

Operating Instructions

RADIO SENSOR
Heavy Duty TAG
Bluetooth sensor module
Rail Vehicles



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1 Preface

In addition to the ZF documentation, observe the provisions of the vehicle manufacturer or the body manufacturer.

1.1 Validity and field of application

This documentation applies to the following add-on device:

- Heavy Duty TAG (radio sensor)

2 Safety

2.1 Signal words and symbols

This document contains particularly highlighted safety instructions which are marked with one of the following signal words depending on the severity of the danger.

DANGER

DANGER

The signal word **DANGER** indicates a dangerous situation that, if not prevented, will lead to a severe injury or death.

⇒ Information as to how the danger can be prevented.

WARNING

WARNING

The signal word **WARNING** indicates a dangerous situation that, if not prevented, can lead to a severe injury or death.

⇒ Information as to how the danger can be prevented.

CAUTION

CAUTION

The signal word **CAUTION** indicates a dangerous situation that, if not prevented, can lead to a slight or moderate injury.

⇒ Information as to how the danger can be prevented.

NOTICE

The signal word **NOTICE** indicates a situation that, if not prevented, can lead to property damage.

⇒ Information as to how the property damage can be prevented.

The following symbols are additionally used:



This symbol refers to additional, safety-relevant information.



This symbol indicates information concerning special workflows, methods, application of aids, etc.

2.2 General safety instructions

Read all safety instructions and information. Failure to comply with safety instructions and information may lead to property damage, serious injuries or death.

Intended use

The ZF product is exclusively intended for the application as defined in the contract and as agreed on the time of delivery. Any other or extended form of use does not comply with this definition of intended use. The intended use includes compliance with this documentation and other applicable documents, in order to avoid malfunctions and damage in operation.

The ZF product is designed and produced in line with state-of-the-art technology. The ZF product in its delivery status is safe to operate. However, the ZF product may pose dangers if improperly used by unauthorized, untrained and uninstructed staff or if not used according to its intended use.

Figures might deviate from the ZF product and are not drawn to scale. No conclusions can be drawn with regard to size and weight.

Installation, commissioning, maintenance and repair

Perform assembly, commissioning, maintenance and repair work exclusively according to this documentation and other applicable documents.

Observe the following points:

- Employ authorized, trained and instructed staff.
- Observe technical provisions.
- Only use genuine ZF spare parts.
- Only use genuine ZF accessories.
- Only use genuine ZF special tools.
- Unauthorized changes and modifications lead to the expiry of the operator's license, warranty or guarantee.

In case of damage, contact ZF and have the following information on the product ready:

- Type
- Parts list [BoM] number
- Serial number
- Operating hours
- Description of damage

Observe safety instructions, valid safety regulations and legal conditions to prevent malfunctions and damage.

The country-specific safety regulations, accident prevention regulations and environmental protection provisions apply additionally.

Wear safety-relevant workwear for all work. Depending on the work, also wear personal protective equipment.

After completing the work, check correct function and functional security.

Handling of ZF product

Unauthorized changes and modifications might impair functional security. Changes, modifications and applications are only permissible upon written approval by ZF Friedrichshafen AG.

Observe the following when working on the ZF product:

- Secure workspace.
- Only carry out work at the unit when in a voltage-free state.
- Protect unit against being started accidentally. Attach instruction plate where it is clearly visible.
- Perform work when engine is switched off.
- Protect engine against being started accidentally. Attach instruction plate where it is clearly visible.
- Do not stand beneath a suspended load.
- Do not work on a suspended load.
- Only use permitted means of transport and lifting devices with sufficient load-bearing capacity.
- Close open tubings and hoses and avoid damage.
- Observe tightening torques.
- Protect cables against mechanical damage.

Noise

Noise might cause irreversible damage to hearing.

The perception of acoustic signals, warning calls or sounds warning of impending danger is impaired by noise.

Observe the following when working on the ZF product:

- Avoid noise.
- Wear ear protection.

Operating supplies and aids

Operating supplies and aids might cause permanent damage to health and environmental damage.

Observe the following when selecting operating supplies and aids:

- Health risks
- Environmental compatibility
- Material safety data sheets

Observe the following when handling operating supplies and aids:

- Store operating supplies and aids in suitable and correctly labeled containers.
- Seek medical help in case of injuries due to hot, cold or caustic operating supplies or aids.

