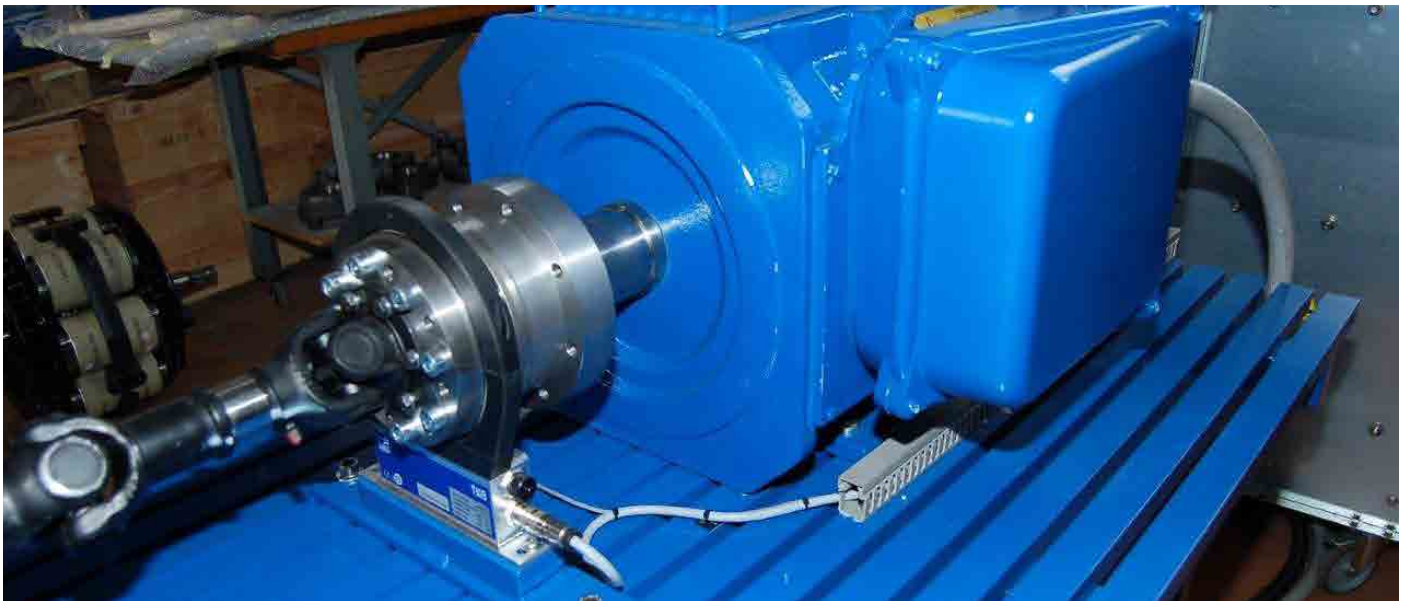
HBM Case Study

EtherCAT-capable test stand for electric motors - with TIM-EC



In order to develop a test bench for electric car engines, Dynosens needed an interface to connect its T40B torque transducer to the EtherCAT fieldbus. The TIM-EC that HBM was in the process of launching was put to operational use straightaway ...

Dynosens specializes in the development of test benches for engines and vehicles of all types. The company, which was founded in 1990 in La Roche sur Foron (Haute Savoie), delivers around thirty test benches every year in both standard and bespoke designs for different markets (cars, motorbikes, scooters, go-karts, tractors, agricultural engines, etc.).

In its different developments, Dynosens strives to capitalize on its existing resources and relies on reference suppliers, explains Yves Rosnoblet, the company's General Director: "We use suppliers with a reputation for the quality and performance of their products, and also for the quality of their technical support. This is why HBM has been our primary supplier of force and torque transducers for 15 years."

Over the years, HBM has developed into a real partner for Dynosens. This was confirmed once again with the recent CEA (French for Commission for Atomic Energy) invitation to tender, which Dynosens won recently.

