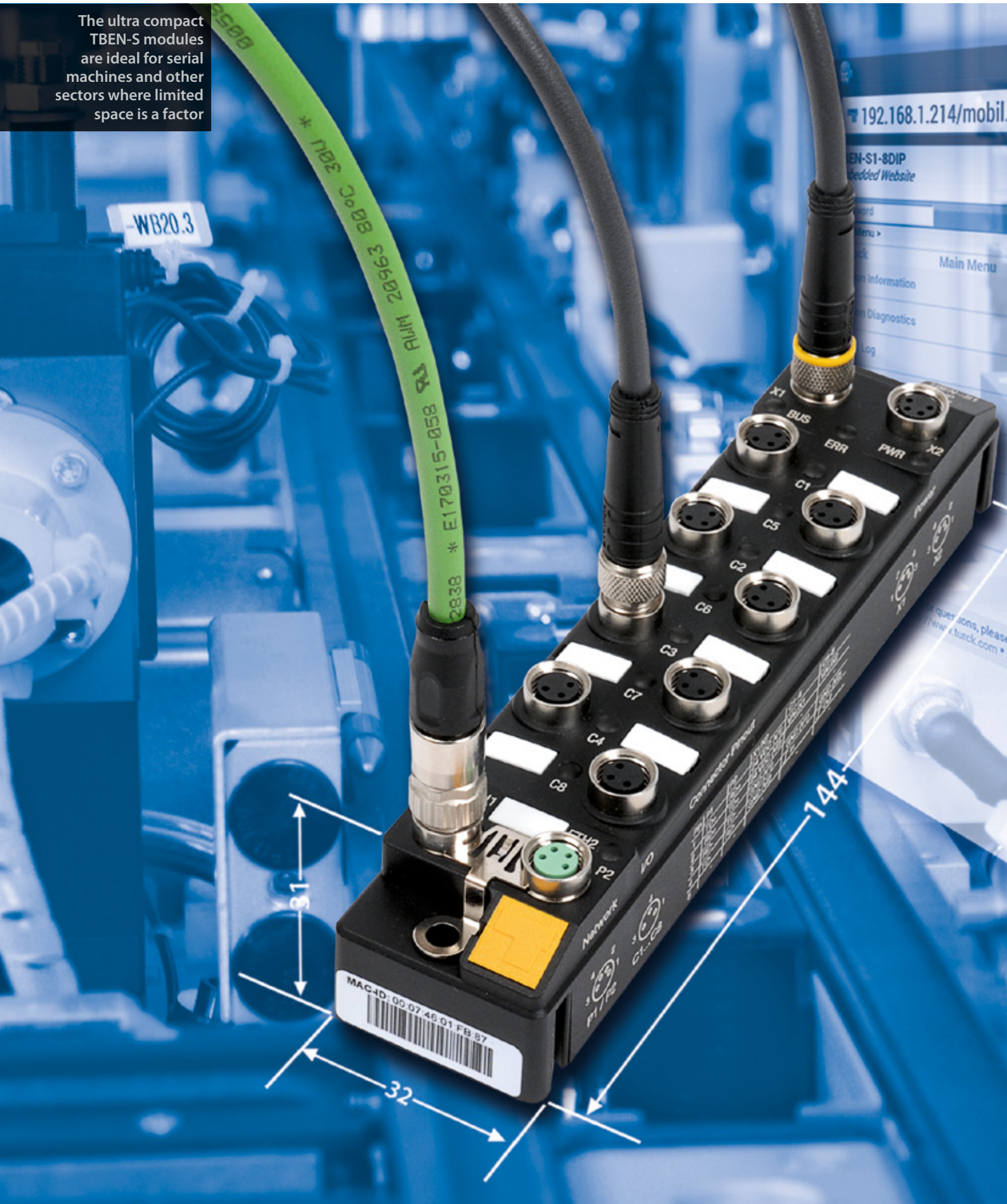


The ultra compact TBEN-S modules are ideal for serial machines and other sectors where limited space is a factor



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# Ethernet I/O Block

Ultra compact TBEN-S series for Profinet, EtherNet/IP and Modbus TCP eliminates the need for subnets

**T**he core of the newly developed TBEN-S I/O block modules is an ARM chip. The ARM architecture is a special microprocessor design. Already developed in the eighties, the chips are integrated in smartphones, tablets and game consoles on account of their reduced instruction set and their energy efficiency. These features enable ARM chips to also be used in many electronic products in the industrial automation sector.

Unlike other suppliers, Turck has decided to develop its own software solution – called Turck Multiprotocol – for Profinet, EtherNet/IP and Modbus TCP based on the ARM family. As the semiconductor market is constantly bringing out new derivatives of ARM processors, this approach enables Turck customers to benefit from falling processor prices while performance features such as memory, size and clock rate improve at the same time.

