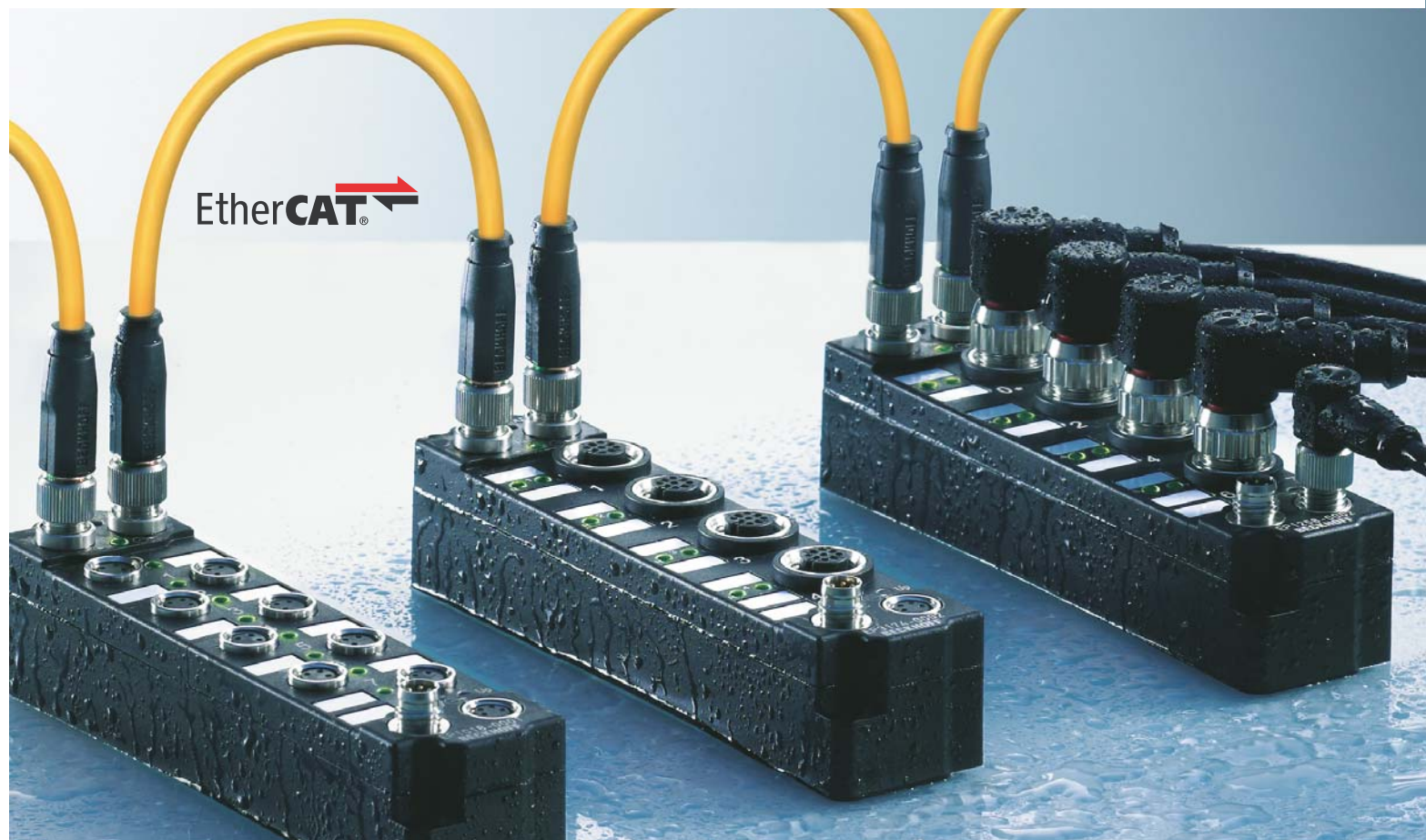


10 years of the Fieldbus Box – an interview with Product Manager Dirk Bechtel

EtherCAT Box: Continuous high-speed Ethernet extended to the IP 67 world

The concept of the Fieldbus Box was presented for the first time at Hanover Fair in 1999. The Fieldbus Box modules are “fieldbus-neutral” and are distinguished by their compact design, rated for protection class IP 67. Beckhoff has now developed a new, high-performance IP 67 solution especially for EtherCAT applications: the EtherCAT Box. The PC Control editorial staff spoke to Beckhoff’s Product Manager Dirk Bechtel on the subject of the IP 67 world and on the new features that are available to the user with the EtherCAT Box.



The Fieldbus Box celebrates its 10th birthday this year. Where are the IP 67 modules primarily used and what are the main areas of application?

Dirk Bechtel: A tendency towards miniaturization can be seen in all areas of daily life, that is to say, everything is becoming smaller and more compact – and this trend is affecting automation technology, too. The market is demanding more and more electronics in the smallest space or in the smallest format. Beckhoff has not just followed this trend with its Fieldbus Box modules, but in fact set the trend very early on. The compact IP 67 modules are installed directly on the machine and do not require a control cabinet. They are therefore used primarily where there is limited

space for installation and where costs need to be saved. – Eliminating a control cabinet naturally also reduces the costs. – Typical fields of application are, for example, handling and assembly technology as well as the packaging and semiconductor industries.

To what extent are the Fieldbus Box and the EtherCAT Box modules compatible with one another?

