CONTROLS

CANtrol EC Modular Control System Powerful and versatile





CANtrol EC The modular control system

Components of CANtrol EC



3 ET1000 Ethernet Terminal

Flexible and modular automation with CANtrol EC by Berghof. All users with modular automation architecture, ranging from mechanical and plant engineers to those working in building or industrial automation right through to users in the industrial services sector, benefit from CANtrol EC. The control system is based on optimally coordinated control and visualisation components, making the CANtrol EC above all the ideal system for distributed control solutions where components have been locally installed.

With a single program for control, I/Os and displays the Berghof CANtrol EC is extremely user-friendly and provides a clear overview of all processes. Fast EtherCAT I/Os and displays located away from the controls and connected to them by Ethernet also make the CANtrol EC highly flexible and efficient. The control system always uses the standard version of CODESYS as a programming tool. The appropriate and most up-to-date version of CODESYS can be installed if required so that new developments are available at all times.

With CANtrol EC sub-units like machines or modules can both be independently automated and also be programmed in a clearer way and put into operation. The wiring in a line topology makes it easily possible to integrate EtherCAT in the system. This permits connection to control systems or integration in the machine and installation network to be realised in a similarly simple and cost-effective manner.

1 EC1000 Ethernet controller

At the core of the CANtrol EC modular control system is the powerful EC1000 PLC controller with its variety of interfaces. I/Os or additional drive components can be connected at the side via EtherCAT. CANopen components are integrated using a CAN bus interface while visualisation and the connection to control systems is effected via the Ethernet interface. Data logging can be carried out using the USB or SD card interface. In combination with CODE-SYS programming and visualisation the Berghof EC1000 represents a multifunctional, upgradeable and compact control unit.

2 E I/O EtherCAT I/O family

More than twenty different I/O modules make up the E I/O EtherCAT I/O system. These are designed either for digital and analog signals or to connect servo motors. Each module is an EtherCAT node, making for a very powerful system that provides the highest degree of synchronicity. The I/Os are connected directly to the EC1000 and decentralised I/O islands are constructed with the EtherCAT bus coupler. The EtherCAT I/O system can be connected to any other controller with an EtherCAT master.

3 ET1000 Ethernet Terminal

The Berghof ET1000 makes direct operation and visualisation on the machine or installation possible. This means that no separate tool is required for visualisation since it is transferred immediately from the EC1000 CODESYS controller via Ethernet. The ET1000 is thus the display unit for the transmitted CODESYS target or web visualisation.

EC1000 Ethernet Controller

Powerful and flexibly upgradeable

EC1000 communication interfaces



EC1000 — **the compact power PLC.** The Berghof EC1000 CODESYS controller with integrated visualisation and a variety of interfaces is the system's control centre, controlling, visualising and communicating in the modular CANtrol EC control system. The EC1000 combines Industrial Ethernet technology with a CAN/CANopen interface and fuses tried and tested CAN components and the latest EtherCAT modules into an efficient control product.



EC1000 Performance data		
CPU clock	400 MHz	
Flash memory	64 MB onboard	
RAM memory	128 MB onboard	

1 EtherCAT

The EC1000 is an EtherCAT master to which EtherCAT I/Os and servo controller modules of the E I/O family can be added. The system is also open for the connection of further drive and I/O modules obtainable on the market.

2 Ethernet protocols

The Berghof EC1000 Ethernet Controller uses open protocols and visualisation for data exchange. These include TCP/IPbased services and protocols such as Profinet, BACnet and SMTP, which are deployed as a CODESYS library. The EC1000 is also a visualisation server. The CODESYS visualisation is part of the PLC program and is transferred via the Ethernet to the ET1000 Ethernet Terminals.

3 CAN and CANopen

The EC1000 as CANopen master features a CAN interface. The CODESYS control configuration is the control centre for standard CANopen modules. Special modules use the CODESYS CAN library for communication.

4 Serial interfaces

The front of the EC1000 is furnished with a RS232 serial interface and a CANBus.

5 Storage media

With the EC1000 data can be saved and loaded on an SD card or USB device. Fast data exchange is executed on the USB port. Application data or Unicode character sets are stored on an SD card.

6 Profibus

The Profibus slave function is integrated via an EtherCAT I/O module.