## Multiprotocol allows flexibility

Turck is pursuing a unique approach with its multiprotocol technology. Instead of being fixed over years to a specific chip family (and thus a specific technology supplier) by buying up ready-to-use technology components, a software solution makes it relatively easy to change to a new ARM derivative and thus use the improved features of new chips. The Ethernet technology developed by Turck makes it possible for any improvement in semiconductor technology that results in smaller and more powerful chips to be directly integrated into the products and passed on to the customers. The company always has complete control of the entire technology.

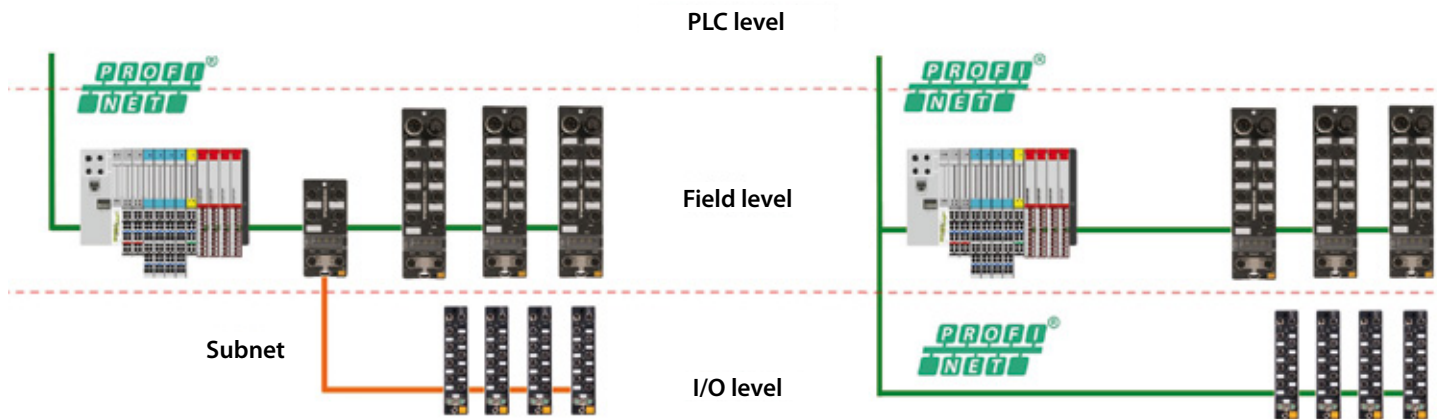
This technological advance now makes it possible for customers to reconsider the use of I/O modules with comparatively few I/O signals and the size of



**Big brother:**  
The very compact design TBEN-S modules is shown in comparison to the TBEN-L series in the standard size

### ▶ Quick read

Small, communicative, unique – that's the best way to sum up Turck's new TBEN-S I/O block module family. With a footprint of only 32 x 144 millimeters, a robust piece of high-tech has been produced that can even be installed in extremely restricted mounting conditions. Fully encapsulated electronics, EMC, shock and vibration resistance, as well as the Turck multiprotocol technology that enables use in Profinet, EtherNet/IP and Modbus TCP networks, make the devices an efficient and reliable solution that brings Ethernet to the I/O level without the need for couplers and subnets.



**New freedom: Unlike the solutions available to date (left), the TBEN-S modules bring Ethernet right into the I/O level – without any additional expense for couplers**

a candy bar, for which a direct connection to Profinet seemed inconceivable a few years ago.

Independence from other technology suppliers has enabled Turck to create the ultra compact TBEN-S block I/O series. Turck provides M8 female connectors on an area of only 32 x 144 millimeters. The fully encapsulated IP67 devices are ideal for all applications in which signals have to be brought to the controller in a restricted space, such as in machine building or serial machinery building applications. In spite of its compact design, each TBEN-S module can be operated without any additional gateways in any of the three Ethernet systems Profinet, Modbus TCP or EtherNet/IP. Thanks to Multiprotocol, the devices detect the protocol used automatically. Their integrated switch also allows use in a linear topology.

### Flexibility benefit

Alternative I/O modules in this design, if any, are only offered on the market in conjunction with gateways which connect several small I/O blocks via a subnets. The direct connection of the Turck modules, such as to Profinet, eliminates the need for any gateways, which would otherwise be required, with the resulting positive effect on the overall price. However, the user not only saves costs for the coupler but also considerably increases

their flexibility, since it is no longer necessary to consider the minimum number of I/Os from which a coupler with subnets expansion modules is worthwhile. With the TBEN-S as an inexpensive I/O solution from the very first module, even the cost-efficient but labor intensive signal connection using passive junctions becomes less attractive.

If a particularly large number of I/Os

are required, using the TBEN-S also has its benefits. With conventional compact modules with gateways, the maximum number of modules connected to one coupler can be reached, making another coupler necessary. In contrast to this, each TBEN-S module is connected separately to the Ethernet. Whether the planner only uses a single TBEN-S module or 16, the costs per I/O stays the same. The number of modules is only limited by the maximum number of Ethernet stations on the controller.

