	+24 V DC	0 V DC	0 V DC	+24 V DC
9	O 9	+24 V DC	0 V DC	0 V DC	+24 V DC
10	O 10	+24 V DC	0 V DC	0 V DC	+24 V DC
11	O 11	+24 V DC	0 V DC	0 V DC	+24 V DC
12	O 12	+24 V DC	0 V DC	0 V DC	+24 V DC
13	O 13	+24 V DC	0 V DC	0 V DC	+24 V DC
14	O 14	+24 V DC	0 V DC	0 V DC	+24 V DC
15	O 15	+24 V DC	0 V DC	0 V DC	+24 V DC

Digital outputs, plug X3					
Pin	Des.	Assignment N-switching		Assignment P-switching	
		logical 0	logical 1	logical 0	logical 1
16	O 16	+24 V DC	0 V DC	0 V DC	+24 V DC

Data from the digital outputs		
Feature	Value	Description
Type of output	Semiconductor	Non-storing, positive or negative switching
Protective circuit for inductive loads	41 V clamping voltage (typ.) compared to +24 V	Fast de-excitation (must be provided externally)
Status display	Yes	One orange LED per output Lights up at logical 1
Overload protection	Yes	In the case of thermal overload, auto-resetting
Short-circuit protection response threshold	Yes	Electronic current limitation: typ. 5 A The current is limited electronically. Activation of the short-circuit protection results in thermal overload and tripping of the thermal overload protection. Permissible limit values starting from cold state for P-switches: max. 10,000 short circuits, total duration max. 500 hours.
Status in unsafe operating conditions	Logical 0	If the supply voltage is insufficient and the control system is started up or shut down, the outputs are set to logical 0.
Output delay "0" after "1"	typ. 1 ms	–
Output delay "1" after "0"	typ. 1 ms	–
Output capacitance	< 20 nF	–
Rated voltage	+24 V DC	–
Voltage drop (at rated current)	< 0.1 V	–
Rated current at "1" signal	0.5 A	–
Total current of all outputs	max. 4 A	–

Data from the digital outputs		
Feature	Value	Description
Parallel switching of two outputs	max. 1 A	Maximum permissible value with a logical connection to increase power

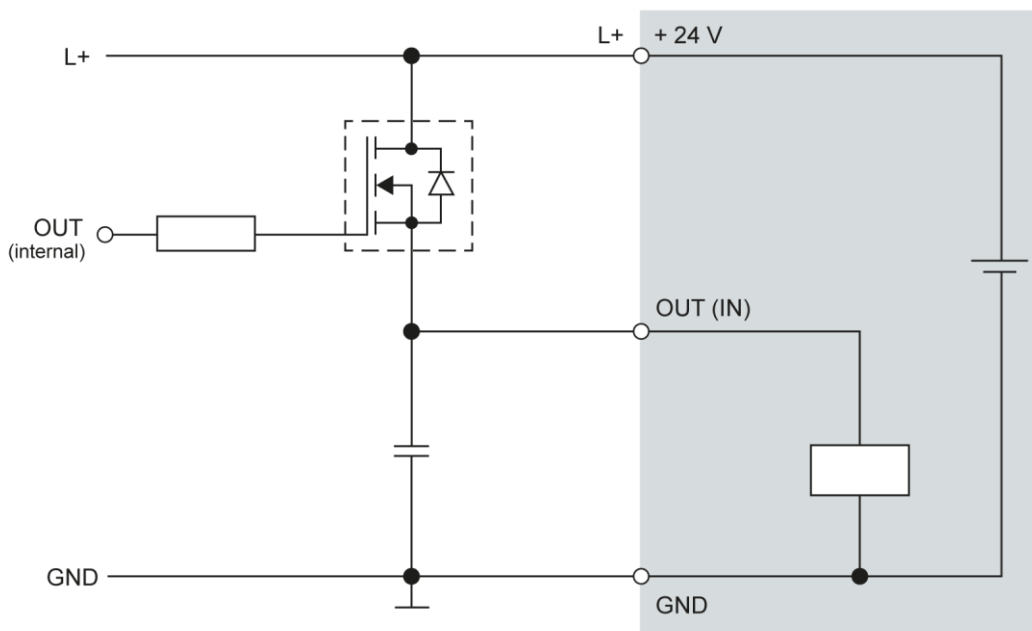


Fig. 14: CC-DIO 16/16: circuit diagram of the principles of positive switching (P) output

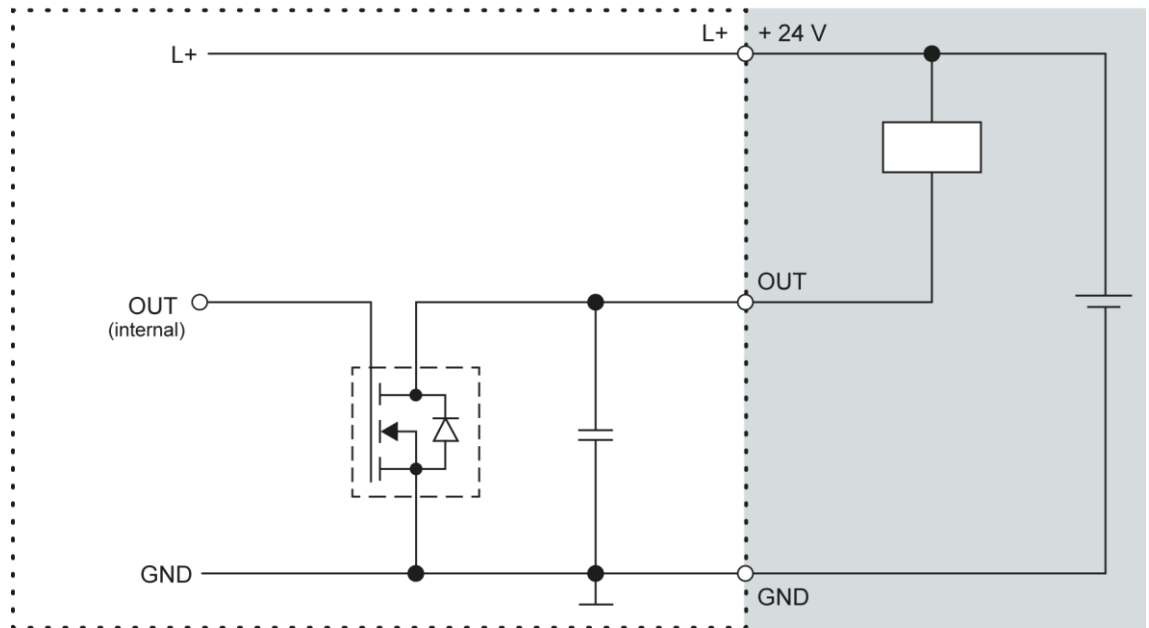


Fig. 15: CC-DIO 16/16: circuit diagram of the principles of negative switching (N) output

5.3.5 Analogue inputs and outputs, CC-AIO 12/6

The CC-AIO 12/6 module has up to 12 analogue inputs (AI) and 6 analogue outputs (AO) on plugs X2, X5 and X6. The arrangement of the I/Os is identical on all 3 plugs.

