

# Full speed ahead thanks to reliable braking technology

Maximum efficiency through constant level check in the brake sand box with ToF



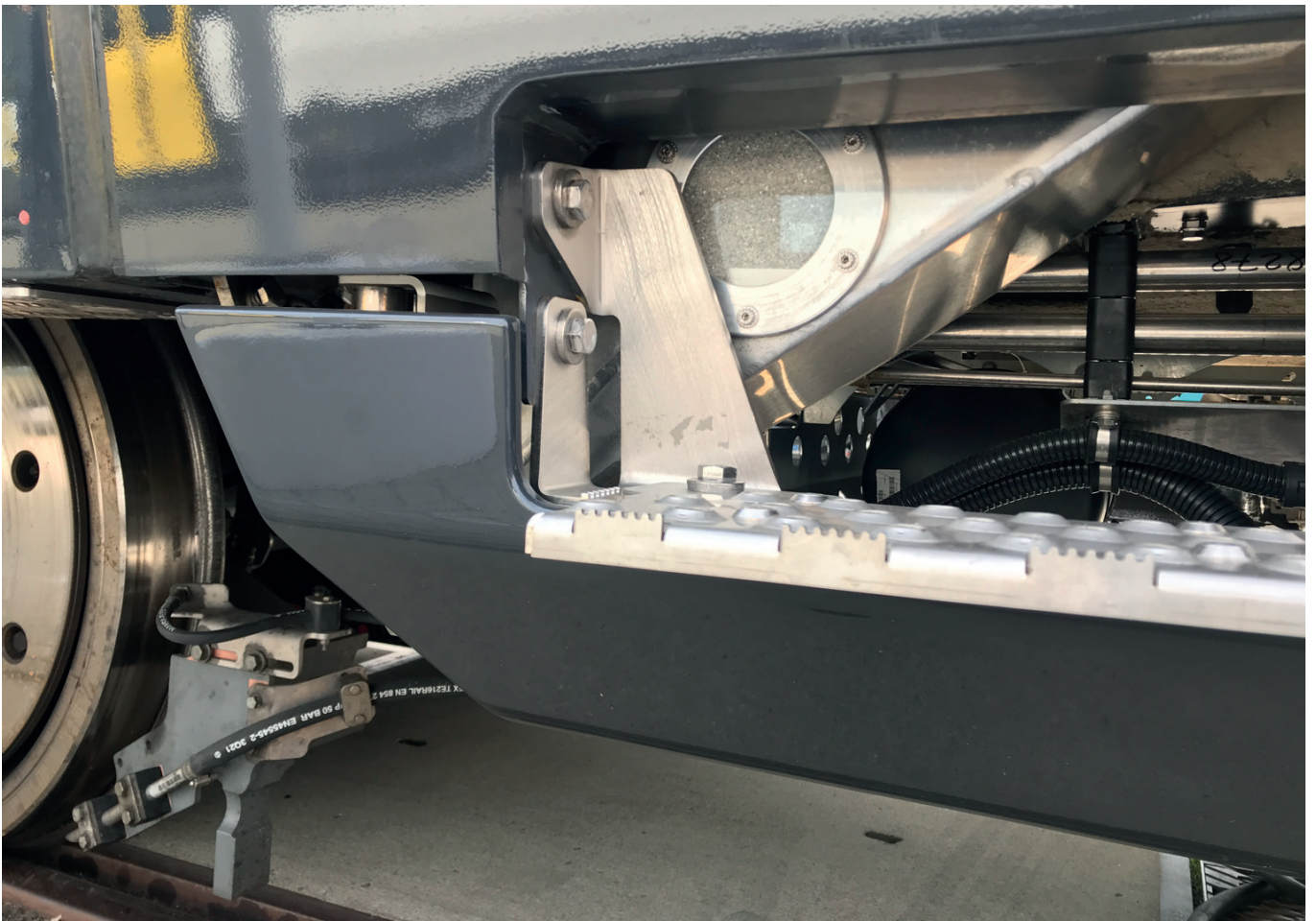
# Manual was yesterday, CALIS is today: optical measuring method for demand-controlled refilling of the sand container

## Challenge and project

CAPTRON has developed the CALIS analog measuring device on behalf of one of the leading providers of transport solutions. This can be used to monitor the status of brake sandboxes on the locomotives of the world's leading mobility and logistics company. The analog and optical sensor based on ToF (Time-of-Flight) technology enables predictive planning in rail traffic as well as continuous inspection and timely refilling of brake sandboxes.