EC-COM — flexible interface extension for EtherCAT control systems

With the new Berghof EC-COM communication modules the number of interfaces in the modular CANtrol EC can be easily and rapidly expanded. To do this the EC-COM module is simple attached to the left side of the EC1000 control unit. In this way the complete control system achieves greater flexibility and gains additional interfaces such as one or two Ethernet switch ports, a second CAN bus or another switchable serial interface (RS232, RS485).

Digital and analog I/Os





Digital and analog	EtherCAT I/Os		
Digital I/Os	E-I/O DI16/DO 16 1 ms/0.5 A E-I/O DI32 1 ms E-I/O DI16 1 ms E-I/O DO16 0.5 A	Analog I/Os	E-I/O AI4/8-U 13 Bit (0-10 V/+-10 V/+5 V/+-2.5 V) E-I/O AI4-I 12 Bit (0-20 mA/4-2 0mA) E-I/O AO4-U/I 12 Bit (0-20 mA/0-10 V) E-I/O AI8-I 12 Bit (0-20 mA)
Encoder	E-I/O Counter/Posi 2 5 V	Temperature measurement	E-I/O AI4-Pt/Ni100 16 Bit (PT/NI-100) E-I/O AI4-Pt/Ni1000 16 Bit (PT/NI-1000) E-I/O AI4-Thermo 16 Bit (Thermo Typ K) E-I/O AI8-PT/NI100 16 Bit

Each I/O terminal is an EtherCAT device

EtherCAT represents maximum-performance data transfer. It is an Industrial Ethernet protocol specially developed for the requirements of automation technology. Because each I/O module is an Ether-CAT device the modules achieve maximum levels of performance. Dispensing with an intermediate bus the I/O data pass direct from the terminal for processing by the appropriate master unit, thus ensuring maximum access performance coupled with optimal synchronisation of the cyclic PLC task.

High I/O integration in a small unit for decentralised solutions

The clearly structured E-I/O system comprises around twenty different I/O modules. A removable spring connector is attached to the narrow 25 mm wide I/O clamp so that the I/O modules can be simply attached to the conventional standard top-hat rails. Temperature measurement and counter modules complement the extensive range of various digital and analog Berghof EtherCAT I/O modules.

Benefits

- → Best performance from the EtherCAT to the terminal
- → Compact, space-saving construction and high I/O integration
- → Simple CODESYS integration as a result of extremely fast start-up
- → Modular design an individual model for each signal class
- → High packing density up to 32 I/Os on one terminal
- → Scalable with 18 or 36 pole connector

Multifunctional I/Os



Multifunctional EtherCAT I/Os						
	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Digital In	8	8	8	8	8	8
Digital In/Out	8	8	8	8	8	8
Analog In	4	-	8	8	4	4
Analog Out	-	-	-	-	4	-
Analog In/Out	4	-	-	-	-	-

Multifunctional digital and analog I/Os

The more compact machines become the more flexible the I/O modules need to be. To achieve this Berghof's comprehensive E-XR series offers ultra-compact multifunctional I/O modules for the E-I/O EtherCAT I/O system. An automation solution using E-XR makes do with just a few different I/O modules, an advantage that optimises logistics chains in production or in the purchasing of replacements.

Digital I/Os with counter function

Digital I/Os comprise eight inputs and outputs. The outputs can also be used as digital inputs, with the inputs being capable of counting up to a frequency of 10 kHz. Digital I/Os with counter function can count both forwards and backwards, as well as being able to process 24 volt encoder signals.

Configurable analog I/Os

Four out of the total of eight analog channels are freely configurable – as current or voltage inputs or as voltage outputs. The analog I/Os are characterised by a high resolution of at least 16 bits.

Benefits

- → Multifunctional all important input and output signals on one card
- → Economical from the freely configurable full version to the preset minimum functional model
- → Systematic functions are identical to the DC-XR expansion card for the DC1000 Display Controller

Coupler and communication modules





E-I/O bus coupler

The E-I/O bus coupler functions as a link between the EtherCAT and the modular expandable I/O modules, which can be connected in sequence to the bus couplers. The Ethernet/EtherCAT protocol is retained right through to the last I/O module. The outward and return line connection at the end of the module block is automatically closed so that the next EtherCAT device can be connected to the second port of the bus coupler with a 100base TX line.