The following counterparts have been tested for the SC-SMT 3.81 plug-in connector (Weidmüller), and may be used with the CC-AIO 12/6:

- Weidmüller BCZ 3.81/14/180 (F, LH, LR)
- Weidmüller BCF 3.81/14/180 (F, LH, LR)

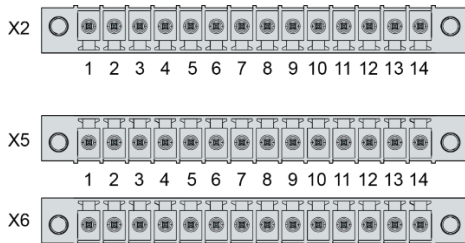


Fig. 16: CC-AIO 12/6: analogue inputs and outputs, plugs X2, X5 and X6

Analogue inputs and outputs, plugs X2, X5 and X6				
Pin	X2	X6	X5	Assignment
1	AI 1	AI 5	AI 9	U/T; ± 10 V; PT100/1000
2	AI 1	AI 5	AI 9	I; ± 20 mA
3	–	–	–	AGND
4	AI 2	AI 6	AI 10	U; ± 10 V
5	AI 2	AI 6	AI 10	I; ± 20 mA
6	–	–	–	AGND
7	AI 3	AI 7	AI 11	U/T; ± 10 V; PT100/1000
8	AI 3	AI 7	AI 11	I; ± 20 mA
9	–	–	–	AGND
10	AI 4	AI 8	AI 12	U; ± 10 V
11	AI 4	AI 8	AI 12	I; ± 20 mA
12	–	–	–	AGND
13	AO 1	AO 3	AO 5	U; 0–10 V
14	AO 2	AO 4	AO 6	U; 0–10 V

5.3.5.1

5.3.5.2

5.3.5.3 Wiring the analogue channels

To ensure the measuring accuracy of the device, observe the following connection technology requirements for the analogue sensors:

- ▶ Use analogue cables with a braided shield.
- ▶ Lay analogue cables and power cables separately. Where required, install metallic shielding in cable channels.
- ▶ Earth the screen at the place where it enters the control cabinet.
- ▶ Connect the screen close and directly with AGND.

5.3.5.4 Data from analogue inputs

Data from analogue inputs		
Feature	Value	Description
Cable length	max. 30 m	Applies to unshielded connection cables. Cables over 30 m in length must be shielded.
Modulation method	Delta-sigma modulation	–
Shared points between the channels	AGND reference	–
Calibration frequency	12 months	Maintenance of accuracy class
Clamp arrangement	Shielding on common AGND pins	–
Sampling duration/rate for measuring values	1 ms	A reading is taken from each input channel every millisecond regardless of how many channels are actually in operation
Sampling rate AI-PT operating mode	250 ms	In AI-PT operating mode, calculations are carried out according to the millisecond sampling rate. A new value is available in the user program every 250 ms.

Digital filtering		
Possible filter settings	Time range for averaging	Time range for averaging AI-PT operating mode
10	10 ms	2.5 s
100	100 ms	25 s
1,000	1,000 ms (1 s)	250 s

If filtering is active, an average is calculated for the set time range. However, a value is still issued during the sampling rate interval. For example, if the filter is set to 1,000, the average of the measurements for the last 1,000 ms / 1,000 measurements is issued each millisecond (or, in the case of AI-PT operating mode, every 250 ms, the average from the last 250 ms / 1,000 measurements).

The filtering can be activated and configured using CODESYS V3. The sampling rate is constant. It can only be filtered with a whole multiple of the sampling rate.

5.3.5.5 Operating modes for the analogue inputs

NOTICE

Damage to channel

High voltages can damage analogue channels, stopping them from working correctly.

- ▶ Ensure the input voltage does not exceed ± 30 V.

Operating mode: voltage input AI (U)

Feature	Value	Description
Connections per input	–	AI (U/T) and AGND or AI (U) and AGND; connect shield to AGND.
Measuring range	-10 - +10 V	–
Input impedance in signal range	100 k Ω	between AI (U/T) and AGND or between AI (U) and AGND
Max. errors at 25°C	$\pm 2,500$ ppm (± 25 mV)	–
Temperature coefficient	± 40 ppm/K (± 0.4 mV/K)	–
Digital resolution	24 bit	–
Data format in Application program	32 Bit Real	(floating-point number) in millivolts (mV)
Maximum permissible permanent overload	Max. ± 30 V compared to AGND	± 30 V = max. voltage on AI channel
Output of digital value in case of overload	–	If a voltage of ± 10 V is applied to an AI (U), a plausible value is still given up to approx. ± 15 V. The specified accuracy is only valid for the range -10 to +10 V. When applying voltages above ± 16 V, the values are strongly distorted, above +23 V a fault

Operating mode: voltage input AI (U)		
Feature	Value	Description
		bit is set which can be queried in the application program.
Input type	–	Asymmetrical voltage metering (single-ended)
Reference potential	AGND	–
Dynamic properties		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 500 μ s	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

Operating mode: voltage input AI (I)		
Feature	Value	Description
Connections per input	–	AI (U) and AGND connect shield to AGND.
Protective device	–	Thermal current limitation
Measuring range	–20 - +20 mA	Technical current direction into AI (I)
Load impedance	typ. 20 Ω	–
Max. errors at 25°C	\pm 2,000 ppm (\pm 40 μ A)	–
Temperature coefficient	\pm 40 ppm/K (\pm 0.8 μ A/K)	–
Digital resolution	24 bit	–
Data format in Application program	32 Bit Real	(floating-point number) in milliamps (mA)
Maximum permissible permanent overload	Max. \pm 25 mA	–
Output of digital value in case of overload	–	If a voltage of more than \pm 20 mA is applied to an AI (U), a plausible value is still given up to approx. \pm 25 mA. The specified accuracy is only valid for the range –20 - +20 mA.