Observe the following to protect the environment:

- Collect leaking operating supplies and aids in sufficiently large containers.
- Observe disposal regulations.
- Observe material safety data sheets.

2.3 Product-specific safety instructions

Handling

The ZF product contains primary lithium thionyl chloride batteries. If used improperly or damaged, the batteries may become dangerous.

Please observe the following safety instructions:

- **Please note the intended use.**
Incorrect use may result in liquid leaking from the batteries. Liquid leaking from the batteries may cause skin irritation or burns. Avoid skin and eye contact. If you come into contact with leaking liquid accidentally, rinse it off with water and seek medical help.
- **Avoid damage.**
Damaged ZF products may develop unpredictable properties that may cause fire, explosions or injuries. Observe the following:
 - Replace damaged products as soon as possible.
 - In case of damage, stop using the damaged product immediately (*refer to Section Decommissioning*).
- **Do not throw the product into the fire or subject it to intense heat.**
If batteries are thrown into the fire or subjected to temperatures above 130°C, the resulting heat may cause an explosion and/or a fire and injuries.
- **Do not immerse the product in liquids.**
The ZF product is sufficiently protected from water for safe operation. Immersing the ZF product in liquids will cause a defect.
- **Do not recharge or short circuit the batteries.**
An attempt to charge or short circuit the batteries may cause a fire.
- **Do not open the ZF product or the batteries.**
Opening or modifying the ZF product or the batteries will damage the safety devices. This may cause heat or smoke to develop or cause the product or batteries to ignite or explode.
- **Do not dispose of the ZF product in household or residual waste.**
- **Store the ZF product outside the reach of children.**

In case of fire

If lithium thionyl chloride batteries catch fire, the resulting fire can be fought with water. It is not necessary to use special fire extinguishing media for lithium thionyl chloride batteries.



Use conventional fire extinguishing media to fight surrounding fires of lithium thionyl chloride batteries.

If a battery catches fire, this fire cannot be considered separately from the surrounding fire. The cooling effect of water keeps the fire from spreading to the battery cells that have not yet reached the critical ignition temperature (thermal runaway).



Reduce the fire load by separating larger quantities and by removing them from the danger area.

A fire may result in the development of gases that, if inhaled, can cause health damage. Observe the following:

- Ensure sufficient respiratory protection.

- The firefighters may find instructions on what to bear in mind in the case of fire useful.
- If large quantities of smoke or gas develop or are emitted, leave the affected area immediately.
- Seek medical help in case of smoke and/or gas inhalation or respiratory tract irritation.
- Ensure sufficient ventilation.

2.3.1 Screw connection

The torque wrenches must be calibrated to DIN EN ISO 6789.

3 Description

3.1 Brief product description



Fig. 1 Heavy Duty TAG

- The Heavy Duty TAG is a battery-powered wireless sensor.
- The sensor measures the acceleration and the temperature of parts in the bogie.
- The measured data is transmitted to the gateway inside the vehicle via radio technology.
- The data, e.g. position information, is evaluated in the gateway and then transmitted to the internet.
- ZF automatically and centrally evaluates the data in the cloud.
- The vehicle status and corresponding recommendations for action for the vehicle operator are indicated via a web portal.

Field of Application

The sensor is designed and intended for use in rail vehicles in Europe. Other applications or fields of application are not intended and no claims for suitability or technical conformity for such applications or fields of application are made.

Use

The sensor may be operated in a frequency range from 2,402 MHz to 2,480 MHz.

Function

The sensor and the overall system will only function in combination with further ZF Friedrichshafen AG components. For more information, please talk to your ZF contact or visit www.zf.com/hd-tag.

4 Technical Data

4.1 Data sheet

Please request the technical data sheet from ZF or download it at www.zf.com/hd-tag-data.

