

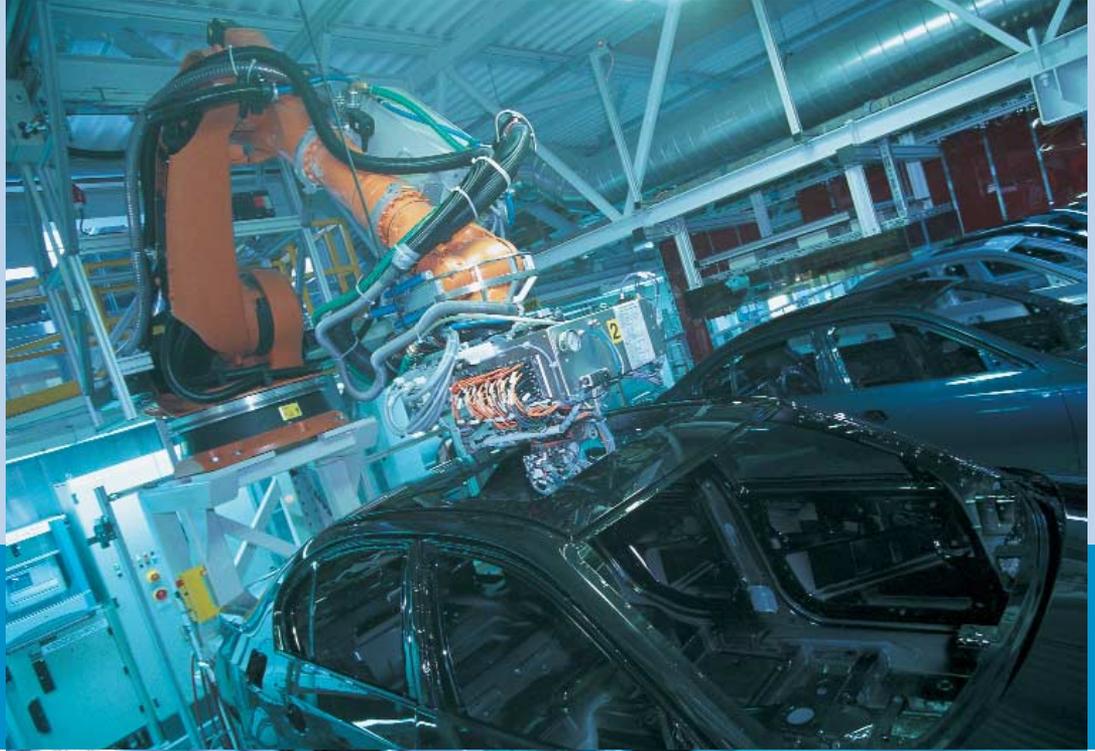
BMW: Fieldbus Box system with convincing performance
in front-line robot head application

A fine hand!

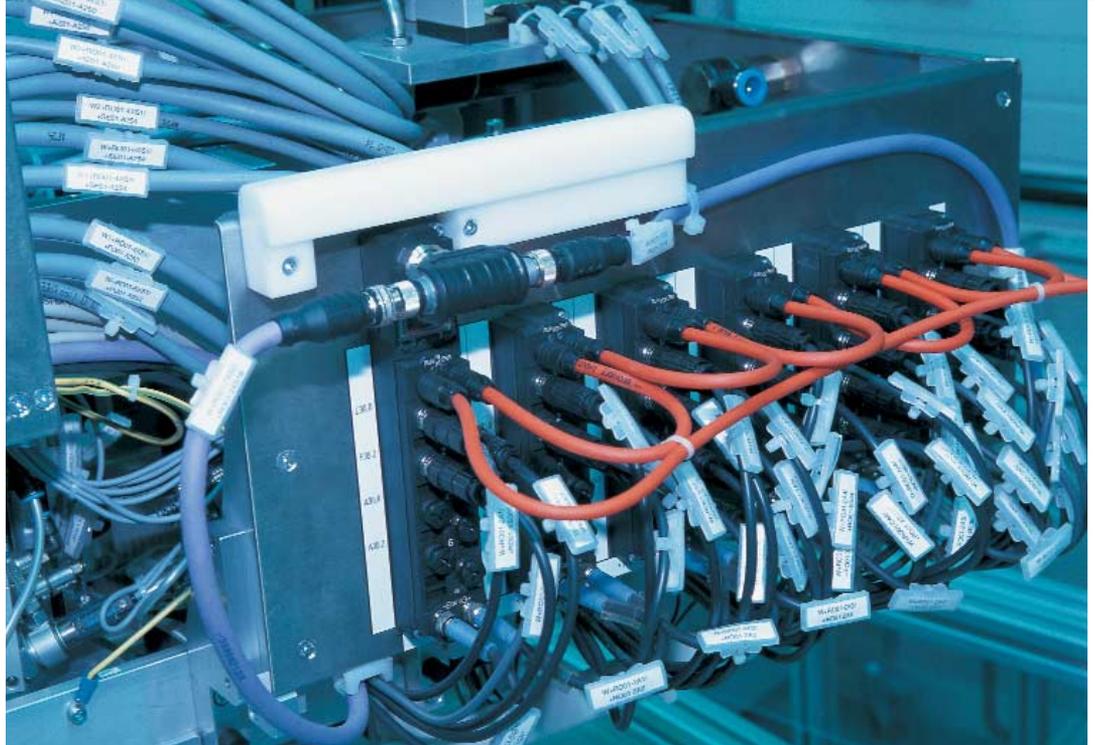
→ Decentralized automation technology and Fieldbus Box systems from Beckhoff are becoming more and more popular: In a front-line application at the BMW plant in Dingolfing, Germany, Fieldbus Box modules offer a "fine" robot hand for installing rubber seals for glass sliding/vent roofs.