For rail vehicles, safe and reliable locomotive speed control is essential. To improve braking and increase friction in adverse environmental conditions and in emergencies, sand is sprinkled between the wheels and rails. The brake sand required for this is stored in a container and must be checked and refilled regularly. Until now, locomotive engineers could only rely on two relatively unreliable methods to check the fill level: a viewing window on the outside of the wagon and an indicator inside that could at best distinguish between „empty“ and „full“ with digital measurement.

As a result, the customer was looking for a more reliable way to identify data for on-demand replenishment and prepare it for deployment in the cloud. In addition, the meter should be weather resistant and designed to last 30 years. The choice initially fell on a capacitive sensor from CAPTRON. During the development phase, both sides worked closely together and discussed progress, problems and changed requirements in regular intervals. After initial research, CAPTRON recognized the weakness of the concept: The conductivity of dry and even slightly moist sand differs seriously, making reliable capacitive measurement impossible. Therefore, an alternative solution was needed.



Installed brake box in locomotive

## Customer Benefits

- **Continuous level measurement**  
In the brake sand box of the railcar, the filling level is constantly checked.
- **Low supply voltage**  
Due to the low voltage of 24 V, the device does not pose any electrical hazards.
- **Accurate level indication instead of manual control**  
The train driver no longer has to check the fill level manually. This can be visualized via the analog output signal, e.g. on a display, and, if required, various messages can be output to the train driver and also the control center(s).
- **Time-of-Flight Technology**  
Increased precision due to reliable optical measuring method under various operating conditions.
- **Maximum efficiency**  
The use of ToF technology saves time and costs and reduces maintenance.
- **Certified and extremely durable**  
Certified according to EN50155. Wear-free electronics and high-quality materials with a service life of over 30 years.

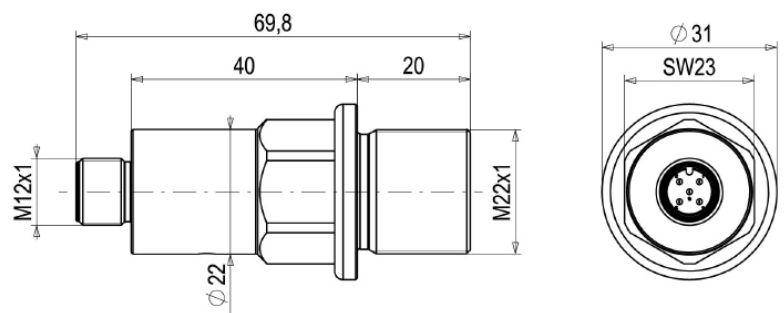
## CAPTRON solution

CAPTRON advised the customer to use an optical process based on ToF technology, which the sensor technology experts were already working with in other areas: Similar to a bat's lidar or echosounder, the measuring device emits an infrared laser signal to obtain information on the filling level of the brake sand tank. The time for the outward and return journey of the light is measured, the distance is determined, converted into an electrical signal and then output for further processing and visualization.

To meet the requirements of railroad standard EN50155 and the additional requirements requested by the customer, such as a service life of 30 years, CAPTRON chose a particularly corrosion-resistant and robust design for the CALIS measuring device: The housing is made of stainless steel and the lens is covered with a glass pane. All connections are completely sealed and the product is fully encapsulated so that no moisture can penetrate.



3D drawing CALIS



Technical drawing CALIS

## Result

In the meantime, the first trains have been equipped with CAPTRON's CALIS technology and put on the rails. The feedback from the locomotive manufacturer so far has been positive all round: „The new measurement method has proven to be an absolute success. All data is recorded precisely and reliably. Refilling the sand container as needed according to weather conditions and driving distance is now effortless. We've also laid the foundation for predictive maintenance as well as integration of the data into the cloud.“

CAPTRON is also satisfied with the results of the customized solution and has identified additional areas of application: At the moment, the sensor experts are examining how the technology can be used in further variants in the industrial sector, for example to save time, personnel and maintenance effort in the IoT environment and in the automation of manufacturing processes. And further applications are also conceivable in local public transport, such as on the entrance doors of vehicles.

## ABOUT CAPTRON

Since 1983, we have been shaping the future in man-machine and machine-machine interaction with capacitive and optical sensors. From our company locations in Europe, USA and China as well as sales partners around the globe, we develop, manufacture and supply complete sensor systems and software solutions to small and medium-sized companies as well as large corporations from a wide range of industries and areas of application. We have been active in the field of mobility since the company was founded.

With CAPTRON Technologies, we offer customers a broad portfolio of sensor technology, which we supplement with our CAPTRON Solutions brand with services related to individual software development and integration, process consulting (lean management) and project management. Our customers thus receive a comprehensive overall package directly from a single source. Perfectly tailored to the needs and challenges posed by the digitalization of production and logistics processes.

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