

TB

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

TB/T 2235-2016

**Rolling bearing in the railway passenger car and wagon
(English Translation)**

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1 Scope

This Standard specifies the type size and geometric tolerance, technical requirements, test methods, inspection rules, package, marking and quality certificate and etc. of solid rolled steel wheel (hereinafter refers to wheel) for quasi rail vehicle.

This Standard is applicable to the manufacturing, ordering, and testing of solid rolled steel wheel for rolling stock with passenger train speed $\leq 160\text{km/h}$, and freight train speed $\leq 120\text{km/h}$.

2 Normative References

The following normative documents contain provisions which, through reference in this Standard, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All the standards will be revised and all parties who reach an agreement according to this Standard are encouraged to study whether the latest editions of the following standards are applicable.

GB 222-84 Method of Sampling Steel for Determination of Chemical Composition and Permissible Variations for Product Analysis

GB 223 Methods for Chemical Analysis of Iron, Steel and Alloy

GB 226-91 Test Method for Macrostructure and Defect of Steel by Etching

GB 228-87 Method of Tensile Tests for Metal

GB/T 229-1994 Metallic Materials-Charpy Notch (U-Shaped Notch) Impact Test

GB 231-84 Test Method for Brinell Hardness of Metal

GB 8601-88 Solid Rolled Steel Wheel for Railway

GB 10561-89 Microscopic Testing Method for the Non - Metallic Inclusions in Steel

TB 1967-87 Wheel Profile for Locomotive and Car

ZBY 230-84 Commonly Used Specification for A-Mode Ultrasonic Flaw Detector

4.1.3 Allowable tolerances (%) of chemical composition analysis and melting

analysis of finished wheel are shown as follows.

C. -0.02 or +0.03 P. +0.005

Si. -0.02 or +0.03 S. +0.005

Mn. -0.04 or +0.05

4.2.1 Steel making

Wheel steel shall be manufactured by excellent-quality killed steel molten in electric furnace, open hearth, or revolving furnace; if it is agreed by the buyer and seller, other melting method can also be adopted, and go through the refining treatment outside of the furnace, the hydrogen content in the molten steel is $\leq 3.5\text{ppm}$. Steel ingots must be casted from the bottom. After stripping, the steel ingots must conduct fully slow-cooling in the slow-cooling pit. When it undertakes vacuum degassing treatment, it can realize stack-cooling directly.

4.2.2 Wheel thermoforming

Wheel shall be manufactured by the steel ingots with head-cutting, and the head-cutting amount shall be sufficient to eliminate the harmful part that may influence the wheel quality on two sides of the steel ingots, all surfaces of the steel ingots must not have any defects that may influence the rolling quality.

During the thermoforming heating period, the over-burning and over-heating of wheel steel billet shall be avoided, thermoforming heating temperature shall not exceed

After the thermoforming of wheel manufactured by steel that doesn't carry out vacuum degassing treatment, measures to eliminate white spots must be taken, such as isothermal, slow cooling, and etc..

4.2.3 Wheel's identification marking during the manufacturing process

All steel ingots, steel billets, cutting bars, and wheels must be marked clearly on each process, so that each wheel can be identified before delivery. If such mark is different from

the final mark of the finished wheel, then such mark shall be as shallow as possible, even leaves no trace on the finished wheel.

4.2.4 Wheel heat treatment

Wheel rim shall be carried out quenched and tempered treatment, water shall be prevented to enter into the spoke during the quenching period.

No more than Grade-2 general looseness, center looseness, segregation, and non-metallic inclusion are allowed to exist.

4.5 Non-metallic inclusion

In the three specimens of rim, the grade of each inclusion shall conform to the following requirements. Class B (alumina inclusion) shall be no more than Grade 1; Class A (sulphide inclusion), Class C (silicate inclusion), and Class D (globular oxide) shall be no more than Grade 3 respectively.

4.6 Ultrasonic flaw detection

All wheels, after the heat treatment and mechanical machining, shall be carried out ultrasonic flaw detection one by one.

To detect the internal discontinuity of all wheels' rims, adopt the following specified equipment to conduct ultrasonic flaw detection as per the following procedures.

4.6.1

Flaw detection equipment shall conform to the provisions of ZB Y 230-84, and its frequency band shall meet the requirements of flaw detection method.

4.6.2

Probe operating frequency. 2.25~5MHz.

4.6.3

Probe structure and dimension shall be applicable to all testing methods.

4.6.4

Ultrasonic flaw detector shall be equipped with defect automatic alarm system.

4.6.5

Proper couplant shall be used between the testing surface and the probe, however, the impermissible corrosion shall not be generated on the rim. The same couplant shall be used for the adjusting instrument, calibrating instrument, and in the testing period.

4.6.6

One wheel or one segment of rim, which has artificial simulation defect shall be used as comparison test block to calibrate the instrument. Instrument sensitivity shall be adjusted to make the artificial defects specified in Clause 4.6.7, Clause 4.6.8, and

Clause 4.6.9 generate 1/2 full magnitude of the reflected echo.

4.6.7

During the axial test period, the artificial defect shall be placed at half thickness of rim, the diameter perpendicular to rim side face is about 3.2mm, and the depth of flat-bottom hole is about 25~38mm (see Figure 2).

formal table for future checking.

4.7.3 Lighting illumination shall be checked once a week, the test results shall be recorded in the specified table for future checking.

4.7.4 During magnetic particle testing period, the test surface of wheel shall be maintained clean.

4.7.5 Wheel's test surface shall, under the condition of fully covering the detection medium, adopt continuous magnetizing method to detect the discontinuous defect on any axis.

4.7.6 Such checking shall be performed after the final mechanical machining.

4.7.7 Discontinuous defect detected by magnetic particle testing shall be eliminated through mechanical machining or grinding methods, the dimension of wheel through trimming shall meet the minimum dimension requirements specified in the drawing, if the wheel is evaluated to be qualified through the repeat magnetic particle testing, it can be regarded as the qualified product, otherwise it shall be rejected.

4.8 Residual stress

Sample one wheel from each batch, apply the cutting method to test the residual stress, after cutting the reduction value of the distance between two marks shall be less than

1mm, see Clause 5.5 for the test method.

4.9 Shot peening strengthening

Each wheel's spoke shall be carried out shot peening strengthening treatment, in order to ensure the effect of shot peening strengthening, it shall be carried out after the wheel's ultrasonic testing, magnetic particle testing, and mechanical machining.

Process requirements of shot peening strengthening.

Steel shot applied in shot peening shall conform to the technical requirement of cast steel shot specified in...