

# **"High Speed Train Maintenance Profession Defined and Recognized" (High-Speed MAPDaR)**

Qualification employee maintenance in the  
field of high-speed trains in Germany

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## 1. Introduction

This document provides an overview of the qualification of maintenance staff for high-speed trains in Germany. The document does not claim to be complete. As part of the **High Speed Train Maintenance Profession Defined and Recognized (High-Speed MAPDaR)** project for the TCDD, the document is intended to help to gain an understanding of training in Germany.

The document describes the qualification for regularly periodic maintenance, troubleshooting and repair. Training for heavy maintenance /revision is not considered due to other requirements.

## 2. General

An employee of the maintenance of high-speed trains in Germany may not carry out any activity on the trains independently without a corresponding qualification.

Until the qualification is completed and completed, the employee may only be employed as a helper under the supervision of a qualified employee.

This applies without exception to all high-speed train activities. From cleaning to regular maintenance to replacement of components.

## 3. Rules

There is a comprehensive set of rules / standards for the qualification of employees in the maintenance of high-speed trains in Germany.

This set of rules lists all the basics for the qualification of maintenance workers.

The rulebook specifies the knowledge that employees must have for the appropriate qualification.

Furthermore, the goals, contents and duration of each qualification are included.

The rules also contain the requirements for the trainers.

The detailed training plan is included in the annex to the rulebook.

## 4. Basic qualification of maintenance staff

Maintenance staff for high-speed trains usually have qualifications/training in the following areas:

- Electrician
- Electronics
- Industrial mechanics
- Mechatronics engineers
- Engine mechanics

This training can be provided internally with the operator of the high-speed trains or at an external training centre. These types of basic training in Germany are generally standardised and differ only in individual sections depending on the later use of the employees.

As a result, employees who have received training in external companies are also recruited to work as maintenance workers for high-speed trains.



## 5. Qualification for recruitment as maintainer for high-speed trains

Initial training is organized for newly recruited staff who have the training referred to in point 4.

This initial training includes:

- Occupational safety
- Organisation of the company
- Processes in the company and responsibilities
- Basics of railway technology
- Basics of rail vehicles
- Basics of maintenance of rail vehicles

## 6. Qualification for maintenance activities

The qualification of the employees for the maintenance of the high-speed trains is carried out separately according to pre-qualification and future tasks of the employees. This means that not all employees have to go through all qualification measures.

### 6.1 Qualifications according to legal requirements

For some of the qualification measures, special legal requirements must be observed. On the basis of these requirements, employees have to complete qualifications that are independent of the vehicle type and, in some cases, independent of the railway sector. Qualifications are standardised independently of the railway sector. These include the following qualifications:

- Training as a refrigeration technician as a pre-qualification for air conditioning activities
- Training welding technology - depending on the metals used in vehicle construction.
- Adhesive specialist as a pre-qualification for adhesive processing on the vehicle
- Expert for the regularly recurring testing of compressed air tanks / reservoirs

### 6.2 Qualifications for series-independent components and functions

For some components/functions on the railway vehicles, qualifications are carried out independently of a special series.

These include, but are not more than one, the following qualifications:

- Basics of vehicle brake systems
- Brake test
- Train radios (GSM-R)
- ATP Systems
  - PZB
  - LZB
  - ETCS

### 6.3 Vehicle-specific qualification

The vehicle-specific qualification usually takes place in one of the depots for high-speed trains. Depending on the previous knowledge of the employees, the duration of the qualification varies. For example, if an employee is trained on a series for a specific activity (e.g. braking equipment), then only the delta is trained for the next series. If an employee does not yet have any knowledge of the system or component, the entire system is trained in a longer qualification.



### 6.3.1 Qualifications for mechanics

The following qualifications are carried out for the mechanics among the maintenance staff:

#### Rail vehicle inspector

The inspector is a qualification that entitles the employee to carry out visual inspections on all assemblies of the train. These visual inspections take place every time the train is sent to the workshop. During this qualification, the employee receives a detailed overview of all components and basic functions of the train. A major part of the qualification includes the bogies of the train.

