USER MANUAL 1.1

EC-COM Communication Module

Interface module for the EC1000

BERGHOF

Disclaimer

The content of this publication was checked for compliance with the hardware and software described. However, discrepancies may arise, therefore no liability is assumed regarding complete compliance. The information in this document will be checked regularly and all necessary corrections will be included in subsequent editions. Suggestions for improvements are always welcome.
Subject to technical changes.

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General Information on this Manual

→ Content
→ Completeness

This equipment manual contains product-specific information valid at the time of publication.
This equipment manual is only complete in conjunction with the product-related hardware and software user manuals required for the individual application.

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Berghof Automation GmbH works in accordance with DIN EN ISO 9001:2000.

Update

Version	Date	Subject
1.0	20.06.2013	First Version
1.1	25.04.2016	New corporate name “Berghof Automation GmbH” UL certification New version of the EC-COM Module included Variant EC-COM 01 removed Section “Conformity declaration” updated Section “Nameplate” updated

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Contents

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1. General Information

Documentation
This equipment manual is intended for qualified personnel and contains information regarding mounting, installation, commissioning and maintenance. The information contained in this manual is subject to change without prior notice.

1.1. About This Manual

This equipment manual is an integral part of the product. Make sure the equipment manual is always available near the product's point-of-employment. The manual contains information about the following topics:

- → Areas of application;
- → Safety;
- → Mechanical construction;
- → Electrical construction;
- → Connections;
- → Commissioning;
- → Care and maintenance;
- → Decommissioning;
- → Disposal.

1.2. Hazard Categories and Terminology

The indications described below are used in connection with safety instructions you will need to observe for your own personal safety and the avoidance of damage to property.

The indications have the following meaning:

	**Immediate danger.** Failure to observe the information indicated by this warning will result in death, serious injury or extensive property damage.
	**Potential danger.** Failure to observe the information indicated by this warning may result in death, serious injury or extensive property damage.
	**Danger.** Failure to observe the information indicated by this warning may result in injury or property damage.
	**No hazard.** Information indicated in this manner provides additional notes concerning the product.

1.3. Conformity Declaration

Both the standard version of the controller module and the extension modules mentioned below comply with and make allowance for the following directives and standards:

→ **EMP Directive 2014/30/EU**

→ **DIN EN 61131-2:2009-1** Programmable controllers
Part 2: Equipment requirements and tests

→ **UL 508:2013-10** Industrial Control Equipment
17 th edition / 1999-01-28

1.4. Qualified Personnel

Only qualified personnel may install, operate and maintain the controller module.
Within the context of this documentation and the safety information it contains, qualified personnel constitutes trained specialists who have the authority to mount, install, commission, ground and identify equipment, systems and power circuits in accordance with the standards of safety technology, and who are familiar with the safety concepts of automation technology.

1.5. Due Diligence

The operator, or the processor (OEM) must ensure that ...

- → the controller module is only used for the purpose for which it was intended;
- → the controller module is only operated in impeccable full working order;
- → the user manual is always available in full and in a legible condition;
- → only specialists with sufficient qualification and authorisation mount, install, commission and maintain the controller module;
- → these specialists are regularly instructed in all relevant questions of occupational health and safety and environmental protection and that they also know the contents of the user manual and especially of the safety notes therein;
- → the device markings, identifications, safety and warning notes attached to the controller module are not removed and are always kept in a legible state;
- → the national and international regulations for controlling machines and systems which apply at the relevant usage site are observed;
- → the relevant information about the controller module and its application and operation is always available to the users

1.5.1. Working on the controller module

Before carrying out work on the controller module you must always:

- → first ensure that the controller and the system are in a secure state;
- → only then switch off the controller and the system and
- → only now disconnect the controller module from the system.

⚠ CAUTION	**Live parts!** Before starting any work on the device, disconnect all inputs, including any connected peripherals. Inappropriate handling (installation and movement), while the device is powered on, may result in damage and / or data loss.

1.6. Use as Prescribed

This is a modular automation system based on the CANbus, intended for industrial control applications within the medium to high performance range.