Requirement	Description	Comment
Trade name	Heavy Duty TAG	—
Type of equipment	wireless sensor	for rail vehicles
Material number	0501.339.922	—
Weight	0.39 kg	
Radio technology	2.4 GHz, Bluetooth 4.2 Low Energy	—
Frequency band	2,402 MHz to 2,480 MHz	—
Transmitting power	+5 dBm	—
IP protection class	IP65	in accordance with IEC 60529
Temperature range	-40°C to +85°C	—
Vibration resistance and shock resistance	DIN EN 61373, category 3	—
Batteries	3 x lithium thionyl chloride batteries	Non-replaceable
CE conformity	www.zf.com/hd-tag-ce	—

Tab. 1 Datenblatt Sensor

Warranty

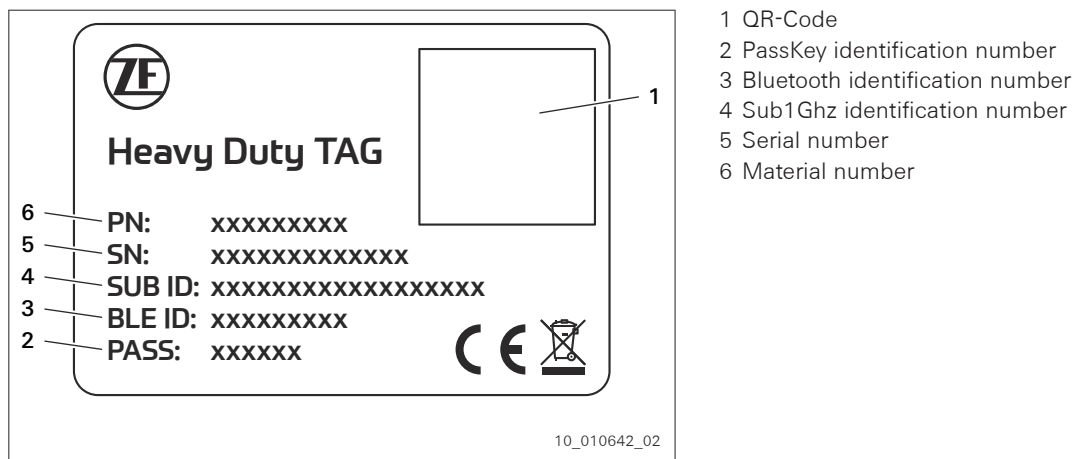
The sensor comes with a 1-year warranty. During the warranty period, any defects that can be proven to result from material defects or manufacturing defects will be remedied by replacing or reworking the defective parts. ZF reserves the right to decide on how to remedy the defects.

4.2 Type plate

Position of type plate

The type plate is located on the side of the housing.

4.2.1 Radio sensor type plate



- 1 QR-Code
- 2 PassKey identification number
- 3 Bluetooth identification number
- 4 Sub1Ghz identification number
- 5 Serial number
- 6 Material number

Fig. 2 Type plate

5 Transport and Storage

5.1 Transport

Commercial transport of lithium thionyl chloride batteries is subject to the dangerous goods laws.

Preparation for transport and transport may only be carried out by trained persons and the process must be monitored by qualified experts or companies.

5.1.1 General transport instructions

Lithium thionyl chloride batteries are subject to the following dangerous goods regulations and exemptions from these regulations, as amended.

- Category 9
- UN 3480: Lithium-ion batteries
- UN 3481: Safety information for lithium-ion batteries contained in equipment
 - Lithium-ion batteries contained in equipment** (inserted into the battery-powered product)
 - Lithium-ion batteries packed with equipment** (packed together with the battery-powered product)

ADR, RID ^{1) 2)}

- Special provisions: 188, 230, 310, 376, 377, 636
- Packing instructions: P903, P908, P909, LP903, LP904 tunnel category E

IMDG Code ³⁾

- Special provisions: 188, 230, 310, 348, 360, 376, 377
- Packing instructions: P903, P908, P909, LP903, LP904
- EmS: F-A, S-I
- Stowage category A

ICAO, IATA-DGR ^{4) 5) 6)}

- Special provisions: A88, A99, A154, A164, A181, A182, A183, A185, A201
- Packing instructions: 965, 966, 967

All modes of transport

- The 38.3 test series (UN test) was passed. Test certificates or manufacturer confirmations are available.⁷⁾
- Defective or damaged batteries are subject to more stringent provisions that may result in a complete transport ban. A general transport ban applies to air transport (IATA special provision A154).