This shows clearly that TBEN-S is more than just a block I/O module in a highly compact design. Turck has produced a highly slimline solution that enables the creation of flat communication architectures.

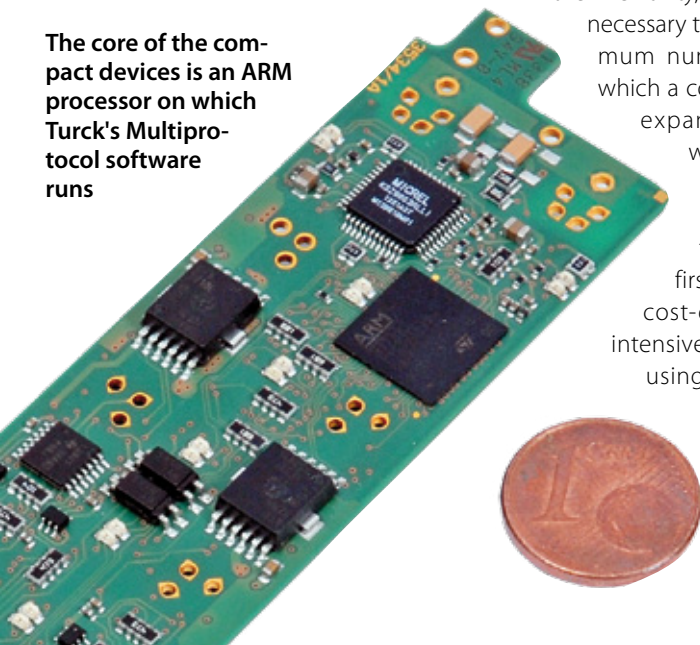
### FSU, QC, MRP, DLR and web server on board

The implementation of all three protocols has no disadvantage compared to individual protocol devices. On the contrary: the modules support Fast startup mode (FSU) in Profinet and Quick connect (QC) in EtherNet/IP mode, as well as the MRP and DLR bus redundancy protocols.

Turck has also provided a web server on the processor. This enables each module to be addressed separately for diagnostic and parameterization tasks. The web server provides these diagnostic messages in plain text. The diagnostic buffer allows the user to also call up diagnostic messages with a time delay. Both Ethernet ports are provided with an error counter that can be monitored by the web server. Users of EtherNet/IP and Modbus TCP in particular will appreciate this function since, unlike Profinet, these networks normally do not provide these kinds of in-depth diagnostic tools.

For smartphone and tablet users, Turck has implemented the web server in a responsive design so that even mobile terminal devices can be used to call up diagnostic and configuration functions if a suitable wireless access is provided in the system. The fact that a powerful web server could also be implemented in the multiprotocol platform as well as the three protocols mentioned, is made possible by the economical and exceptionally slim architecture of the operating system.

The core of the compact devices is an ARM processor on which Turck's Multiprotocol software runs





## Flexible signal types

Turck is initially offering five TBEN-S variants in the range: devices with four digital inputs and outputs each, with eight digital inputs including module and channel diagnostics, with eight digital outputs, as well as with eight universal digital inputs/outputs (TBEN-S1-8DXP). This last device automatically sets itself to the configuration required. Some of the outputs of the modules switch a current of up to 2 amps.

Analog devices and an IO-Link master will also follow the five digital modules over the course of 2015. The key feature of the version with four analog inputs (TBEN-S2-4AI) is the fact that each input can not only be configured as a voltage or current input but can also be used to connect PT100 sensors or thermocouples. The customer can thus use one device to replace up to four alternative modules. Up to now it was necessary use several modules in applications with different AI signals. With the typical four-channel granularity available, many channels were therefore often unused. With the universal analog input of the TBEN-S, the same application can be implemented in future with considerably fewer modules and also at less cost. A variant with four IO-Link ports completes the range of devices on offer.

## Reducing complexity

The conventional multiprotocol benefits that Turck has already been providing for two years in increasingly

more I/O solutions are now provided in the TBEN-S family. Customers using different Ethernet protocols can effectively reduce the number of device variants that have to be kept in stock by using multiprotocol devices. Machine builders that offer their machines both with Rockwell controllers (EtherNet/IP) as well as Siemens controllers (Profinet) can use multiprotocol I/O devices to implement a standard electrical planning for two different machine versions. With the devices of the TBEN-S series this is the case down to the lowest I/O level. There are also customers that use the multiprotocol modules in conventional automation technology on controllers with Profinet or EtherNet/IP. However, their measuring and testing technology in quality assurance uses PC-based systems. Thanks to Modbus TCP the same modules can be used here as in production.

## Outlook

The life cycle time in the semiconductor industry is short. New chip generations are appearing on the market every few months. Since Turck presented the first multiprotocol generation in 2012, more powerful chips have already been integrated into the devices twice. With the strategy described, it won't be too long before Turck can integrate the next chip generation in its devices. In view of the dynamic development in semiconductor technology, the chips should also be cheaper in future and suitable for use in other product groups at Turck. ■



The new analog modules are particularly flexible in terms of input signal types