The automation system is designed for use within Overvoltage Category I (IEC 364-4-443) for the controlling and regulating of machinery and industrial processes in low-voltage installations in which the rated supply voltage does not exceed 1,000 VAC (50/60 Hz) or 1,500 VDC.

The automation system is further usable in a pollution degree 2 environment or similar.

The modules shall be supplied by a power source with safe separation protected by an UL 248 fuse, rated max. 100/V where V is the DC supply voltage with maximum value of 28.8 VDC, such that the limited voltage / limited current requirements of UL 508 are met.

Wire connection specifications: Use AWG wire size 16-22 or equivalent.

Qualified project planning and design, proper transport, storage, installation, use and careful maintenance are essential to the flawless and safe operation of the automation system.
The automation system may only be used within the scope of the data and applications specified in the present documentation and associated user manuals.

The automation system is to be used only as follows:
- → as prescribed
- → in technically flawless condition
- → without arbitrary or unauthorized changes and
- → exclusively by qualified users

The regulations of the German professional and trade associations, the German technical supervisory board (TÜV), the VDE (Association of German electricians) or other corresponding national bodies are to be observed.

Safety-oriented (fail-safe) systems
Particular measures are required in connection with the use of SPC in safety-oriented systems.
If an SPC is to be used in a safety-oriented system, the user ought to seek the full advice of the SPC manufacturer in addition to observing any standards or guidelines on safety installations which may be available.

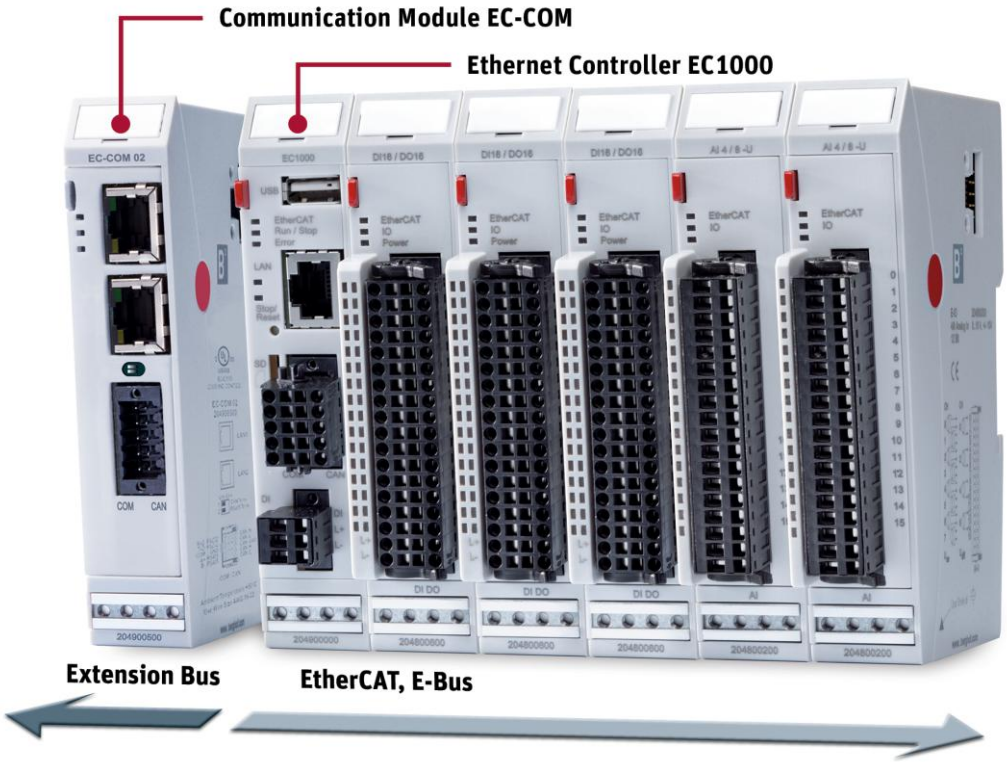
⚠ WARNING	**As with any electronic control system, the failure of particular components may result in uncontrolled and/or unpredictable operation.** All types of failure and the associated fuse systems are to be taken into account at system level. The advice of the SPC manufacturer should be sought if necessary.

