

EtherCAT<sup>®</sup> P

The ultra-compact EtherCAT P Box modules in a size comparison with the new EPP3632 with 2-channel interface for condition monitoring in a standard IP 67 housing.

EtherCAT P: Maximized flexibility through mini-box modules with IP 67 protection rating

## Reduced cabling time and effort, minimum space requirements, maximum diagnostic possibilities

One Cable Automation (OCA) technology from Beckhoff – achieved as a one cable solution EtherCAT P or a hybrid variant with the ECP and ENP plug connector families in the Beckhoff I/O system – opens up numerous efficiency potentials in machine and plant automation. In this interview Dirk Bechtel, Product Manager Fieldbus Systems, presents the new IP 67 rated I/O modules for OCA and explains the advantages of ultra-compact device designs and extensive diagnostic functions.



Dirk Bechtel, Product Manager Fieldbus Systems: "The new ultra-compact EtherCAT P Box modules reduce previous space requirements by 50% and provide a finer granularity in use due to the smaller number of channels."

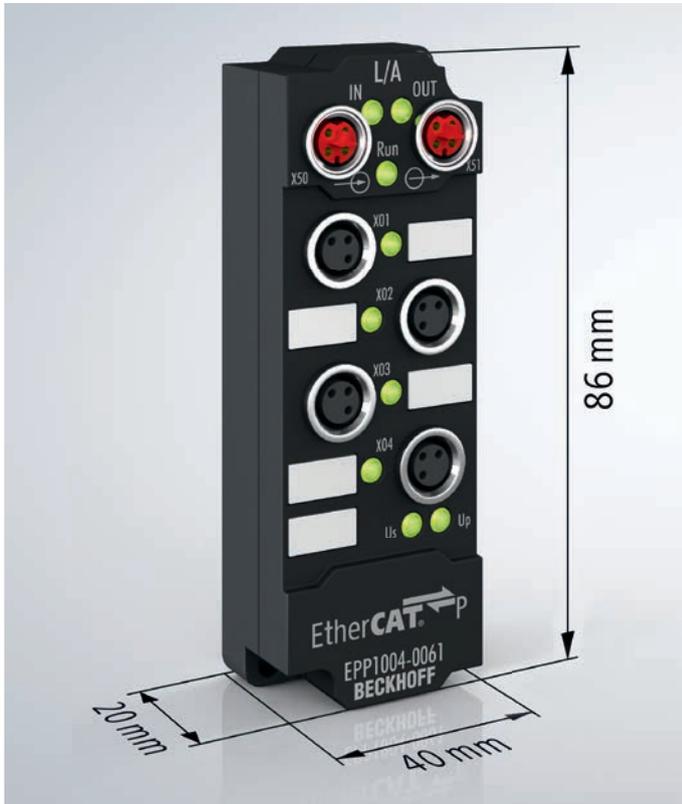


#### What advantages does OCA offer users as an overall concept?

**Dirk Bechtel:** As the name One Cable Automation indicates, only one cable is needed to supply a complete machine or line with both data and power. This reduces material costs, time and effort for cabling, while minimizing space requirements and error rates during installation. Furthermore, OCA offers ideal conditions for a modularized machine design. Because a plant can only be consistently divided into individual segments if a machine segment, such as a feeding or labeling unit, can be connected simply via one cable with communication, 24 V, 400 V and so on. This in turn has obvious benefits: the flexibility of machines is increased and both installation and commissioning are simplified for the end customer.

#### For which areas of use are the different one cable variants EtherCAT P, ECP and ENP designed?

**Dirk Bechtel:** Basically, the idea of EtherCAT P with the M8 connector means that the transmission of communication and power is not only in the same cable, but is also delivered via the same copper cores of a standard Ethernet cable. Due to the small wire cross-section of an AWG22 cable, the transmissible current in this case is limited to 3 A. EtherCAT P is therefore ideally suited to the power supply of compact digital I/O modules or smaller drives. In contrast, the ECP and ENP connector families are available if more power is required, for example if you want to connect complete machine modules. ECP combines the EtherCAT P configuration – in other words, EtherCAT communication and power



The ultra-compact EtherCAT P Box modules enable users to follow the current trend towards miniaturization in machine automation and also allow for finer granularity in decentralized I/O systems.

supplied over an internal M8 cable – with additional, larger power conductors in a hybrid cable. The ENP version has a similar structure, but uses EtherCAT communication only. Since all variants can be mixed in a single system, the user can select the most suitable connection method for the task at hand. With EtherCAT P integrated in ECP, for example, the logic of a machine segment can be realized independently of the installation for energy distribution. ENP, on the other hand, is ideal if you want to use EtherCAT as the universal backbone for machine communication. Apart from that, ENP is also better suited to longer transmission distances than EtherCAT P.

**EtherCAT P not only reduces cabling time and costs, as well as space requirements, but it also enables minimized housing dimensions through compact connection technology. What products does the new, ultra-compact I/O module series include?**

**Dirk Bechtel:** With only 50% of the volume – that means dimensions of 30 x 86 x 20 mm – the new series is considerably more compact than previous EtherCAT P I/O box modules. The EPP1004 four-channel input box and the flexible EPP2334, with four channels that can be used as inputs or outputs, are designed for the connection of digital sensors. In addition to these, there are two system components. Standard EtherCAT devices can be supplied with power and communication on-site at the machine and integrated into the EtherCAT P system via the EPP9001 EtherCAT P/EtherCAT connector with voltage forwarding. The EPP9022 I/O Box enables detailed current and voltage diagnostics.