Beckhoff IP 67 modules at the BMW
plant in Dingolfing, Germany.



The Fieldbus Box modules are mounted on a Kuka robot that inserts the rubber seal for the electric glass sliding/vent roof in the BMW 5 series.



The Coupler Box with Profibus interface gathers the I/O data from the extension box modules via the interference-free IP-Link optical fiber connection.

The compact Fieldbus Box modules in protection class IP 67 are robust and watertight and can be mounted directly at the machine with no control cabinet or terminal box required. Due to their small weights and measures, they are particularly suitable for applications where space is tight, or for applications featuring moving I/O interfaces such as robot arms.

The IP 67 modules were installed at the head of a Kuka robot that inserts the rubber seal for the electric glass sliding/vent roofs in the BMW 5 series. In the past, this operation had to be carried out manually, but now a robot is able to meet

the high quality standards. The rubber seal is installed with high precision and constant pressure, providing a precise and reliable seal for the glass sliding/vent roof that also minimizes wind noise.

Patented production know-how

What may sound simple often requires immense production planning and implementation. As a result of their successful efforts, BMW engineers are very proud about their patented technique. It is the first assembly step after the body has



At the robot head, the Beckhoff I/O modules can fully utilize their advantages: compact, robust, light-weight.

been painted: First, the roof cut-out is dried with an infrared lamp and heated to 22 °C – the optimum temperature for processing the seal. The robot arm then travels into the roof cut-out and installs the rubber seal.

A Coupler Box and five Extension Box modules are crucial components: The Coupler Box gathers the I/O data from the extension box modules via the interference-free IP-Link optical fiber connection. They are digital 24 V input and output devices for coupling of light barriers and sensors for color recognition. The light barriers monitor the uniformity of the tension over the complete length of the rubber seal during the installation. The higher-level controller processes the associated signals via the Fieldbus Box modules and Profibus.

The color sensors are used for quality assurance purposes. Among other functions, they are used to detect when sealing material from a new roll is used. In order to minimize differences in material and eliminate loss in quality, the seal for each vehicle must originate from the same batch or roll.

Protection class IP 67 makes I/O decision easy and pays dividends

The complete robot system was built and supplied by the company Symax Systemtechnik Sondermaschinenbau GmbH based in Germany. The Symax mechanical engineering experts didn't have to debate long about whether to use Beckhoff modules. Because the modules come in protection class IP 67, no additional housing was required. Due to their compact design (only half the width of alternative products), the modules could be fitted into the limited space available. The simple, flexible and cost-effective expansion option via IP-Link provides further benefits.

Considering the wide diversity offered by the Fieldbus Box, the possibilities for subsequent extensions become clear. The Extension Box modules cover the full

I/O range: digital inputs with different filters, digital outputs with 0.5 or 2 A output current, analog inputs and outputs with 16 bit resolution, thermocouples and RTD inputs, serial interfaces and encoder inputs. The Coupler Box gathers a wide range of I/O data via the 2 Mbit/s IP-Link connection. For example, 1000 binary I/O data is transferred quickly and safely in approximately 1 ms - smaller configurations are even faster. The high usable data rate ensures that IP-Link coupling has no appreciable negative impact on fieldbus performance. Up to 120 extension modules can be connected to a Coupler Box at a distance of up to 15 m from box to box.

Flexibility does not always have to mean diversity. The Compact Box can be used for applications that do not require a wide range of I/O options. While it does not offer modular expandability, a wide range of models is available, providing a choice of I/O functionality. The PLC Box is suitable for applications where sensor data not only has to be recorded, but also pre-processed. As the name suggests, it offers PLC functionality. The box enables parts of an application to run outside the central controller in order to relieve the CPU and the fieldbus. Decentralized counting, controlling or switching are typical applications for the box with an integrated small controller. The advantages are obvious: The reaction times remain independent of the bus communication and the higher-level controller and the functionality is retained even in the event of a bus or controller failure (enabling, for example, orderly transfer of the process into a safe state).