2. Product description EC-COM

2.1. Overview

The CANtrol EC control system with its EC1000 SPS controller is modular, flexible and compactly designed. With a module width of just 25 mm the EC1000 controller features a whole range of interfaces. The comprehensive basic configuration includes EtherCAT, Ethernet, USB, CAN bus and RS232. If additional interfaces are required a communication module for direct connection to the EC1000 is available under the system designation EC-COM. The additional EC-COM interfaces offer the same best performance as those on the EC1000. They are directly linked to the CPU and thus represent a modular extension to the EC1000 controller.

→ Brief description



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Mounting
The EC-COM communication module is connected to the left face of an EC1000 controller with the integrated plug connectors. The module is meant for mounting in a switching cabinet and DIN rail installation. The power supply is provided by the EC1000, with provision for a maximum of one communication module on the EC1000.

Ethernet switch ports
The Ethernet interface of the EC 1000 is already provided with a switch. The corresponding switch ports are transferred to the two RJ45 plugs of the EC-COM module. The EC-COM saves on the need for an additional switch. An Ethernet interface with 10/100 Mbit/s is available. A highly flexible connection to a visualisation software, superordinate control units or the IT infrastructure is enabled by the TCP/IP and UDP/IP protocols.

CAN interface
With the EC-COM the EC1000 controller gets a second, opto-decoupled CAN interface which is compliant with the CAN high-speed standard (ISO11898) and can be used as CANopen master.

Serial interface
The serial interface of the EC-COM can be operated either as RS232 or as RS485. Therefore two pairs of connecting terminals are available for the serial interface. During RS485 operation a terminal resistor may be connected.

Performance features – an overview
- → 2 Ethernet switch ports for 10/100 Base-T interface
- → 1 CAN interface
- → 1 serial interface RS232 or RS485 optional
- → Lateral slot for connection to EC1000 controller

→ Scope of supply and accessories

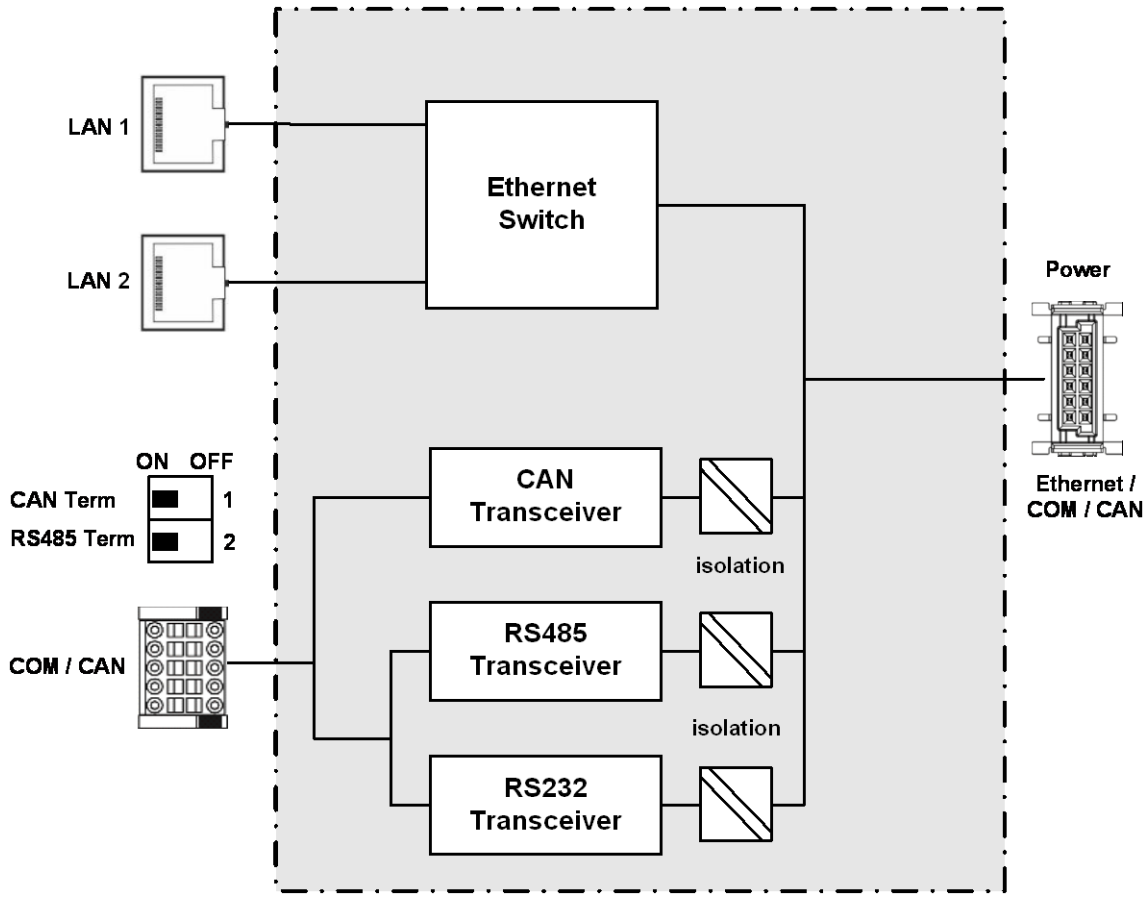
Scope of Supply
The scope of supply of the controller module consists of:
- → EC-COM