Technical specifications -	– E-I/O bus coupler
Baud rate	100 Mbit/s
Cable	CAT5
Cable length	max. 100 m between two bus couplers
EtherCAT connection	2 x RJ45
Power supply	24 V DC - 20% -/+ 25%
Input power	50 mA + eBus supply
eBus supply	max. 3 A (approx. 20 modules)
eBus load	195 mA

E-I/O Profibus DP slave

As Profibus DP slave this Berghof module provides a gateway function from Ether-CAT to Profibus DP. The GSD file is required for the exchange of data between the EtherCAT and a Profibus DP system for the configuration of the Profibus master.

Technical specifications — E-I/O DP slave		
EtherCAT baud rate	100 Mbit/s	
Profibus baud rate	12 Mbit/s	
Profibus connection	9 pin D-SUB female	
eBus load	210 mA	

Extender and servo controller





Extender

EtherCAT network in star or line topology Using the extender the EtherCAT I/O

blocks can be expanded with additional EtherCAT modules with a standard Ether-CAT connector. The extender converts the transmission of LVDS (eBus) into twisted pair, for which purpose the module is generally attached to the end of the I/O block. If both EtherCAT connectors are used a star topology can be constructed from the line topology.

EtherCAT servo controller

Compact EtherCAT decentralised intelligent servo controller

The E-I/O drive control is a 4-quadrant drive controller for controlling small actuators and positioning drives up to 350 watts. As part of the E-I/O system family the compact servo controller can be attached directly to E-I/O modules. The flexible device controls actuator, positioning and speed operation as well as torque regulation.

Intelligent control with the CODESYS motion library

The compact design and the EtherCAT topology make it possible to operate several servo controllers from one PLC controller. For this only a drive regulator and a coordinated CODESYS motion library are required.

Benefits

- → Flexible due to the 4-quadrant controller for EC and DC motors
- \rightarrow Compact small construction
- → Decentralised intelligence servo controller with CODESYS

ET1000 Ethernet Terminal Direct visualisation with CODESYS



The Berghof ET1000 Ethernet terminal is a component of the server-based visualisation concept. The EC1000 CODESYS controller contains the visualisation per se. This transforms the Berghof EC1000 itself into the visualisation server and the ET1000 Ethernet terminal into the visualisation client.

CODESYS web and target visualisation

With CODESYS and the Berghof ET1000 Ethernet terminals two visualisation systems may be selected: web or target visualisation. In the case of web visualisation the display is via a web browser, while with target visualisation the display is transferred via Ethernet and shown with the existing functions in the operating system. Here the terminal can be relocated away from the control.

Target visualisation is suitable for demanding visualisations since it features the complete range of functions of the visualisation implemented in CODESYS. Web visualisation, on the other hand, can be integrated in a more flexible way, permitting the linking of several displays with a controller. Moreover, connection to a third-party CODESYS controller is made possible.

Display with smart phones

An HTML5 compatible web visualisation permits display on smart phones as well as on a Berghof ET1000. **Direct operation and visualisation** on the machine or installation can be easily realised with the Berghof ET1000 Ethernet Terminal. An additional separate visualisation tool can be dispensed with since the CODESYS visualisation is transmitted directly from the EC1000 CODESYS controller via Ethernet. Berghof ET1000 Ethernet Terminals are distinguished by their simple operation and rapid integration in the system solution.



Technical specifications ET1000					
	ET 1003-QT	ET 1005-VT	ET 1007-WT	ET 1007-WT-C	ET 1010-VT
	resistive	resistive	resistive	capacitive	resistive
Display /	QVGA /	VGA /	WVGA /	WVGA /	VGA /
diagonal	3,5" Touch	5,7" Touch	7" Touch	7" Touch	10,4" Touch
Resolution /	320 x 320 pixels /	640 x 480 pixels /	800 x 480 pixels /	800 x 480 pixels /	640 x 480 pixels /
colour	TFT: 65,536				
Dimensions (w x h x d mm)	120 x 85 x 38.2	170 x 130 x 40	215 x 156 x 41	215 x 156 x 41	313 x 250 x 77
	(+3 mm front plate)	(+5.5 mm front plate)			

The CANtrol EC starter pack with CODESYS V3

Your introduction to Berghof control solutions



CODESYS V3	
CODESYS controller	EC1000 MP400 00 1131 V3
Ethernet Terminal	ET1005-VT
EtherCAT I/O	E-I/O DI16/D016 1MS/0.5 A
Software licence	CODESYS V3 Target Package — controller single licence
Accessories	Display stand, mains unit, prefabricated connectors
Article no.	204900200

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