Operating mode: voltage input AI (I)		
Feature	Value	Description
Input type	–	Current measurement compared to AGND
Reference potential	AGND	–
Dynamic properties		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 215 µs	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

Operating mode: temperature inputs AI-PT		
Feature	Value	Description
Connections per input	–	Sensor connection between AI (U/T) and AGND
Possible sensors	PT100 and PT1000 acc. to EN 60751	Accuracy class AA, A, B and C platinum sensors may be used; recommended: B or C
Measuring range	-40 - +200°C	–
Measuring current (RMS)	0.3 mA	–
Conversion time	250 ms	–
Max. errors at 25°C	±2,100 ppm (±0.5°C)	–
Temperature coefficient	±50 ppm/K (±0.012°C/K)	–
Digital resolution	24 bit	–
Data format in Application program	2 × 32 Bit Real	(floating-point number) in Ohms (Ω) and degrees Celsius (°C)
Linearisation	–	The value in degrees Celsius is calculated from the resistance value and linearised (3rd degree polynomial)
Input type	–	2-wire measurement or 3-wire measurement
Reference potential	AGND	–
Dynamic properties		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 500 µs	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

5.3.5.6 Data from analogue outputs

Data from analogue outputs		
Feature	Value	Description
Protective device	Thermal over-load protection	–
Isolation voltage between channel and other circuits	None	–
Cable length	max. 30 m	Applies to unshielded connection cables. Cables over 30 m in length must be shielded.
Shared points between the channels	AGND	AGND is the reference potential for all analogue outputs
Calibration frequency	12 months	Maintenance of accuracy class
Permitted load types	–	Resistive and capacitive loads
Largest capacitive load	10 μ F	Larger capacitive loads can cause the output to vibrate.
Load impedance range	> 1 k Ω	–
Overload protection	Short-circuit-proof	Current limitation from approx. 22 mA (at 25°C ambient temperature)
Output response during power supply switching on and switching off processes		
No supply voltage	AI (I) to AGND: < 40 Ω	Low-resistance output
During device boot-up	–	The analogue output is not yet active during device boot-up. Deviations from the zero value during switch-on are approx. \leq 1.5% of the signal range (voltage connected to open output for approx. 150 ms).
During temporary interruptions	–	The analogue outputs are disconnected and low resistance in the case of temporary interruptions to the power supply of > 10 ms.
Behaviour in stop mode		
Voltage output	–	Can be configured in CODESYS. Either the last valid value is used or 0 V is used.

5.3.5.7 Operating modes for the analogue outputs

Operating mode: voltage output AO (U)		
Feature	Value	Description
Signal range	0-10 V	–
Connections per output	–	AO (U) and AGND; connect screening to AGND. Screening used alongside AI channels.
Load impedance	> 1 kΩ	–
Output impedance in the signal range	< 1 Ω	at an active output
Output current	Max. 10 mA	–
Max. errors at 25°C	±0.5 % (±50 mV)	–
Temperature coefficient	±40 ppm/K (±0.4 mV/K)	–
Value of least significant bit (LSB)	±244 ppm (±2.44 mV)	–
Digital resolution	12 bit	–
Data format in Application program	32 Bit Real	(floating-point number) in millivolts (mV)
Dynamic properties		
Build-up time for change in full range to 95% of final value	320 μs	–
Overshooting	0.1% of measuring range	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

If a wiring error causes a voltage source of more than 30 V, this channel may become defective.

5.3.6 Example connections of analogue inputs and outputs

5.3.6.1 Voltage input AI (U)

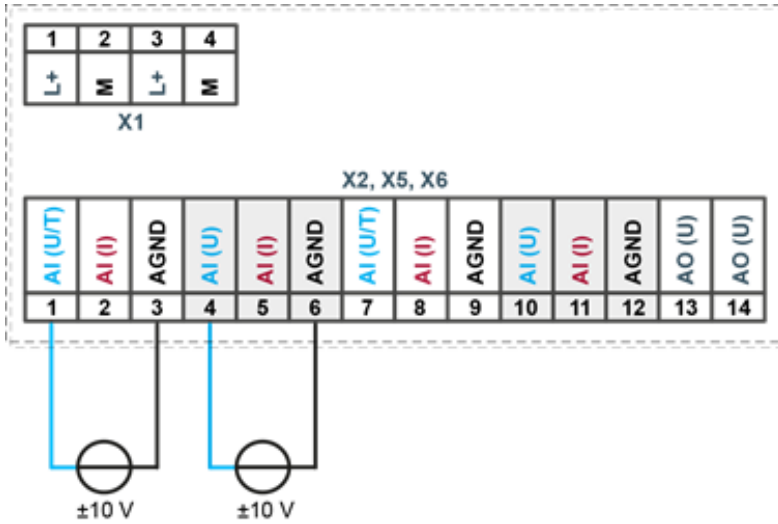


Fig. 17: Connection example: voltage input

- ▶ Only use the corresponding AGND for each voltage input.
- ▶ Do not connect AGNDs from different channels.
- ▶ Only use one channel per function: either AI (U) or AI (I).
- ▶ Do not connect to the common GND. The required connections can already be found on the circuit board.
- ▶ Cables to the analogue sensors/encoders should be connected as directly as possible (avoid the use of terminals and terminal blocks).

5.3.6.2 Power input AI (I)

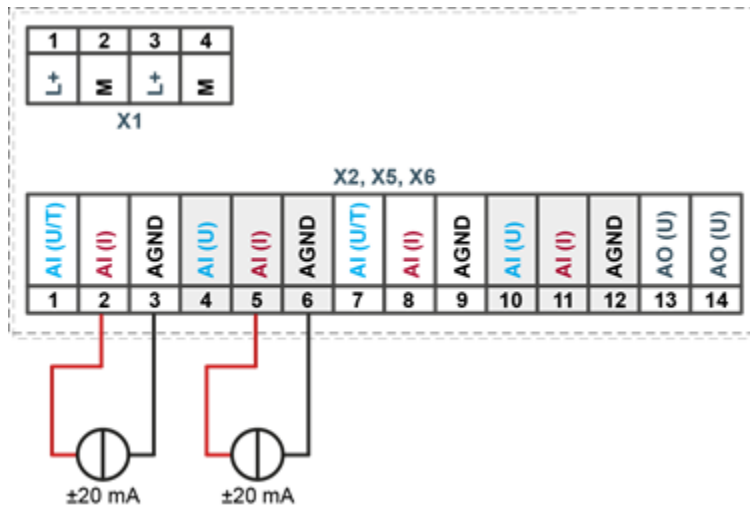


Fig. 18: Connection example: power input

- ▶ Only use the corresponding AGND for each power input.
- ▶ Do not connect AGNDs from different channels.
- ▶ Only use one channel per function: either AI (U) or AI (I).
- ▶ Do not connect to the common GND. The required connections can already be found on the circuit board.
- ▶ Cables to the analogue sensors/encoders should be connected as directly as possible (avoid the use of terminals and terminal blocks).