1) ADR: Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

2) RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations concerning the International Carriage of Dangerous Goods by Rail)

3) IMDG: International Maritime Code for Dangerous Goods

4) ICAO: International Civil Aviation Organization

5) IATA: International Air Transport Association

6) DGR: Dangerous Goods Regulations

7) UN: United Nations

- Please also observe the applicable special provisions for the transport of used but undamaged batteries.
- Waste batteries and batteries being shipped for recycling or disposal are prohibited from air transport (IATA special provision A183).
- Exemptions must be approved in advance by the appropriate national authority of the state of origin of the batteries and the state of the operator (airline).

5.2 Storage

The ZF product may not be stored under conditions that do not correspond to the specified technical data (*refer to Chapter Technical Data*).

Observe the following:

- Avoid high temperatures.
- Store the product at room temperature (approx. 20°C).
- Store the product in a vibration-free space.
- Store the product in a dry place.


6 Decommissioning

6.1 Decommissioning

Superficial changes such as scratches and spalling are signs of use and are not regarded as damage.

Larger dents or deformation (of more than 3 mm) that can be expected to have affected internal components are regarded as damage. A breakage or hole through which the insides of the ZF product can be seen is regarded as a relevant damage.


A damaged ZF product represents an increased hazard potential. In case damage to the ZF product is detected, the product concerned may no longer be used and must be disposed of properly. This also applies to ZF products that are still functional.

 In case the ZF product is damaged, please inform ZF Customer Service.

If damaged, the batteries inside the ZF product may develop intense heat or cause a fire. In case of damage, the product may also release hazardous gases or leak hazardous liquids.

When handling a damaged ZF product, wear suitable protective equipment, handle the ZF product carefully and observe the following:

- Wear protective gloves to avoid direct skin contact.
- In the event of contact with skin or eyes, rinse thoroughly with water.
- In case of injuries or contact with the inside of the batteries, seek medical help.
- Store and transport damaged ZF products individually in fire-proof containers.

 Minimum protective equipment required: protective clothing, protective gloves and respirator.

6.2 Disposal

6.2.1 Product-related notes on disposal

NOTICE

Inappropriate disposal may cause environmental damage.

- ⇒ Please dispose of the ZF product, parts, operating supplies and auxiliary materials in accordance with the applicable regional, national and international regulations of the respective operating country.
- ⇒ Please use an authorized disposal specialist to dispose of the ZF product, parts, operating supplies and auxiliary materials.

According to European Directive 2002/96/EC, all electrical and electronic equipment must be disposed of via local collection facilities.

ZF recommends using fire-proof containers for transporting the ZF product to disposal centers for proper disposal (*refer to Section Transport*).

Bags or containers intended for this purpose, for example, can be used for transporting and storing lithium thionyl chloride batteries. The batteries may only be removed for disposal by trained specialized staff.

The ZF product may only be opened for disposal by trained specialized staff.

Once opened, the ZF product may not be started-up again. Once the product has been opened, the housing is no longer properly sealed (*refer to Section Product-specific safety instructions*).

For the WEEE register number, please refer to www.zf.com/hd-tag-weee. ⁸⁾

8) WEEE: Waste Electrical and Electronic Equipment

7 Installation

7.1 Preparatory activities

The sensor may only be installed by trained qualified staff and in accordance with the provisions and specifications provided by the vehicle manufacturer or operator.

Installation location

When installing the sensor, make sure that the installation location is protected from damage such as stone chipping or other mechanical impacts. Avoid surrounding the sensor with metal in the form of a Faraday cage as this may impair the function of the sensor.



The installation position of the sensor can be selected freely.

Damping

The sensor must be installed on the component that is to be monitored. Keep the mechanical damping effect between the component to be monitored and the sensor as low as possible.



Do not install any rubber elements or similar between the component and the sensor.

Fastening

Brackets or parts to which the sensor is fastened must not show any resonance vibrations in the relevant frequency range (e.g. no protruding brackets).

Fire protection

Observe the fire protection requirements as defined in DIN EN 45545-2. When selecting the installation location, make sure that you install the sensor at a distance from other components that are not in conformity with table 2 of the DIN EN 45545-2 standard.

- Horizontal minimum distance: 20 mm
- Vertical minimum distance: 200 mm

7.2 Installing the sensor

Install the sensor with four M6x45 hexagon screws (material number: 0636.104.852).

Requirements:

- Make sure that the screw-in depth is at least 15 mm.
- Only use the hexagon screws supplied with the sensor once.