**What advantages does the ultra-compact design offer the user?**

**Dirk Bechtel:** The small size can be of great importance where installation space is limited. At the same time, it follows the trend towards hardware miniaturization – this is a driving force in all areas of machine automation. Also of importance is the advantage of finer granularity, which means that in addition to the previous design with eight channels, there is now also a smaller 4-channel variant. Moreover, the new housing offers the possibility to refine the scalability still further if the series is extended in the future by modules with even fewer channels or, for example 1- or 2-channel analog box modules. In this way, the decentralized IP 67 I/O system can be adapted even better to on-site requirements of a machine or an individual machine segment.

**How important are the topics of diagnostics and condition monitoring, especially from the point of view of One Cable Automation?**

**Dirk Bechtel:** In view of the growing trend toward modularized machines and plants, the topics of diagnostics and condition monitoring are ever more important. In general, it is important in all system installations that the necessary voltage level of, for example, 24 V is present at each device, or in other words, that sufficient power is available. Previously such a verification had barely been possible using simple methods, but using the ultra-compact EPP9022 EtherCAT P Box, it can now be done in a system-integrated and simplified manner.

**What diagnostic functions does the EPP9022 EtherCAT P Box offer?**

**Dirk Bechtel:** The EPP9022 is suitable for diagnosing and measuring the voltages  $U_s$  and  $U_p$  as well as the currents  $I_s$  and  $I_p$ , both temporarily during commissioning and permanently during operation. The voltage range is displayed on the box itself via variously colored LEDs and without the need for an EtherCAT master during the commissioning process. Values recorded during ongoing operation can also be read out as process data in the master. In this way, all requirements for extensive machine diagnostics, fast error detection and precise predictive maintenance of a plant can be met.

**And how important is that for practical use?**

**Dirk Bechtel:** First and foremost it's about reliable system operation. The EPP9022 is an important and valuable tool to ensure this, even starting with the design of a machine. For this purpose, the EPP9022 can be used in the most diverse places in the EtherCAT P system. If it is placed within an EtherCAT P segment, the current flow and resulting current consumption can be measured on the fly at the desired position. When placed at the end of an EtherCAT P segment, the EPP9022 is suitable for ensuring via voltage measurement that there is still sufficient voltage supply at the last device for switching the connected actuators or for operating a sensor. The LED on the EtherCAT P Box visually displays the voltage levels, which is particularly helpful during commissioning. The three levels are displayed in green, yellow and red – with level values such as 20.4 V preset for green according to IEC 61131 and individually adjustable if necessary – clearly visualize the state of the network at a glance.

**Also new is the EPP3632 with 2-channel interface for condition monitoring (CM) realized in the conventional full-size housing design. What special features does this EtherCAT P Box offer?**



An ultra-compact EtherCAT P Box, such as the EPP1004 (on the right), needs only 50% of the installation space compared to standard box modules such as the EPP2338 (on the left).

**Dirk Bechtel:** With regard to the functionality, the new EtherCAT P Box corresponds to the proven EL3632 EtherCAT Terminal, so that users can continue to use their existing CM knowledge, while the box module in IP 67 protection rating offers the advantage of installation directly on the machine. As a result, cabling time and efforts are reduced and machine modularization is simplified, and moreover, interference immunity is increased due to shorter sensor cables. The EPP3632 EtherCAT P Box provides a decentralized interface for up to two IEPE sensors with two-wire connection. The input signal is acquired according to the oversampling principle with up to 50 ksamples per channel and second. The EPP3632 can additionally be adapted to application-specific requirements by means of adjustable filters and supply currents.

#### What distinguishes the new EP9221-0057 and EP9224-0037 infrastructure box modules?

**Dirk Bechtel:** Both EtherCAT Box modules enable the distribution of a B17-ENP input to one or four EtherCAT P ports as well as the B17-ENP forwarding for cascading of the system. The only difference in the functionality is the number of channels. The overall design is different though, with its flat design and laterally placed B17 and EtherCAT P M8 connections, the single-channel EP9221-0057 version simplifies installation in the field. Both box modules are suitable for implementing diagnostics, because in each EtherCAT P junction the current consumption for the control voltage US and the peripheral voltage UP are monitored so they can be limited and switched off if required. Moreover, the input voltage and current values of the EtherCAT P output can be evaluated via the

The new EP9221-0057 (on the left) and EP9224-0037 power distribution modules provide EtherCAT communication in conjunction with 2 x 24 V and PE conductor via a B17-ENP connector for higher power supply or greater distances.

process data. Using these ENP infrastructure box modules, it is simple to branch from an EtherCAT backbone directly into the EtherCAT P world.

#### What requirements placed on an OCA system can be solved by this?

**Dirk Bechtel:** The EtherCAT P Box modules can be supplied with up to 14 A (per  $U_s/U_p$ ) via the five-pin B17-ENP connector on account of the larger wire cross-section of the ENP cable. This allows the bridging of considerably longer distances than is currently possible with EtherCAT P. Therefore, these new infrastructure components are ideal for control centers that are detached from the actual machine or for main control cabinets, and for the modularization of larger installations. An extensive EtherCAT network can be realized as a backbone so that individual machine segments can simply be supplied via the infrastructure box modules as a junction or star hub by EtherCAT P. The same principle can be applied in the future to suit even higher power requirements or distances to be covered. For instance, further infrastructure box modules could be supplied via a B23- or even a B36-ENP connector and then equipped with B17 or B23 outputs instead of the current EtherCAT M8 output.

This interview was conducted by Stefan Ziegler, Marketing Communications, Beckhoff

Further information:

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