A bespoke test bench based on exacting technical specifications

This invitation to tender related to a test bench for electric engines which would aim to study and optimize the engine control laws based on a representative engine from an electric car, the Renault ZOE. CEA itself wanted to take responsibility for the control electronics on the engine and the application of the measurements.

The test bench was to be delivered with a ZOE engine and a machine to simulate the changes applied to the engine during acceleration or deceleration or going uphill or downhill. The charging system is an asynchronous electric servo motor with torque and/or speed controls.

As the aim of the test bench was to study the parameters for the engine, the measurement information needed to be recorded (voltage, current, electrical power, torque, speed, etc.). "The specifications document stipulated that these measurements were transmitted via an EtherCAT fieldbus," explains Yves Rosnoblet.

EtherCAT is a realtime industrial version of Ethernet. Launched in the early noughties by Beckhoff, EtherCAT has rapidly become an open standard controlled by an independent organization (ETG, with now over 2400 companies as its members) which provides all the documents and tools required to develop products in compliance with the standard.
Typically, an EtherCAT bus can process (cycle time) 1000 digital inputs/outputs in 30 µs or 200 analog inputs/outputs in 50 µs, or 100 axes in 100 µs.

T40B torque transducer, ideal for this kind of application

Dynosens wanted to use an HBM torque transducer for the new test bench. The company has long been a convert to the HBM technology and appreciated the innovation it had produced involving fitting the strain gauges to a measurement flange instead of a rotating shaft. This reduces the strain on the shaft and also ensures better measurement performance, especially in terms of dynamics.

These transducers are also very robust, which is very useful for test bench applications for thermal engines, where the engine's working methods and transmission systems create more demanding mechanical

conditions. Under the circumstances, it is hardly surprising that these transducers have become the new reference for tests beds for thermal engines for Dynosens (and other companies!).

Over the years, the range has increased (the measurement ranges go from 50 Nm to 80 kNm) with product families more and more specifically targeted to different applications. This is how the T40B manages to achieve an unparalleled cost to benefit ratio. Compared to the previous generation models, performance is improved for half the price. And it is no surprise that, having become the standard for thermal engine test benches, HBM is already making good headway among electric engines.

Dynosens also appreciates the T40B for its ability to transmit speed as well as torque, which makes the design process easier.