5.3.6.3 Temperature measurement AI (T)

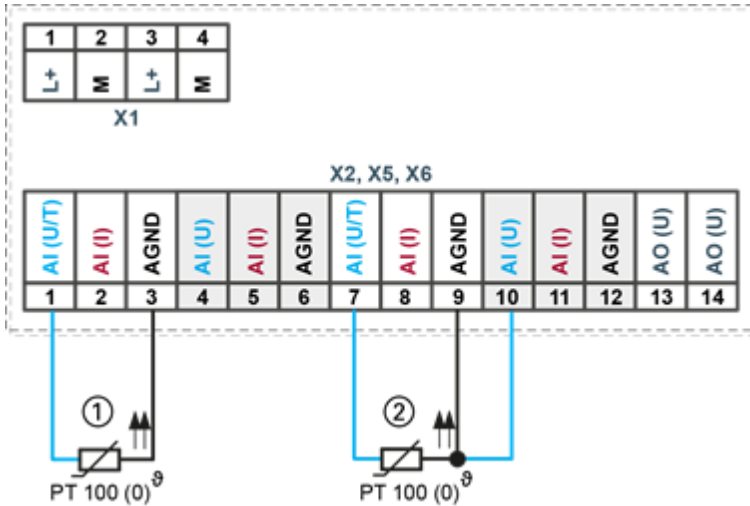


Fig. 19: Connection example: temperature measurement

No.	Description
1	PT 100 or PT 1000 with 2-wire connection
2	PT 100 or PT 1000 with 3-wire connection

- ▶ Only use the corresponding AGND for each power input.
- ▶ Do not connect AGNDs from different channels.
- ▶ Only use one channel per function: either AI (U) or AI (I).
- ▶ Do not connect to the common GND. The required connections can already be found on the circuit board.
- ▶ Cables to the PT100(0) sensors should be connected as directly as possible and without detours (avoid the use of terminals and terminal blocks).
- ▶ Only connect PT100(0) sensors to AI (U/T) channels. Each 14-pin plug-in connector has 2 AI (U/T) channels.

5.3.6.4 2-wire measurement

Resistance can result in a measurement error, which in the case of long cables with a small cross-section can be up to 10°. If the temperature of the sensor is known, this deviation can be subtracted and compensated through the software (alternatively, use 3-wire measurement).

5.3.6.5 3-wire measurement

The nearest AI (U) connection is used to compensate the resistance in the cable. It can only be used directly in conjunction with the following AI (U/T) channel.

5.3.6.6 Voltage output AO (U)

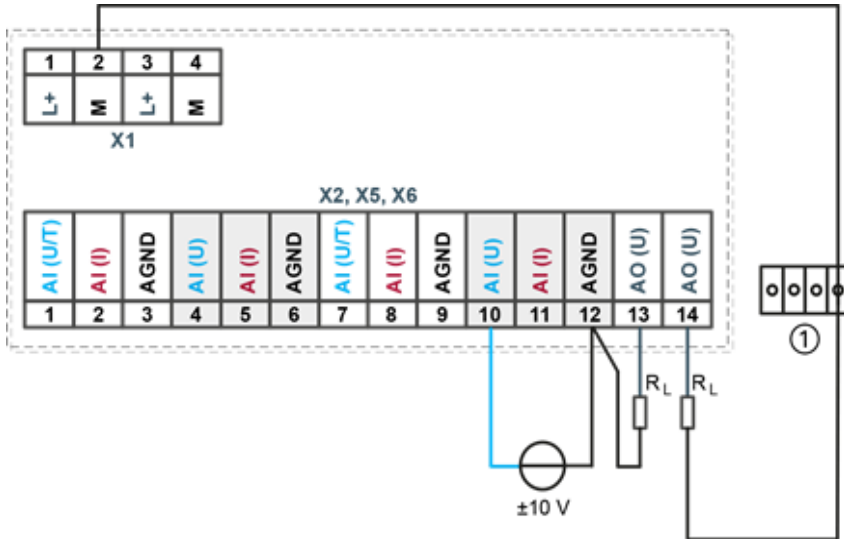


Fig. 20: Connection example: Voltage output

No.	Description
1	Terminal block

- ▶ Connect the voltage outputs directly to the input channel AGND.
If direct connection to the AGND is not possible: connect the voltage input to the overall GND of the device.
- ▶ AGNDs which are also used by other input channels should not be connected to the same terminal block in order to avoid changes in the voltage to the AO (U) and the temperature value.
- ▶ Only use the corresponding AGND for each power input.
- ▶ Ensure that the cable resistance is substantially lower than the load resistance R_L so as to guarantee high measuring accuracy. Take into account the voltage divider between the load and cable resistance.

5.3.7 EtherCAT output

The onboard Ethernet adapter has two RJ45 EtherCat connections for networking. The EtherCAT interface X3 can only be used as an EtherCAT output.

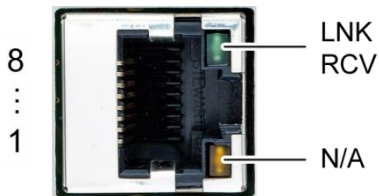


Fig. 21: EtherCAT output X3

Assignment of EtherCAT output X3			
Pin	Assignment	Pin	Assignment
1	TX+	5	NC
2	TX-	6	RX-
3	RX+	7	NC
4	NC	8	NC

LEDs		
LED	Colour	Meaning according to IEEE 802.3 clause 25
LNK/RCV	Green	Link, Data Receive Flashing: connection active; data transfer in progress Off: no connection established
N/A	Yellow	no function

5.3.8 EtherCAT input

The onboard Ethernet adapter has two 100 Base-T interfaces with RJ-45 connections for networking. The EtherCAT interface X4 can only be used as an EtherCAT input.

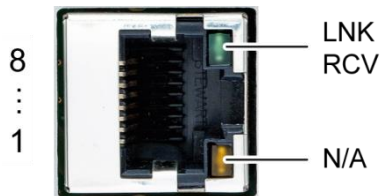


Fig. 22: EtherCAT input X4

Assignment of EtherCat input X4			
Pin	Assignment	Pin	Assignment
1	TX+	5	NC
2	TX-	6	RX-
3	RX+	7	NC
4	NC	8	NC

LEDs		
LED	Colour	Meaning according to IEEE 802.3 clause 25
LNK/RCV	Green	Link, Data Receive Flashing: connection active; data transfer in progress Off: no connection established
N/A	Yellow	no function

6 Operation

6.1 Switching on and off

NOTICE

Damage or malfunction!

- ▶ Do not insert, connect, undo or touch any connections while the device is in operation.
 - ▶ Before starting any work on the device, switch off all power supplies, including those to any connected peripherals (externally powered encoders, programming devices etc.).
-

NOTICE

Damage to property!

- ▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct.
-

Switching on

The device does not have an on/off switch. The device starts automatically when the system is switched on or the power is connected.

Switching off

The device is switched off when the system is switched off or the power supply is disconnected.

6.2 Initial start-up of the CC-DIO 16/16 (P/N)

- 1st Download the “BerghofECCDIO_x.x.x.xml” device description from the download area of www.berghof.com and install on the controller.
- 2nd Integrate the device into the CODESYS project as shown in the following graphics.

The device logs on to the bus as CC-DIO 16/16P (or CC DIO 16/16N).

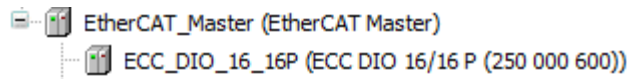


Fig. 23: Logged on device

There are two bytes each for the digital inputs and the digital outputs.