Dirk Bechtel: The Fieldbus Box and the EtherCAT Box modules have identical housing form factors and the same dimensions, allowing the user to convert to EtherCAT conveniently with no additional mechanical engineering expenditure. To put it simply, we have upgraded Beckhoff’s

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previous IP-Link technology using EtherCAT. Analogous to our IP 20 I/O systems (Bus Terminals and EtherCAT Terminals), the EtherCAT Box is not intended to replace the successful IP-Link Box, but to allow entry into the world of ultra-fast high-speed automation, for example with the eXtreme Fast Control (XFC) modules. We will be consistently developing both IP 67 series into the future.

The new EtherCAT Box modules have enlarged the IP 67 product range from Beckhoff. What are the main differences with the Fieldbus Box solution?

Dirk Bechtel: The fieldbus box modules with IP-Link communicate via the Coupler Box with the superimposed controller. This converts the respective fieldbus, e.g. PROFIBUS, DeviceNet, CANopen, etc. to IP-Link. IP-Link is a fast fiber optic bus that connects the local Extension Box modules with the Coupler Box. This conversion is eliminated in the EtherCAT Box. Each box is a 100 percent EtherCAT device and a self-contained EtherCAT slave, which can be connected directly to any other EtherCAT device via an Ethernet cable with 100BASE-TX.

Does that mean that you can connect two EtherCAT modules with a conventional Ethernet cable over a distance of 100 m?

Dirk Bechtel: In theory, yes. In practice, too; however, not all cables are created equal. By that I don't mean so much the transmission properties of the cable, but rather its industrial suitability, such as shield properties, flexibility or handling when fitting plugs on site. For this reason, we offer our users a range of Ethernet or EtherCAT cables as well as connectors that are optimized for the most diverse industrial purposes.

How has the EtherCAT Box been received by the market?

Dirk Bechtel: Acceptance was virtually instantaneous – as if the market had been waiting just for the EtherCAT versions of the Fieldbus Box! On the one hand, this development gives many EtherCAT users the ability to process signals directly with an IP 67 box in the field without an additional control cabinet. On the other hand, there are many IP-Link users who can now simply switch to EtherCAT with the same IP 67 design. By means of direct connection, a transparent, continuous communication

Beckhoff EtherCAT Box

The Beckhoff EtherCAT system has been extended with EtherCAT Box modules rated with protection class IP 67. The modules can be connected directly to an EtherCAT network via an integrated EtherCAT interface. The impressive EtherCAT performance of 100 Mbit/s is therefore retained right into each IP 67 box. With dimensions of only 126 x 30 x 26.5 mm (H x W x D) – the same as the Extension Box modules – the modules are exceptionally small and are particularly suitable for applications where space is tight. The EtherCAT modules cover the typical range of requirements for IP 67 I/O signals: digital inputs with different filters (3.0 ms or 10 µs), digital outputs with 0.5 or 2 A output current, analog inputs and outputs with 16 bit resolution, thermocouple and RTD inputs, and stepper motor modules. XFC modules such as inputs with time stamp are also available.



The Fieldbus Box, the Beckhoff I/O system for IP 67 applications, was unveiled for the first time at Hanover Fair in 1999.

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structure is created that offers considerable advantages in engineering, operation and service.

What types of signals are available for the EtherCAT Box?

Dirk Bechtel: First of all, we have developed the digital 24 V DC EtherCAT Box modules. Besides the pure input and output modules, there are also combination box modules with four input and four output channels, as well as modules in which the input or output function is freely selectable for each channel. The digital EtherCAT Box modules have been in series use since the beginning of 2009. Analog I/O modules will now follow, along with a stepper motor box that allows the direct connection of a stepper motor (50 V DC, 5 A), incl. encoder and digital inputs/outputs.

The EtherCAT Box also enables use in XFC applications (eXtreme Fast Control). What XFC modules are there?

What are the fields of application?

Dirk Bechtel: The EP1258, a digital input box with a time stamp function, is one of the first XFC modules in IP 67. It acquires the system time – simultaneously with the digital event – with a resolution of one nanosecond! In this way, many high-precision, dynamic applications can be realized, or their optimization is made possible.

A further advantage is that expensive special equipment can be replaced by less expensive sensors using XFC. For example, the measurement of torsion in a shaft can be accomplished using two markings and simple digital sensors. The precisely timed resolution of the digital signal due to XFC technology enables the momentary torsion of the shaft and thus the torque, for example, to be calculated via a powerful IPC.

The compact IP 67 system also supports Motion applications. What types of motors can be used and what are the advantages in comparison with the IP 20 EtherCAT Terminals?

Dirk Bechtel: With our first 'Motion Box,' we can control stepper motors up to 50 V DC and 5 A. Such a solution obviously only makes sense if you

can also directly acquire all of the signals associated with the motor. For this reason, the EP7041 also offers an encoder connection, two digital inputs for limit switches and an output for the brake. All relevant signals can be acquired in the compact 126 x 30 x 26.5 mm (H x W x D) box without any additional wiring expense. Due to the compatibility of the software to the IP 20 terminal, migration to the IP 67 world could not be simpler.

Beckhoff is increasingly integrating measurement technology into its I/O systems. Which measurement technique signals does the EtherCAT Box system support? Which modules will follow?

Dirk Bechtel: The analog current/voltage input/output box modules offer an entry into the world of industrial measurement technology. The 16-bit resolution represents a solid foundation for solving most tasks in the IP 67 field. We can also contribute to temperature measurement technology with the PT100 and thermocouple inputs. Additional boxes will follow, in which our experience in the IP 20 field will make the conversion considerably easier.

What can we expect from Beckhoff in the future in the IP 67 I/O field?

Dirk Bechtel: One large package will no doubt be the integration of safety into the IP 67 world. However, alongside that, the continuous expansion of product variety and the range of accessories in the fields of communication, power and sensor cabling will shape the future.

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