Signal processing - a key point

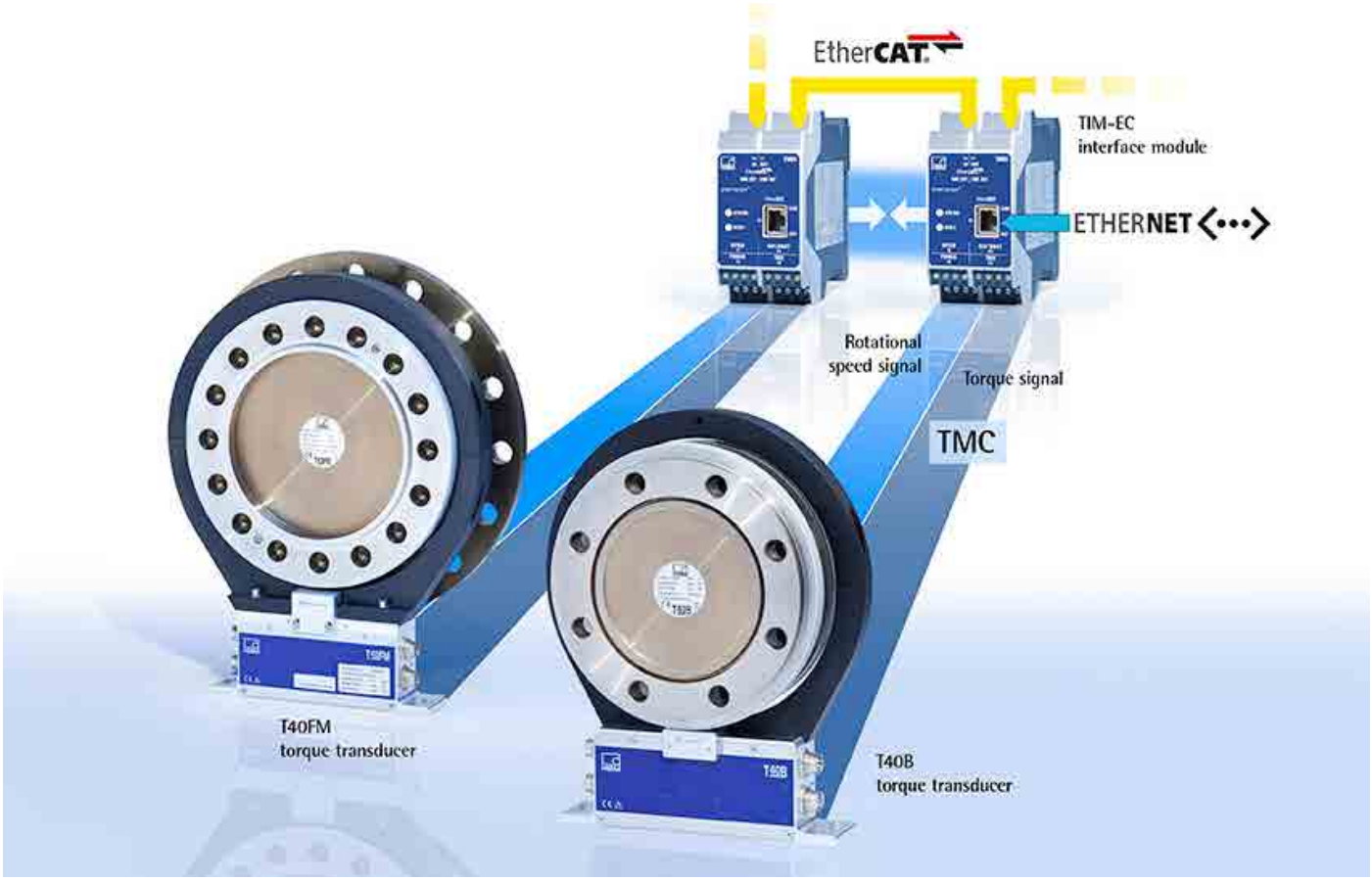
But when the test bench was being designed, HBM was not offering an EtherCAT connector for the T40B. The plan was to implement the traditional solution of integrating the transducer into an EtherCAT I/O module.

But for Yves Rosnoblet, this would not have allowed the performance of the transducer to be fully utilized: "Transducer manufacturers are best placed to develop the processing and diagnostics functions built into the fieldbus connectors. The I/O blocks developed by the manufacturers of automatic devices are non-specific by nature and cannot be optimized for all transducer types, and more specifically for a transducer which has evolved from the T40B class".

A direct connection to EtherCAT with the TIM-EC module

Of course, Dynosens informed HBM about its experiments. The response was immediate. At the very same time, the leading European automotive manufacturer had made the same request, prompting HBM to develop an EtherCAT interface. The product was not yet on the market, but experience told Dynosens it could count on HBM and start work on designing the test bench in the knowledge that it would effectively be 'beta testing' the EtherCAT interface.

The interface, known as TIM-EC, was delivered by the deadline agreed and Dynosens is the first user in France. "We took a bit of a risk but it paid off. The product went into service immediately and fitting it into the test bench did not cause any problems at all. In terms of performance, it delivers a resolution of 25 bits, a level which is beyond the scope of an industrial I/O module. As we know, precision is a key point for users of test benches because it is precision which allows performance improvements," explains Yves Rosnoblet with pleasure. The TIM-EC interface from HBM also allows various filtering speeds to be selected and provides diagnostics information along the entire measurement chain (from the transducer to the interface).



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