Sofis – Surface acoustic wave identification system

Automatic vehicle identification and locating

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Economical and efficient

Sofis

Ensuring mobility is one of the big challenges in our society. We need networked traffic and information systems to remain mobile in future – for safe, cost-effective and environmentally friendly passenger and cargo traffic. This is why Siemens – with its “Complete mobility” approach – is offering integrated transportation and logistics solutions: from infrastructure systems for railways and roads to solutions for rolling stock, airport logistics and postal automation. Key elements of “Complete mobility” are efficient solutions for rail-based transportation systems.

Efficient rolling stock resource management is definitely becoming a strategic competitive advantage in the field of mass transit and mainline rail traffic, particularly in view of the ever-increasing quality and cost requirements.

The focuses of resource management today are on the quick provision of vehicles, the determination of optimum transport routes, but also on permanent vehicle locating and management.

Our solution to this is Sofis – the surface acoustic wave identification system.

Convincing benefits
> Identification of all vehicles according to their individual code
> Transmission path highly insensitive to electromagnetic emissions
> High transparency through a time and date stamp for every vehicle identified
> Easy adaptation of hardware and software to higher-level applications
> Passive high-frequency ID tag – only activated when the reading point is passed; no battery required

Versatile and flexible
Sofis is particularly suitable for mass transit and mainline trains, high-speed trains and goods trains. The scope of application of the system ranges from object identification through automatic control tasks to the locating of vehicles.

The positions of the two system components can be selected as required: A configuration with a stationary Sofis reading device and ID tags on the moving object is just as feasible as a Sofis reading device mounted on the vehicle and a fixed ID tag used as a position marker.

Identification applications
> Train or car tracking in depots or in the rail network
> Assignment of measured values to the vehicle (e.g. ARGUS and DAFUR wheelset diagnostics, weight of coal cars)
> Identification of vehicle direction
> Vehicle type identification in washing plant with corresponding selection of the washing program
> Outgoing goods control
> Fault monitoring
> Determination of route mileage of goods cars and passenger coaches
> Proof of transport capacity provided (for accounting purposes and compliance with timetable)

Automatic control applications
> Train driver and passenger information
> Industrial automation
> Automation of transport processes (e.g. shunting operations, hump)

Locating applications
> Resource management
> Switching functions (e.g. control of wheel flange lubrication systems)
> Intermittent locating of remote-controlled shunting locomotives (with stationary ID tag and Sofis reading device on the vehicle)

Your competitive advantages
> Low investment and installation costs
> Improved logistics due to efficient management
> No need for maintenance of ID tags
> No monitoring management required
> Easy system integration due to the use of standard interfaces
> Subsequent delivery guaranteed at any time, resulting in high system availability
Contactless and fast
As a surface acoustic wave identification system, Sofis is used for non-contact identification of ID tags located on mobile or stationary objects.

The Sofis reading device with its computer-controlled high-frequency transmitter and receiver unit reads the information stored in the ID tag and conveys it to a higher-level customer application for evaluation and further processing.

This type of identification ensures that the ID tag and Sofis reading device only communicate for a very short period of time. As a result, the data can also be reliably read when the train travels at high speeds. This is a particular advantage for railway operations with their requirements for higher speeds and faster goods transport.

The Sofis reading device is able to read ID tags with a storage capacity of both 13 and 20 bits.

Robust and resistant
The Sofis reading device comprises an evaluation unit and an integrated antenna. It is designed for railway applications and is therefore accommodated in a robust housing.

The ID tag principally consists of a surface acoustic wave chip and an antenna, also well protected in a housing. An operating frequency of 2.45 GHz ensures high interference immunity to electromagnetic fields, particularly in railway applications.

ID tag and Sofis reading device are highly resistant to vibrations and shocks and are thus eminently suitable for use in the track ballast or installation on the vehicle body.

High data security
The data is represented in the ID tag by means of a dedicated number defined by the manufacturer. This number is of no significance to third parties. Only the user allocates this number to the specific application in his/her data processing system. This offers two advantages, namely high data security and flexible use of the ID tag.

The physical principle
An interrogating pulse from the Sofis reading device is transmitted to the piezoceramic interdigital converter located in the ID tag. The reflected acoustic signals returning to the interdigital converter are converted to electromagnetic oscillations and emitted via the antenna. The pulses form a pulse train, also called pulse response. This pulse train can be received by the antenna of the Sofis reading device and evaluated using a downstream signal processor in line with the intended purpose.
**Technical data**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Frequency</td>
<td>2.45 GHz</td>
</tr>
<tr>
<td>Reading distance</td>
<td>0.25 m to 1.5 m</td>
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<tr>
<td>Speed range for data transmission</td>
<td>0 to 400 km/h</td>
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<tr>
<td>Speed range for direction-of-travel detection</td>
<td>1 to 150 km/h</td>
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<tr>
<td>Storage capacity</td>
<td>20 bits of permanent usable data</td>
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<tr>
<td>Degree of protection Sofis reading device</td>
<td>IP 67</td>
</tr>
<tr>
<td>Degree of protection ID tag</td>
<td>IP 67</td>
</tr>
<tr>
<td>Power supply of Sofis reading device</td>
<td>18 V DC to 72 V DC</td>
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<tr>
<td>Power consumption</td>
<td>&lt; 5 W</td>
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<td>Interface</td>
<td>RS422</td>
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<tr>
<td>Dimensions Sofis reading device</td>
<td>270 x 210 x 90 mm</td>
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<tr>
<td>Dimensions ID tag</td>
<td>160 x 90 x 27 mm</td>
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<tr>
<td>Weight Sofis reading device</td>
<td>4,600 g</td>
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<tr>
<td>Weight ID tag</td>
<td>50 g</td>
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<td>Ambient temperature Sofis reading device</td>
<td>-40°C to +55°C</td>
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<tr>
<td>Ambient temperature ID tag</td>
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The SOFIS surface acoustic wave identification system has been successfully used in various applications since 1995. Customers include the following:

> DB Netz AG
  (DAFLUR wheelset diagnostic system for long-distance trains)
> Deutsche Bahn AG
  (ARGUS wheelset diagnostic system)
> Railion Deutschland AG
  (KOMBILOK vehicle locating system)
> S-Bahn Berlin GmbH
  (vehicle identification for depot management)
> Stadtwerke München GmbH
  (vehicle locating and management)
> Eurotunnel, France / UK
  (wheelset diagnostic system)
> Northam Train Depot, UK
  (depot management)
The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.