Accessories
- → Plug-in connector 10-pin; order no.: 204802100
  Shield connection terminals:
  2 x 8 mm; order no.: 204802400
  1 x 14 mm; order no.: 204802500

2.2. Technical data

EC-COM module data	
Designation	**EC-COM 02**
Article no.	204900500
Ethernet interfaces	
Number / type of interfaces	2 x 10/100 Mbit per RJ45 (2 switch ports of the EC1000)
Serial interface	
Number / type of interfaces	1 x serial interface (opto-decoupled) RS232 or RS485 (RS485 with polarisation and switchable terminal resistor)
CAN bus interface	
Number / type of interfaces	1 x CAN bus interface, opto-decoupled
Dimensions and weights	
Dimensions (WxHxD [mm])	25x120x90 (CANtrol EC system housing)
Weight	138 g
Operating conditions	
Ambient temperature	0 °C to 50 °C (with installation instructions complied with)
Relative humidity	Max. 85 %, non-condensing
Transport, storage	
Ambient temperature	-20 °C to +70 °C
Relative humidity	Max. 85 %, non-condensing
Shock resistance	
Vibration	Sinusoidal (EN 60068-2-6) test: Fc 10 ... 150 Hz, 1 G (operation mode)
Shock resistance	15 G (approx. 150 m/s²), 10 ms duration, half sinal (EN 60068-2-27) test: Ea
EMC, protection type	
Emitted interference	EN 61000-6-4, industrial
Insensitivity to interference	EN 61000-6-2, industrial
Protection class	III
Protection type	IP20
Energy supply	
Energy supply	5 VDC via EC1000 controller; no external supply connection
Power consumption	Typically 0.3 A