Variable	Mapping	Kanal	Adresse	Typ	Standardwert	Einheit	Beschreibung
ecc_out_0		Digital Output 0	%QB40	USINT			Digital Output 0
ecc_out_1		Digital Output 1	%QB41	USINT			Digital Output 1
ecc_in_0		Digital Input 0	%IB300	USINT			Digital Input 0
ecc_in_1		Digital Input 1	%IB301	USINT			Digital Input 1

Fig. 24: Bytes for the inputs and outputs

Variable	Mapping	Kanal	Adresse	Typ	Standardwert	Einheit	Beschreibung
ecc_out_0		Digital Output 0	%QB40	USINT			Digital Output 0
ecc_out_1		Digital Output 1	%QB41	USINT			Digital Output 1
ecc_in_0		Digital Input 0	%IB300	USINT			Digital Input 0
		Bit0	%IX300.0	BOOL	FALSE		Digital Input 0
		Bit1	%IX300.1	BOOL	FALSE		Digital Input 0
		Bit2	%IX300.2	BOOL	FALSE		Digital Input 0
		Bit3	%IX300.3	BOOL	FALSE		Digital Input 0
		Bit4	%IX300.4	BOOL	FALSE		Digital Input 0
		Bit5	%IX300.5	BOOL	FALSE		Digital Input 0
		Bit6	%IX300.6	BOOL	FALSE		Digital Input 0
ecc_in_1		Digital Input 1	%IB301	USINT			Digital Input 1
		Bit0	%IX301.0	BOOL	FALSE		Digital Input 1
		Bit1	%IX301.1	BOOL	FALSE		Digital Input 1
		Bit2	%IX301.2	BOOL	FALSE		Digital Input 1
		Bit3	%IX301.3	BOOL	FALSE		Digital Input 1
		Bit4	%IX301.4	BOOL	FALSE		Digital Input 1
		Bit5	%IX301.5	BOOL	FALSE		Digital Input 1
		Bit6	%IX301.6	BOOL	FALSE		Digital Input 1
Bit7	%IX301.7	BOOL	FALSE		Digital Input 1		

Fig. 25: Bytes for the digital inputs

Variable	Channel	Inputs
ecc_in_0	Digital input 0, Bit 0–7	1–8
ecc_in_1	Digital input 1, Bit 0–7	9–16



Variable	Mapping	Kanal	Adresse	Typ	Standardwert	Einheit	Beschreibung
ecc_out_0		Digital Output 0	%QB40	USINT			Digital Output 0
		Bit0	%QX40.0	BOOL	FALSE		Digital Output 0
		Bit1	%QX40.1	BOOL	FALSE		Digital Output 0
		Bit2	%QX40.2	BOOL	FALSE		Digital Output 0
		Bit3	%QX40.3	BOOL	FALSE		Digital Output 0
		Bit4	%QX40.4	BOOL	FALSE		Digital Output 0
		Bit5	%QX40.5	BOOL	FALSE		Digital Output 0
		Bit6	%QX40.6	BOOL	FALSE		Digital Output 0
ecc_out_1		Digital Output 1	%QB41	USINT			Digital Output 1
		Bit0	%QX41.0	BOOL	FALSE		Digital Output 1
		Bit1	%QX41.1	BOOL	FALSE		Digital Output 1
		Bit2	%QX41.2	BOOL	FALSE		Digital Output 1
		Bit3	%QX41.3	BOOL	FALSE		Digital Output 1
		Bit4	%QX41.4	BOOL	FALSE		Digital Output 1
		Bit5	%QX41.5	BOOL	FALSE		Digital Output 1
		Bit6	%QX41.6	BOOL	FALSE		Digital Output 1
Bit7	%QX41.7	BOOL	FALSE			Digital Output 1	

Fig. 26: Bytes for the digital outputs

Variable	Channel	Inputs
ecc_out_0	Digital output 0, Bit 0–7	1–8
ecc_out_1	Digital output 1, Bit 0–7	9–16

6.3 Initial start-up of the CC-AIO 12/6

- 1st Download the “BerghofECCAIO_x.x.x.xml” device description from the download area of www.berghof.com and install on the controller.
- 2nd Integrate the device into the CODESYS project as shown in the following graphics.

The device logs on to the bus as CC-AIO 12/6.

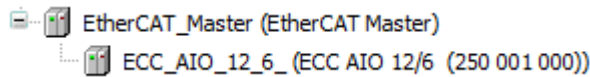


Fig. 27: Logged on device

6.3.1 Configuration

The multifunctional analogue inputs (AI) are configured via the startup parameters of the Ether-CAT slave module

- 1st Choose the channel function via the drop-down list (AI_U, AI_I, AI_PT100_2, AI_PT100_3, AI_PT1000_2 or AI_PT1000_3).
- 2nd If required, choose optional filters for the AI-channels via the drop-down list (standard setting of all AI channels: voltage input without filter function).

Zeile	IndexSubindex	Name	Wert	Bitlänge	Abbruch bei Fehler	Springe zu Zeile bei Fehler	Nächste Zeile	Kommentar
1	16#8000:16#01	CH0_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH0_Mode
2	16#8000:16#02	CH0_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH0_Filter
3	16#8001:16#01	CH1_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH1_Mode
4	16#8001:16#02	CH1_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH1_Filter
5	16#8002:16#01	CH2_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH2_Mode
6	16#8002:16#02	CH2_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH2_Filter
7	16#8003:16#01	CH3_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH3_Mode
8	16#8003:16#02	CH3_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH3_Filter
9	16#8004:16#01	CH4_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH4_Mode
10	16#8004:16#02	CH4_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH4_Filter
11	16#8005:16#01	CH5_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH5_Mode
12	16#8005:16#02	CH5_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH5_Filter
13	16#8006:16#01	CH6_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH6_Mode
14	16#8006:16#02	CH6_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH6_Filter
15	16#8007:16#01	CH7_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH7_Mode
16	16#8007:16#02	CH7_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH7_Filter
17	16#8008:16#01	CH8_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH8_Mode
18	16#8008:16#02	CH8_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH8_Filter
19	16#8009:16#01	CH9_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH9_Mode
20	16#8009:16#02	CH9_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH9_Filter
21	16#800A:16#01	CH10_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH10_Mode
22	16#800A:16#02	CH10_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH10_Filter
23	16#800B:16#01	CH11_Mode	AI_U	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH11_Mode
24	16#800B:16#02	CH11_Filter	0	32	<input type="checkbox"/>	<input type="checkbox"/>	0	CH11_Filter

Fig. 28: CC-AIO start parameters

6.3.2 I/O mapping

The I/O mapping contains the analogue outputs (AO) channel 0–5 (CH0_AO to CH5_AO) and the analogue inputs (AI) channel 0–11 (CH0_AI to CH11_AI).

The analogue inputs consist of a REAL value which contains the value of the quantity to be measured and a status byte of the USINT type. The status byte must be checked to validate the input before usage and to detect errors. Depending on the configuration of each channel, the value shown can be interpreted as millivolts (mV) or as degrees Celsius (°C).