#### Rail vehicle- mechanics

This qualification entitles the employee to carry out all activities on mechanical components of the train. These include, but are not more than one:

- Couplings
- Bug nose including flaps
- Gangway
- Measuring the car bodies
- Roof equipment (including high-voltage components, especially pantographs) that mechanics are allowed to carry out activities on the pantograph as it is assessed as a mechanical component.

#### Brake equipment (pneumatic and mechanical)

In this qualification, the employee is given the necessary knowledge about the pneumatic equipment and the functions of the brakes. He shall then be able to carry out the maintenance activities on the braking equipment.

#### Rail vehicle mechanic interior design

With this qualification, the employee can carry out all activities in the interior of the trains. These include:

- Seats
- Tables
- Holding rails
- Interior panels
- Cabinets
- Interior doors

#### Rail Vehicle Mechanic Galley

The aim of this training is the components of the Galley. For activities at the Galley refrigeration system, a separate qualification as a refrigeration technician is required.

#### Rail vehicle mechanic air conditioning

Regular maintenance of the air conditioning system is the focus of this qualification. For activities at the refrigeration system of the air conditioning system, a separate qualification as a refrigeration technician is necessary (point 6.1)



### Rail Vehicle Mechanic Doors

The focus of this qualification is the function and components of the external doors.

#### 6.3.2 Qualifications for electricians

For the electricians among the maintenance staff, the following qualifications are carried out:

#### Rail vehicle electrician traction system

As part of the qualification for the traction equipment of the train, the following components are trained:

- Pantographs and roof equipment
- Transformer
- Traction converter
- Traction motors

#### Rail vehicle electrician auxiliary supply

The qualification for the on-board network components includes the following contents:

- Auxiliary converter unit
- Battery charger
- Batteries
- On-board supply distribution

#### Train control network (TCN)

During the qualification for the train control network, the components and functions of vehicle control technology and vehicle control components are trained. In addition, the training includes the functions of all safety loops of the train.

#### Software Loading

This training includes all the points to perform software updates on the entire train. In addition, the update of the software after the exchange of individual controls of the train.

#### Brake control

This training is made for the electrical parts of the brake equipment. During this qualification, the following contents will be trained:

- Brake equipment of the train
- Brake control units
- Electrical functions of the brake
- Magnetic rail brake
- Eddy current brake

#### Passenger information system

This qualification entitles the employee to carry out all activities on the components of the passenger information system of the train.



### 6.3.3 Cross-functional qualifications

These trainings are carried out for both mechanics and electricians.

#### Switching the train

In this qualification, the startup and shut down of the train is trained. In addition, all the activities necessary to prepare the train for a train operation. These include:

- Brake tests
- Train control systems
- Switching of secondary functions such as air conditioners, lighting, doors

#### Earthing of the train

In this qualification, the safe grounding of the train is trained as a pre-service for activities on components of the electrical equipment.

### 6.4 Examination

All qualifications are completed with a written examination. The rate for passing the written exam is 65 percent of the possible total score.

A practical test is also carried out for safety-relevant functions and components. The rate for passing the practical exam is 65 percent of the possible total score. In addition, no safety-relevant error must occur during the practical test. Safety-relevant features include:

- Brake equipment
- Exterior doors
- Chassis
- Inspections

### 6.5 Obtaining and loss of qualification

As a rule, the maintenance employee must work on the corresponding components within one year of the qualification. If the employee are not worked on the components within one year, the qualification will be forfeited. This means that the qualification must be repeated if necessary.

Annual instruction/follow-up training is provided for safety-relevant functions or components. This applies in particular to the issues:

- Brake equipment
- Exterior doors
- Bogie equipment
- Train radio
- ATP equipment