2.3. Block diagram



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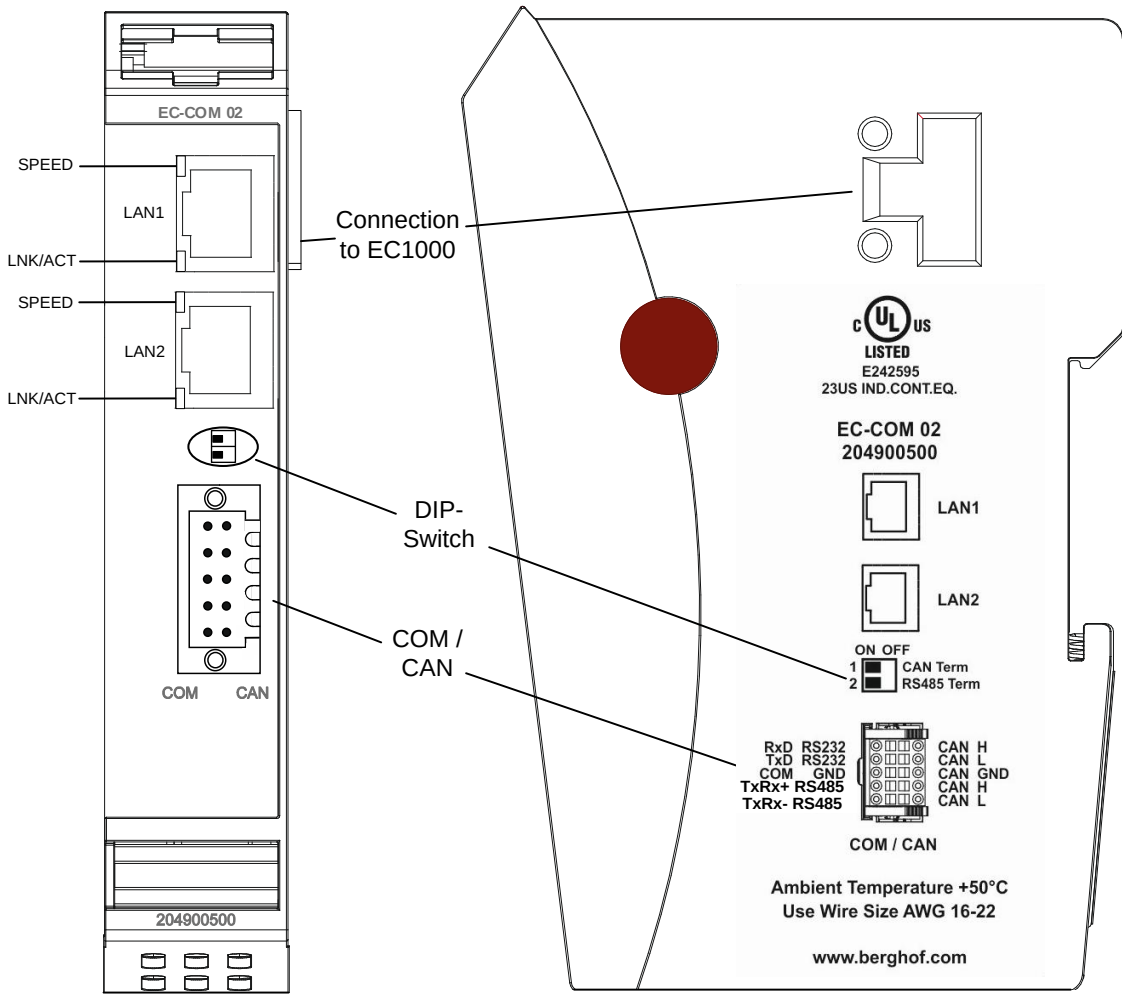
2.4. Module view and pin assignment



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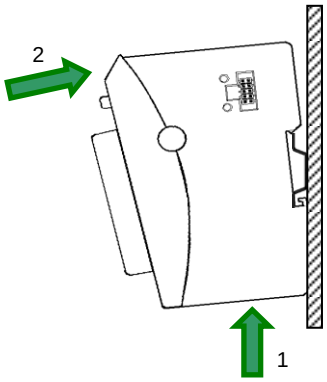
2.5. Mounting and connecting

2.5.1. Mounting

The modules are intended for mounting rail installation (DIN EN 50022, 35 x 7.5 mm).

→ To snap on a single module

→ Push up the module against the mounting rail from below, allowing the metal spring to snap in between mounting rail and mounting area as illustrated.
→ Push the module above against the mounting wall until it snaps in.