Variable	Mapping	Kanal	Adresse	Typ	Standardwert	Einheit	Beschreibung
		CH0_AO	%QD0	REAL	0		CH0_AO
		CH1_AO	%QD1	REAL	0		CH1_AO
		CH2_AO	%QD2	REAL	0		CH2_AO
		CH3_AO	%QD3	REAL	0		CH3_AO
		CH4_AO	%QD4	REAL	0		CH4_AO
		CH5_AO	%QD5	REAL	0		CH5_AO
		CH0_AI	%ID0	REAL	0		CH0_AI
		CH0_Status	%IB4	USINT			CH0_Status
		CH1_AI	%ID2	REAL	0		CH1_AI
		CH1_Status	%IB12	USINT			CH1_Status
		CH2_AI	%ID4	REAL	0		CH2_AI
		CH2_Status	%IB20	USINT			CH2_Status
		CH3_AI	%ID6	REAL	0		CH3_AI
		CH3_Status	%IB28	USINT			CH3_Status
		CH4_AI	%ID8	REAL	0		CH4_AI
		CH4_Status	%IB36	USINT			CH4_Status
		CH5_AI	%ID10	REAL	0		CH5_AI
		CH5_Status	%IB44	USINT			CH5_Status
		CH6_AI	%ID12	REAL	0		CH6_AI
		CH6_Status	%IB52	USINT			CH6_Status
		CH7_AI	%ID14	REAL	0		CH7_AI
		CH7_Status	%IB60	USINT			CH7_Status
		CH8_AI	%ID16	REAL	0		CH8_AI
		CH8_Status	%IB68	USINT			CH8_Status
		CH9_AI	%ID18	REAL	0		CH9_AI
		CH9_Status	%IB76	USINT			CH9_Status
		CH10_AI	%ID20	REAL	0		CH10_AI
		CH10_Status	%IB84	USINT			CH10_Status
		CH11_AI	%ID22	REAL	0		CH11_AI
		CH11_Status	%IB92	USINT			CH11_Status

Fig. 29: CC-AIO I/O mapping

6.3.2.1 Coding of the status bytes

Status	Description
Bit 0	Positive overvoltage in AI_U mode
Bit 1	Negative overvoltage in AI_U mode
Bit 2	Wire breakage detection in AI_PT mode
Bit 3	Reserved
Bit 4	Reserved
Bit 5	Reserved
Bit 6	Reserved
Bit 7	PT multiplexer signal (only for diagnostic purposes)

6.4 Operation

6.4.1 Status indicators

The operating status LEDs show the current status of the power supply and the status of the EtherCAT connection.

The signals from the LEDs depend on the current operating status of the device:

6.4.1.1 Location of the operating status LEDs

The Run/Stop and Error LEDs display the system status.

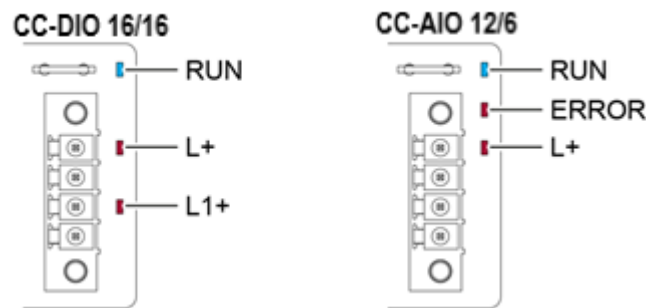


Fig. 30: Operating status LEDs CC-DIO / CC-AIO

CC-DIO 16/16			
LED		Meaning	
L1+	+24 V IO (yellow)	Off:	no power supply connected
		Dark:	the necessary supply voltage has not yet been reached
		Bright:	the correct supply voltage is present
L+	+24 V (yellow)	Off:	no power supply connected
		Dark:	the necessary supply voltage has not yet been reached
		Bright:	the correct supply voltage is present
RUN	EtherCAT Run (green)	Off:	Init (device not active)
		On:	OP (operational, is being operated by the control system)

CC-AIO 12/6			
LED		Meaning	
L+	+24 V (yellow)	Off:	no power supply connected
		Dark:	the necessary supply voltage has not yet been reached
		Bright:	the correct supply voltage is present
RUN	EtherCAT Run (green)	Off:	Init (device not active)
		On:	OP (operational, is being operated by the control system)
ERR	EtherCAT Error (red)	On:	Error

7 Servicing / Maintenance

Repairs and corrective maintenance may only be carried out by the manufacturer or its authorised customer service centres.

7.1 Maintenance

WARNING

Uncontrolled and unpredictable operational behaviour!

Failures or malfunctions may result in uncontrolled and unpredictable operational behaviour.

- ▶ Do not insert, connect, undo or touch any connections while the device is in operation.
- ▶ Before starting any work on the device, switch off all power supplies, including those to any connected peripherals (externally powered encoders, programming devices etc.).

If the device is used correctly it should not require maintenance.

- ▶ Make sure all the ventilation openings are kept free of obstructions
- ▶ Do not open the device. If it is necessary to work in the device, contact the Service department.

7.2 Cleaning

- ▶ Only clean the device using a dry, lint-free cloth.
- ▶ Do not use any cleaning liquids.