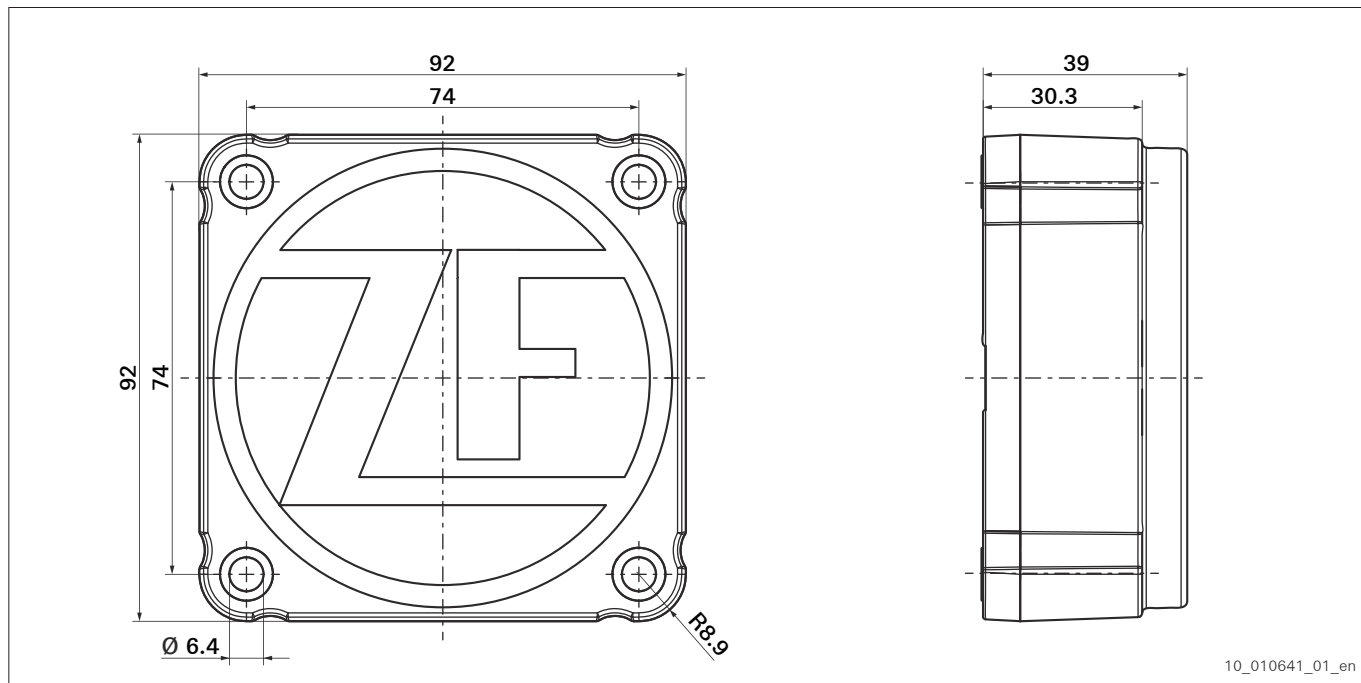



Fig. 3 Sensor

1. Clean the contact surfaces on the vehicle.
2. Remove grease or other residues from the thread holes.
3. Check the sensor for damage and install the sensor.
4. 
 - Applying threadlockers, such as Loctite, or installing additional thread locking elements is not permitted.
 - The screws supplied with the sensor are micro-encapsulated and are therefore already sufficiently secured. The micro-encapsulated threadlocker is activated when the screw is screwed into the thread.

Screw in four hexagon screws and tighten them completely.
Tightening torque: **9 Nm ($\pm 10\%$)**

-  When replacing the sensor, use new hexagon screws.

8 Maintenance

8.1 Checking the sensor

The sensor is maintenance-free.



- In case of potential, exposed installation positions, for example positions close to the track ballast, the sensor must be checked for damage regularly.
- Condition evaluation: *(refer to Section Product-specific safety instructions), (refer to Section Decommissioning)*
- Also check the condition of the add-on components and the joining elements (e.g. screw connections).
- Replace defective parts immediately.

9 Annex

9.1 Overview of revisions

Index	Date of issue	Initiator
a	2021-11	IBRD1 Dept.

Tab. 2 Edition

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