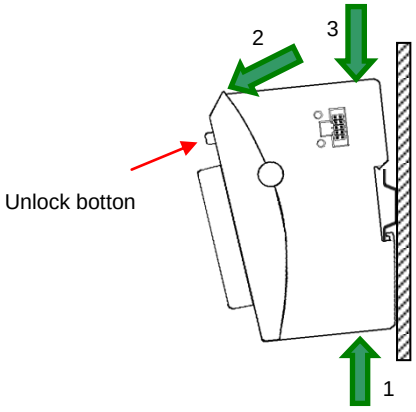
Rail mounting of module

To interconnect with EC1000 controller
After snapping on the EC-COM module to the rail, snap on the EC1000 module about 1cm away towards the right of the EC-COM module. Push the second module along the rail towards the first module until you hear the locking device snap in.

To disconnect two modules
Push down the unlock button (see illustration below) of the EC1000 module that you wish to disconnect from the EC-COM module to the left of it. Push both modules away from one another until they are about 1 cm apart.

→ To take down a single module

→ Push the module up and against the metal spring located on the underside of the rail guide.
→ Tip the module away from the rail as shown in the illustration.
→ Pull the module down and out of the mounting rail.



Uninstalling a module

2.5.2. Connecting

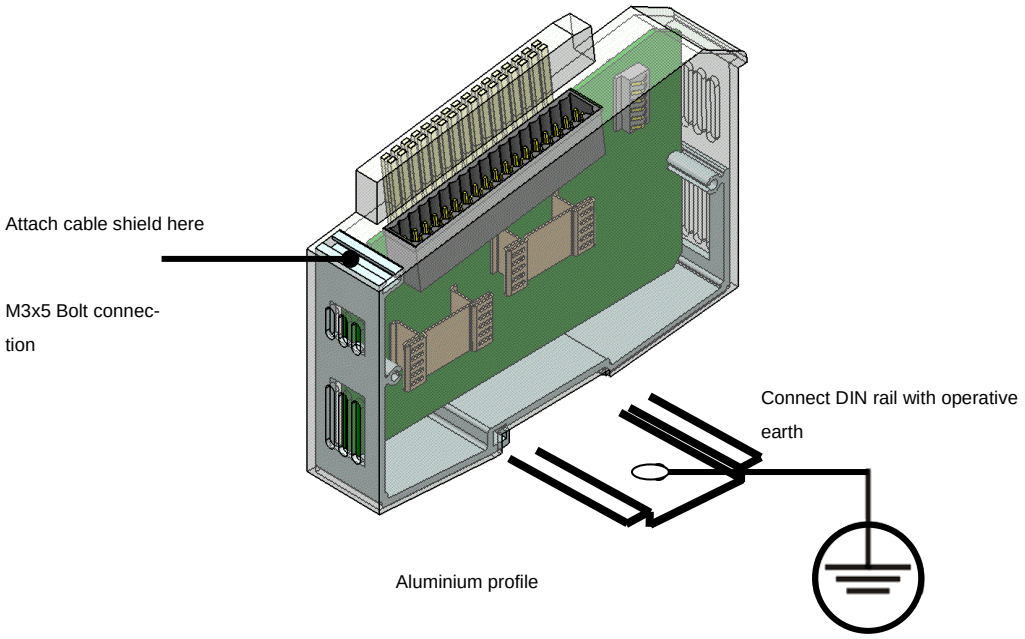
Power supply
The module is supplied by the EC1000 controller.

2.5.3. Earth

The module is to be earthed by attaching the metal housing to operative earth.
Since the operative earth connectors dissipate HF currents, it is of utmost importance for the module's noise immunity. HF interference is dissipated from the electronics board to the metal housing. The metal housing therefore needs to be suitably connected to an operative earth connector.

You will normally have to ensure that
→ the connection between module housing and DIN rail conducts well,
→ the connection between DIN rail and switching cabinet conducts well,
→ the switching cabinet is safely connected to earth.

In special cases you may attach the earth wire straight to the module.



NOTICE

Earth wires should be short and have a large surface (copper mesh).
Further details has site http://en.wikipedia.org/wiki/Ground (electricity).

2.6. Pin assignment

2.6.1. 10/100 Base-T network connection (Ethernet)

→ Connection to the network

The 10/100 Base-T on board Ethernet adapter with RJ-45 connection enables connection to the network. The “SPEED” and “LNK/ACT” status LEDs give information about successful connection to the network in compliance with IEEE 802.3, clause 25.