8 Disassembly

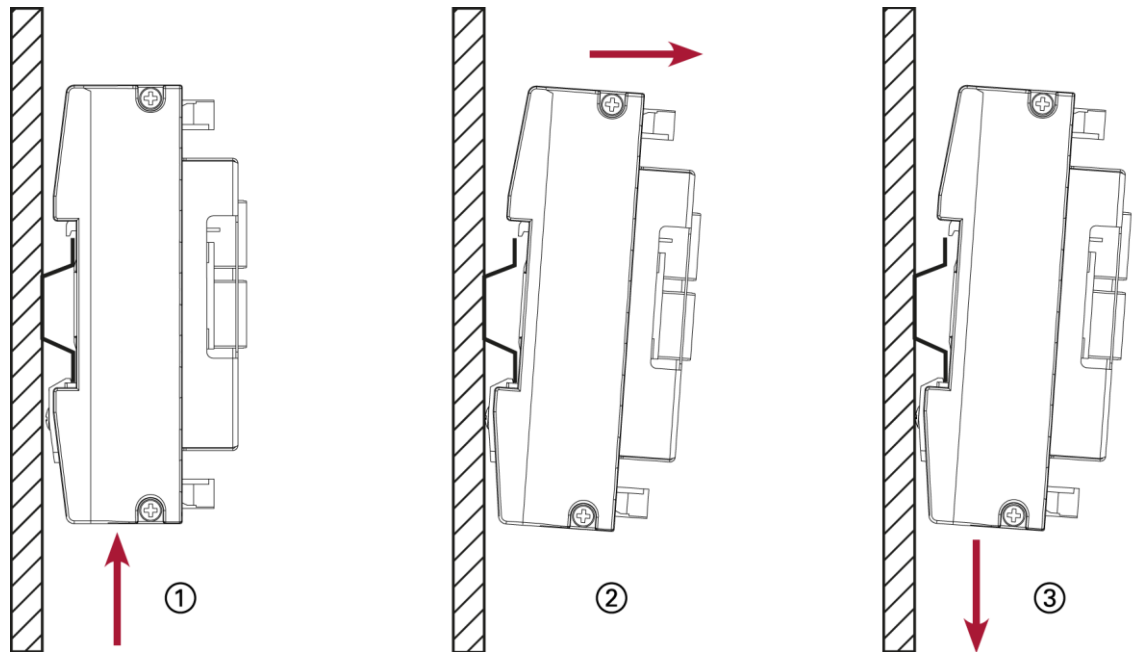


Fig. 31: Disassembling the device

- 1st Push the device from below towards the mounting rail and press in the plastic spring on the underside of the rail guide.
- 2nd Pull the device at the top away from the mounting rail.
- 3rd Push the device downwards and remove from the mounting rail.

9 Disposal

The device contains the following components which need to be disposed of separately:

- Metals
- Electronic components
- Plastics

The following options are available for disposal of the device:

Disposal by the manufacturer

- ▶ At the end of the device's operating life, you can return it to the manufacturer for a set fee. The manufacturer will then take the equipment for recycling.

Disposal in accordance with regional regulations

- ▶ Dismantle the device and disassemble it completely into its component parts.
- ▶ Send the metal parts for metal recycling.
- ▶ Sort the electronic parts (circuit boards, drives, etc.).
- ▶ Dispose of electronic scrap in accordance with the national laws and regulations.

10 Technical data

10.1 CC-DIO 16/16 (P/N)

B-Fortis	CC-DIO 16/16 (P/N)
Order numbers	CC-DIO 16/16 P: S-01020201-0100 CC-DIO 16/16 N: S-01020201-0200
Dimensions and weights	
Dimensions (WxHxD)	92 x 105 x 50 mm (including plugs and stainless-steel cover)
Housing	Housing for installation on a mounting rail, anodised aluminium
Weight	approx. 200 g
Operating conditions	
Ambient temperature	0°C to 55°C (in compliance with installation requirements)
Relative humidity	max. 85%, non-condensing
Transport and storage	
Ambient temperature	-20°C to +70°C
Relative humidity	max. 85%, non-condensing
Operation	
Assembly	on a mounting rail to DIN EN 60715:2001, 35 x 7.5 mm
Certification	to product standards DIN EN 61010-2-201, DIN EN 61131-2
Shock resistance	
Vibration	Sinusoidal (EN 60068-2-6) test: Fc 10-150 Hz, 1 G (operation mode)
Shock resistance	15 G (approx. 150 m/s ²), 10 ms duration, sinusoidal (EN 60068-2-27) test: Ea
EMC, protection rating	
Emission standard	EN 61000-6-3, residential area
Resistance to interference	EN 61000-6-2, industrial zone
Protection class	III
Insulation resistance	SELV (U _e < 30 V) acc. to EN 61131-2
Protection rating	IP20

B-Fortis	CC-DIO 16/16 (P/N)
Power supply (electronics, 24 V power supply unit)	
Supply voltage	+24 V DC (-15% / +20%) SELV max. AC voltage component 5%
Power consumption	typ. 0.05 A, max. 0.25 A at +24 V DC
Protection against reverse polarity	Yes
Internal overload protection	0.1 A, self-resetting
'Power' lamp	Yes
Power supply (digital outputs, 24 V power supply unit)	
Supply voltage	+24 V DC (-15% / +20%) SELV max. AC voltage component 5%
Power consumption	depending on the output load, max. 4 A continuous rating
Protection against reverse polarity	Yes
'Power' lamp	Yes
EtherCAT interfaces	
No. / type of interface	2x EtherCAT (EtherCAT slave, 1 input, 1 output)
Connection system	RJ45
I/O	
Digital IN	16x
Digital OUT	16x (0.5 A)

10.2 CC-AIO 12/6

B-Fortis	CC-AIO 12/6
Order number	CC-AIO 12/6: S-01020202-0100
Dimensions and weights	
Dimensions (WxHxD)	92 x 105 x 50 mm (including plugs and stainless steel cover)
Housing	Housing for installation on a mounting rail, anodised aluminium
Weight	approx. 200 g
Operating conditions	
Ambient temperature	0°C to 55°C (in compliance with installation requirements)
Relative humidity	max. 85%, non-condensing
Transport and storage	
Ambient temperature	-20°C to +70°C
Relative humidity	max. 85%, non-condensing
Operation	
Assembly	on a mounting rail to DIN EN 60715:2001, 35 x 7.5 mm
Certification	to product standards DIN EN 61010-2-201, DIN EN 61131-2
Shock resistance	
Vibration	Sinusoidal (EN 60068-2-6) test: Fc 10-150 Hz, 1 G (operation mode)
Shock resistance	15 G (approx. 150 m/s ²), 10 ms duration, sinusoidal (EN 60068-2-27) test: Ea
EMC, protection rating	
Emission standard	EN 61000-6-3, residential area
Resistance to interference	EN 61000-6-2, industrial zone
Protection class	III
Insulation resistance	SELV (Ue < 30 V) acc. to EN 61131-2
Protection rating	IP20
Power supply (electronics, 24 V power supply unit)	
Supply voltage	+24 V DC (-15% / +20%) SELV max. AC voltage component 5%
Power consumption	typ. 0.05 A, max. 0.25 A at +24 V DC

B-Fortis	CC-AIO 12/6
Protection against reverse polarity	Yes
Internal overload protection	0.1 A, self-resetting
'Power' lamp	Yes
Power supply (digital outputs, 24 V power supply unit)	
Supply voltage	+24 V DC (-15% / +20%) SELV max. AC voltage component 5%
Power consumption	depending on the output load, max. 4 A continuous rating
Protection against reverse polarity	Yes
'Power' lamp	Yes
EtherCAT interfaces	
No. / type of interface	2x EtherCAT (EtherCAT slave, 1 input, 1 output)
Connection system	RJ45
I/O	
Analogue inputs	6 A inputs (voltage ± 10 V; current ± 20 mA; PT100/1000 – 2-wire) 6 B inputs (voltage ± 10 V; current ± 20 mA) (alternatively, the adjacent A+B inputs can also be used as 1 PT100/1000 3-wire input)
Analogue outputs	6x voltage; 0–10 V; 12 bit resolution

