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**TB**

**RAILWAY INDUSTRY STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**TB/T 3475.8-2020**

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**Components of diesel engine for locomotive and DMU - Part 8:  
Turbocharger  
(English Translation)**

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## Table of Contents

|                                                                |    |
|----------------------------------------------------------------|----|
| Foreword...                                                    | 3  |
| 1 Scope...                                                     | 5  |
| 2 Normative references...                                      | 5  |
| 3 Terms and definitions...                                     | 6  |
| 4 Technical requirements...                                    | 7  |
| 5 Inspection methods...                                        | 9  |
| 6 Inspection rules...                                          | 13 |
| 7 Marking, packaging, transport, storage...                    | 16 |
| Appendix A (Normative) Determination method of cleanliness...  | 18 |
| Appendix B (Normative) Performance test of turbocharger...     | 22 |
| Appendix C (Normative) 100-h test condition of turbocharger... | 30 |

### 1 Scope

This Part of TB/T 3475 specifies the terms and definitions, technical requirements, inspection methods, inspection rules, marking, packaging, transport, storage of the axial-flow turbocharger, which is used in the diesel engine for locomotive and DMU (hereinafter referred to as turbocharger).

This Part applies to turbochargers, which is used in the diesel engine for locomotive and DMU.

### 2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document;

for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 191 Packaging - Pictorial marking for handling of goods (GB/T 191-2008,

ISO 780: 1997, MOD)

GB 253-2008 Kerosene

GB/T 1786 Forging tortillas ultrasonic testing method

GB/T 4118-2008 Trichloromethane for industrial use

GB/T 6402-2008 Steel forgings - Method for ultrasonic testing

GB/T 6519 Ultrasonic inspection of wrought aluminium and magnesium alloy products

GB/T 13306 Plate

GB/T 21563-2018 Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373:2010, MOD)

HB/Z 60 Radiographic inspection

HB/Z 61 Penetrant inspection

The speed of turbocharger, which is greater than or equal to 110% of the rated speed,  
AND at which the turbocharger can safely run continuously for more than 24 hours.

### 3.7

Maximum gas inlet temperature

The maximum temperature, at which the turbine can work safely for a long time.

## 4.1 Requirements for working environment

### 4.1.1

The diesel engine power, which is matched by the turbocharger, under the following environmental conditions, does not need to be corrected:

- a) The altitude is not higher than 1500 m;
- b) Atmospheric ambient temperature: -40 °C ~ +40 °C.

### 4.1.2

When the turbocharger is used in an area above 1500 m above sea level OR the atmospheric temperature is greater than +40 °C, the influence of atmospheric pressure and ambient temperature in the area shall be considered.

### 4.1.3

When it exceeds the scope specified in 4.1.1 and 4.1.2, it shall be determined, through negotiation between the supplier and the buyer.

### 4.1.4

The maximum intake vacuum of the turbocharger shall be less than or equal to 4 kPa; the maximum exhaust back pressure of the turbocharger shall be less than or equal to 3 kPa (except for those with exhaust gas aftertreatment system).

## **4.2 Basic requirements**

### **4.2.1**

The turbocharger shall be manufactured, in accordance with the product drawings and technical documents, which are approved by the prescribed procedures. It shall comply with the provisions of this Part.

### **4.2.2**

The main parts of the turbocharger (main shaft, turbine disc, turbine blade, integral casting turbine, wind guide wheel, compressor impeller) shall be subject to non-destructive testing; the results shall comply with the provisions of the technical documents.

### **4.2.3**

The shell, which is equipped with cooling water cavity, shall not leak; repair is not allowed.

### **4.2.4**

The outlet area or code of the nozzle ring of the turbocharger, AND the area or code of the inlet throat of the diffuser shall comply with the provisions of the relevant technical documents. Such information shall be engraved in the designated position

AND recorded in the exit-factory documents.

### **4.2.5**

The assembly clearance of the turbocharger and its main components shall comply with the provisions of the product drawings or technical documents.

### **4.2.6**

After the initial operation test of the turbocharger, there shall be no abnormality.

### **4.3.1 After carrying out the vacuum prestressing overspeed test at room temperature for**

the center perforated compressor impeller and turbine disc, the deformation of the inner hole shall meet the requirements of the technical documents.

4.3.2 The cleanliness of the turbocharger is the total weight of impurities, which are contained in the lubricating oil passages in and out of each turbocharger AND the surfaces of the parts in contact with the lubricating oil; the cleanliness limit is 400 mg/set.

### **4.3.3 The dynamic balance accuracy of the guide wheel, compressor impeller, bladed**

shaft, rotor assembly of the turbocharger shall comply with the provisions of the product drawing.

4.3.4 The oil inlet temperature of the turbocharger is related to the quality of the oil used by the diesel engine. It shall be adapted to the requirements of the matching diesel engine.

4.3.5 Performance requirements of the turbocharger's calibration operating point:

a) When the rotational speed is less than 20000 r/min, the rotational speed deviation shall be controlled within the range of  $\pm 100$  r/min. When the rotational speed is greater than or equal to 20000 r/min, the rotational speed deviation shall be controlled within the range of  $\pm 0.5\%$  of the specified value.

b) The pressure ratio deviation shall be controlled within the range of  $\pm 1.5\%$  of the specified value.

c) The air flow deviation shall be controlled within  $\pm 2\%$  of the specified value.

d) The total efficiency of the turbocharger shall be greater than or equal to the specified value; the specified value shall not be lower than 58%.

4.3.6 After the turbocharger is tested at the highest speed, there shall be no damage to parts or appearance deformation; there shall be no looseness, air leakage, oil leakage or water leakage at the connection.

4.3.7 When the turbocharger is running under the calibration condition, the ratio -- of the calibration flow TO the air flow value at the surge point at the equal pressure ratio

5.1.5 Ultrasonic inspection of turbine disc blanks shall be carried out, in accordance with GB/T 1786.

#### **5.1.6 The X-ray inspection of turbine blade blanks and integrally cast turbine blanks**

shall be performed, according to HB/Z 60.

### **5.2 Vacuum prestressing overspeed test at room temperature**

The compressor impeller and turbine disc, which have central perforation, shall be subjected to the vacuum prestressing overspeed test at room temperature. The overspeed speed shall be greater than or equal to 110% of the maximum speed; the test time shall not be less than 3 minutes.

### **5.3 Cleanliness inspection**

Carry out cleanliness inspection, according to Appendix A.

### **5.4 Rotor dynamic balance inspection**

Carry out the rotor dynamic balance inspection, according to the provisions of Chapter