LAN plug-in connector assignment

LAN		
 RJ45	**1**	TX+
	2	TX-
	3	RX+
	4	NC
	5	NC
	6	RX-
	7	NC
	8	NC
“SPEED” LED	**green**	On = 100 Mbit/s Off = 10 Mbit/s
“LNK/ACT” LED	**yellow**	Link, Data Receive Flashes: connection is active, data transfer runs Off: no connection established

2.6.2. CAN bus and one serial interface

The CAN bus and **one** serial interface are located on the plug-in connector.

NOTICE

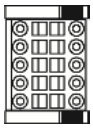
The serial interface can be used either for RS232 or for RS485.

Although therefor each separate connections are available on the plug connector, only ever one interface can be used. The unused connection pair must not be connected.

If RS232 and RS485 connections are simultaneously connected with devices or bus systems transfer errors occur.

The CAN interface is opto-decoupled. It conforms to the ISO 11898 standard and can be operated up to the maximum baud rate of 1 Mbit/s (max. 20 m cable length). The lowest CAN baud rate which can be set is 50 kbit/s.

COM/CAN plug assignment

COM/CAN				
Pin no.	**Name**		**Name**	**Pin no.**
1	**RxD RS232**	 COM/CAN	**CAN H**	**2**
3	**TxD RS232**		**CAN L**	**4**
5	**COM GND**		**CAN GND**	**6**
7	**TxRx+ RS485**		**CAN H**	**8**
9	**TxRx- RS485**		**CAN L**	**10**

NOTICE

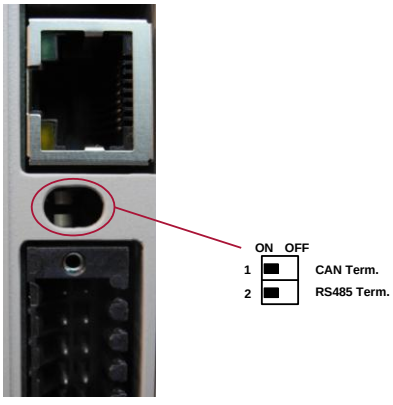
A 120 Ω terminal resistor can be connected between the "CAN L" and "CAN H" connections.

This is necessary if the appropriate CAN interface is located at the beginning or end of the relevant CAN bus topology.

The 120 Ω terminal resistors for CAN and RS485 are activated resp. deactivated by the selection switches which are located at the front of the EC-COM module.

The selection switches are simplest actuated by a small slot srewdriver.

On delivery of the EC-COM modules the selection switches are always in "ON" position as shown in the opposite illustration.



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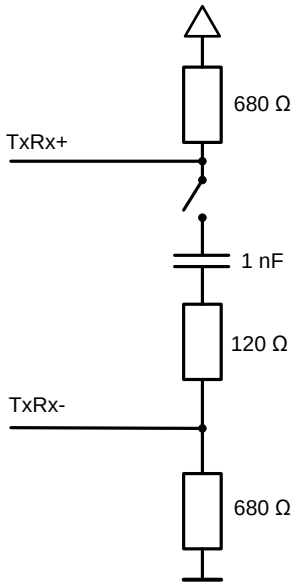
→ Activate or deactivate terminal resistors

The RS485 interface of the EC-COM module is equipped with an internal polarisation of 680 Ω (see following illustration). The RS485 polarisation supports proper voltage values in the inactive state. The number of EC-COM RS485 interfaces on one RS485 bus must be below 5.



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If the interface is located at the beginning or end of the bus topology:

→ Set switch ON in order to connect the terminal resistor of 120 Ω.

Signal faults and terminal resistor

In order to minimise faults, the following information must be attended:

Operative bus

→ An appropriate protocol must ensure that one of the bus members operates the bus actively at each point in time.

→ For a highly symmetrical signal-to-noise ratio the bus must have defined states for logical “1” (A–B < -0.2 V) and for logical “0” (A–B > +0.2 V).