10.3 Type plate

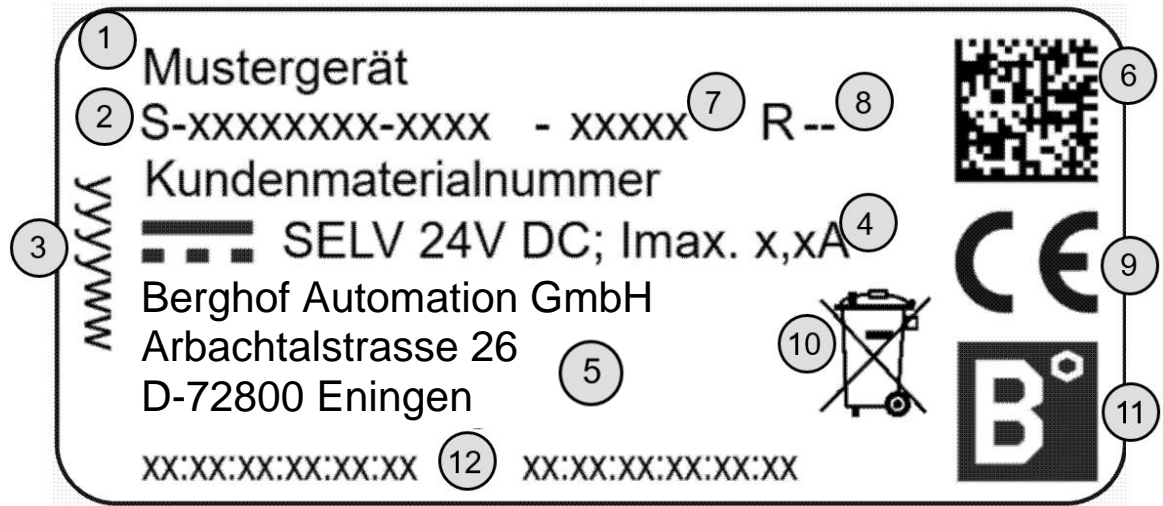


Fig. 32: Type plate for the B-Fortis CC-I/O series

No.	Designation	No.	Designation
1	Product description	7	Device serial number
2	Order number/item number	8	Version identification
3	Date of manufacture (year/week)	9	CE mark
4	Supply voltage and maximum current rating	10	Disposal information
5	Manufacturer (manufacturer's address)	11	Traders' marks (trademarks)
6	QR code (identification no.)	12	MAC addresses of device

11 Standards and certificates

11.1 Standards

Applicable directives

→ EMC Directive 2014/30/EU

Applicable standards

- PLC standard EN 61131-2:2008-4
- Emission standard EN 61000-6-3:2012-11
- Safety provisions DIN EN 61010-2-201

11.2 Declaration of conformity

CC-DIO 16/16:



Hiermit erklären wir in alleiniger Verantwortung, dass die nachstehend bezeichneten Geräte in ihrer Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den aufgeführten Richtlinien und Normen entsprechen. Bei einer mit uns nicht abgestimmten Änderung der Geräte verliert diese Erklärung ihre Gültigkeit.

We hereby declare, that the following described modules in their conception, construction and form are in compliance with the listed directives and standards. In case of any alteration of the modules, not certified by us, this declaration becomes invalid.

Hersteller / manufacturer Berghof Automation GmbH
Arbachtalstrasse 26
D-72800 Eningen

Produktbezeichnung / product name B-Fortis CC-DIO 16/16 P

Produktnummer / product number S-01020201-0100

Es wird die Übereinstimmung mit folgenden EU-Richtlinien und Normen erklärt:
The requirements of the following EU directives and standards are met:

Angewandte Richtlinien / applied directives

2014/30/EU EMV-Richtlinie
2011/65/EU (auch 2015/863/EU) RoHS-Richtlinie (ROHSIII)

Angewandte Normen / applied standards

EN 50581:2012 Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe

EN 61131-2:2007 Speicherprogrammierbare Steuerungen - Teil 2: Betriebsmittelanforderungen und Prüfungen

EN 61000-6-3 :2007 + A1:2011 + AC:2012 Elektromagnetische Verträglichkeit (EMV) – Teil6-3: Fachgrundnorm – Störaussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe (IEC 61000-6-3:2006)

01.10.2020

Datum

Date

Marc Finger

Geschäftsführer Berghof Automation GmbH

CEO Berghof Automation GmbH

i. V. Dr. Arno Rabold

Projektleiter

Project Manager



Berghof Automation GmbH | Arbachtalstrasse 26 | 72800 Eningen | www.berghof-automation.com

CC-AIO 12/6:



Hiermit erklären wir in alleiniger Verantwortung, dass die nachstehend bezeichneten Geräte in ihrer Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den aufgeführten Richtlinien und Normen entsprechen. Bei einer mit uns nicht abgestimmten Änderung der Geräte verliert diese Erklärung ihre Gültigkeit.

We hereby declare, that the following described modules in their conception, construction and form are in compliance with the listed directives and standards. In case of any alteration of the modules, not certified by us, this declaration becomes invalid.

Hersteller / manufacturer Berghof Automation GmbH
 Arbachtalstrasse 26
 D-72800 Eningen

Produktbezeichnung / product name **B-Fortis CC-AIO 12/6**

Produktnummer / product number **S-01020202-0100**

Es wird die Übereinstimmung mit folgenden EU-Richtlinien und Normen erklärt:
 The requirements of the following EU directives and standards are met:

Angewandte Richtlinien / applied directives

2014/30/EU EMV-Richtlinie
 2011/65/EU (auch 2015/863/EU) RoHS-Richtlinie (ROHSIII)

Angewandte Normen / applied standards

EN 50581:2012 Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten
 hinsichtlich der Beschränkung gefährlicher Stoffe

EN 61131-2:2007 Speicherprogrammierbare Steuerungen - Teil 2: Betriebsmitelanforderungen und
 Prüfungen

EN 55011:2009 +A1:2010 Industrielle, wissenschaftliche und medizinische Geräte – Funkstörungen –
 Grenzwerte und Messverfahren

01.10.2020

Datum
 Date

Marc Finger

Geschäftsführer Berghof Automation GmbH
 CEO Berghof Automation GmbH

i. V. Dr. Arno Rabold

Projektleiter
 Project Manager



Berghof Automation GmbH | Arbachtalstrasse 26 | 72800 Eningen | www.berghof-automation.com

12 Customer services / addresses

Repairs and corrective maintenance may only be carried out by the manufacturer or its authorised customer service centres.

12.1 Customer services

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Arbachtalstrasse 26
72800 Eningen
Germany
T +49.7121.894-183
F +49.7121.894-100
email: support-controls@berghof.com
www.berghof.com

12.2 Addresses

CAN in Automation; international manufacturer and user organisation for CAN users in automation:

CAN in Automation e.V. (CiA)
Am Weichselgarten 26
91058 Erlangen, Germany
headquarters@can-cia.de
www.can-cia.de

EtherCAT Technology Group
ETG Headquarters
Ostendstraße 196
90482 Nuremberg, Germany
info@ethercat.org
www.ethercat.org

Beuth Verlag GmbH, 10772 Berlin, Germany
or
VDE-Verlag GmbH, 10625 Berlin, Germany
or
Internet research: www.iec.ch

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