The inverters of the electrically driven freight train Harmony D2 produce a lot of heat that has to be removed in a controlled way

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Train Watch Out!

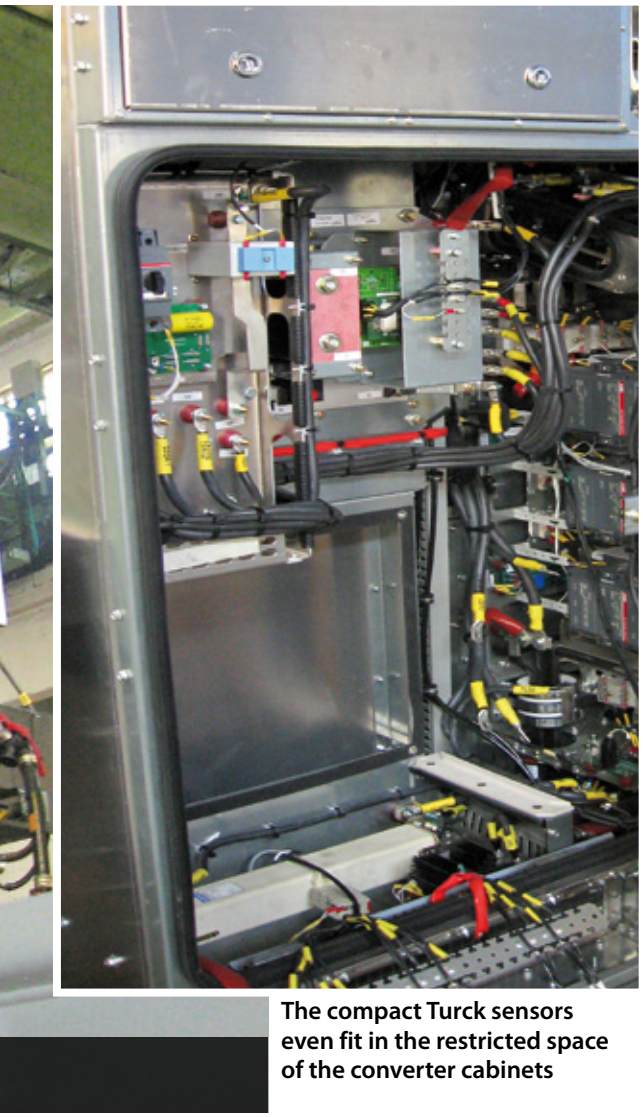
A Chinese freight train uses Turck FCS flow sensors to monitor the air cooling in the current converter cabinets

The expansion of the Chinese rail network has been advanced ever since the founding of the Peoples' Republic of China in 1949. In spite of all the improvements, the rail network and the trains continue to be in need of further expansion. In this respect, powerful freight trains are at the top of the wish list. As in other areas, Chinese manufacturers are building on the proven technology of foreign partners and are developing this further for their own market. This also applies to a manufacturer of electric rail vehicles that is a leading developer in China of state-of-the-art drive technologies.

The manufacturer recently developed a freight locomotive based on the Prima BB 43700 freight train of its cooperation partner Alstom. Harmony D2 is the name of the 8-axle Chinese version of the freight locomotive with a high performance AC drive. The locomotive is a showcase project for the modernization of the Chinese rail traffic. Besides the microcomputer control system, the Harmony D2 also shares the high performance range of its European example. With its high shaft output and good traction, the Harmony D2 also offers a broad application range. The low operating costs of the locomotive are due in part to its ease of maintenance. Turck has contributed here with a flow sensor that monitors the reliable cooling of the converter cabinets.

Heat dissipation in the converter cabinet

The drive power of the high performance AC locomotive is provided by a traction converter. This is a traction current converter, which is installed in the main conver-



The compact Turck sensors even fit in the restricted space of the converter cabinets

ter cabinet. The locomotive is also equipped with two independent auxiliary power converter cabinets. The auxiliary power converters supply power to the ancillary units such as cooling fan, water and oil pump, air conditioning unit, main compressor as well as battery chargers, heating units and other additional equipment. The auxiliary power converters are operated redundantly: one converter in normal operation and one in standby mode. With such a large number of connected loads, the fault-free operation of the locomotive largely depends on the function of the converters and the cabinets in which they are installed.

The temperature in the control cabinet rises the longer the converters are in operation. The cabinets are therefore equipped with an active air cooling system in order to remove the resulting heat. The air circulation must be monitored constantly in order to ensure that permanent cooling continues without interruption.

Problems had occurred several times with the flow sensors of another manufacturer that the customer had installed for this purpose. The sensors were not only insensitive but were also not able to compensate the frequent temperature changes that took place inside the cabinets. The sensors had misinterpreted temperature changes as a drop in the air flow and therefore often supplied incorrect measuring results. The specialists building the locomotive therefore went in search of a sensor solution that provided a steady output signal when the flow was constant, irrespective of any temperature changes. It also required a solution that could be installed in the restricted space of the converter cabinet without any problems.

Quick read

A Chinese locomotive manufacturer relies on Turck flow sensors for a freight locomotive. The flow sensors for gaseous media monitor the air flow in the converter cabinets for the supply of the ancillary units. Turck was able to impress the customer with a compact sensor with a male thread, which could correctly measure the flow speed even when the medium changes temperature.

Turck solution: Aligned fitting

Turck's M18 flow sensors for gaseous media proved to be the sensor solution that could meet all the locomotive manufacturer's requirements. The FCS-M18-LIX is a compact flow sensor in a cylindrical housing with a male thread that enables it to be mounted even in restricted spaces. Although the calorimetric measuring principle used here is susceptible to temperature changes, the Turck sensor compensates for this with its special sensor design and a so-called aligned fitting: The measuring resistor and the heatable measuring resistor have to be positioned parallel to the flow direction. The aligned fitting enables the full precision potential of the sensors to be used. If the sensor was incorrectly fitted, the heated air could also cause the measurement to be incorrectly interpreted as a change in flow. With aligned fitting on the other hand, the sensor cannot be affected by temperature changes of the passing air current.

Once the FCS-M18-LIX, specially designed for gaseous media, is correctly aligned, it can fully utilize its potential. It now reliably monitors the flow with the electric locomotives in continuous operation – even when the temperature increases. The Turck sensor therefore also helps to keep the maintenance times of the locomotive to a minimum and to improve its efficiency. Turck's flow sensor also fulfills the second customer requirement on account of its compact design which combines sensor, probe and processing unit in a single housing. Sensors with a larger housing style or with separate processor units could not be installed in the conditions at hand. ■

When the fitting of the FCS-M18-LIX is aligned, it can compensate for any temperature fluctuations