Inoperative bus

→ An as asymmetric as possible bus termination must ensure a sufficiently large signal-to-noise ratio (reduce the symmetrical signal-to-noise ratio).

→ In order to achieve the necessary voltage difference between the signals, a suitable resistance network as the line termination must be used.

→ The necessary values of the resistors are determined by the length of the bus and the transmission rate (similar to the line termination in the case of the Profibus, see DIN EN 61158-2).

3. Annex

3.1. Environmental Protection

3.1.1. Emission

When used correctly, our modules do not produce any harmful emissions.

3.1.2. Disposal

At the end of their service life, modules may be returned to the manufacturer against payment of an all-inclusive charge to cover costs. The manufacturer will then arrange for the modules to be recycled.

3.2. Maintenance/Upkeep

⚠ WARNING	**Do not insert, apply, detach or touch connections while in operation – risk of destruction or malfunction.** Disconnect all incoming power supplies before working on our modules; this also applies to connected peripheral equipment such as externally powered sensors, programming devices, etc. All ventilation openings must always be kept free of any obstruction.

→ The modules are maintenance-free when used correctly.
→ Clean only with a dry, non-fluffing cloth.
→ Do not use detergents!

3.3. Repairs/Service

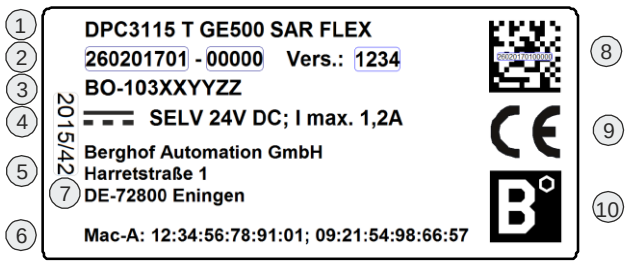
⚠ WARNING	Repair work may only be carried out by the manufacturer or its authorised service engineers.

3.3.1. Warranty

Sold under statutory warranty conditions. Warranty lapses in the event of unauthorised attempts to repair the equipment and/or product, or in the event of any other form of intervention.

3.4. Nameplate

Nameplate descriptions (example)



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1. **Designation of device type**
2. **Identification no. (item no. + serial no.)**
3. **Customer no.**
4. **Supply voltage**
5. **Manufacturer’s address**
6. **Mac addresses**
7. **Production date**
8. **QR code (identification no.)**
9. **CE marking**
10. **Brand of the manufacturer (trademark)**

3.5. Addresses and Bibliography / Standards

3.5.1. Addresses

CAN in Automation; international manufacturers and users organisation for CAN users in the field of automation:
CAN in Automation e.V. (CiA)
Am Weichselgarten 26
D-91058 Erlangen / Germany
headquarters@can-cia.de
www.can-cia.de

→ CiA

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

→ ETG

Beuth Verlag GmbH, 10772 Berlin
or
VDE-Verlag GmbH, 10625 Berlin

→ DIN-EN Standards

VDE Verlag GmbH, 10625 Berlin
or
Internet search: www.iec.ch

→ IEC Standards

3.5.2. Bibliography / Standards

Standard	Label
IEC61131-1 / EN61131-1	Programmable controllers Part 1: General information
IEC61131-2 / EN61131-2	Programmable controllers Part 2: Equipment requirements and tests
IEC61131-3 / EN61131-3	Programmable controllers Part 3: Programming languages
IEC61131-4 / EN61131Bl1	Programmable logic controllers Supplementary Sheet 1: User guidelines
IEC61000-6-4 / EN61000-6-4	German EMC Standard: Emitted interference
IEC61000-6-2 / EN61000-6-2	German EMC Standard: Noise immunity
ISO/DIS 11898	Draft International Standard: Road vehicles - Interchange of digital information - Controller Area Network (CAN) for high-speed communication
DIN EN ISO 13849-1	Safety of machinery: Safety-related parts of control systems (Part 1)
UL 508	Industrial Control Equipment 17 th edition / 1999-01-28

Notice: Our Technical Support team will be glad to provide other literature references on request.