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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 20887.6-2017

**Continuously hot-rolled high strength steel sheet and strip for
automobiles - Part 6: Complex phase steel**

汽车用高强度热连轧钢板及钢带 第6部分：复相钢

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1 Scope

China's national standard for hot-rolled complex phase steel sheet for automotive use. It is Part 6 of GB/T 20887 and specifies the classification and designation, the order content, the dimensions, shape and weight, the technical requirements, the test methods, the inspection rules, and the packaging, marking and quality certificate of hot-rolled high strength complex phase steel sheet and strip. Complex phase steel in hot-rolled form goes to the parts that carry load and take a beating: chassis arms, subframes, torsion beams, bumper reinforcements and wheel discs. What distinguishes it from the dual phase steel of the same tensile strength is its yield strength, which is far higher, and its edge behaviour, which is far better. Both matter in a hot-rolled part for the same reason: these parts are made by roll forming, bending and stretch flanging from thicker material, and they carry punched holes. A steel with a low yield ratio deforms early and springs back unpredictably, and a steel with poor hole expansion splits at the edge of a punched hole when that edge is flanged - the characteristic and expensive failure of high strength chassis parts. Complex phase steel avoids both because its microstructure is fine ferrite and bainite with only small amounts of martensite and retained austenite, strengthened by precipitation and grain refinement, so it is uniformly hard rather than being a soft matrix with hard islands. It also gives high energy absorption in a crash, since it resists from the first millimetre of deformation. The standard sets the strength grades and the mechanical requirements, including hole expansion, together with the composition, the tolerances and the surface

classes. Issued on 7 September 2017 and in force since 1 June 2018.

This Part of GB/T 20887 specifies the classification and designation representing method, ordering content, dimensions, shape, weight, technical requirements, test methods, inspection rules, package, mark, and quality certificate of hot rolled high strength complex phase steel sheet and strip. This Part applies to the steel strip with a thickness of no more than 8 mm and steel plate cut transversely from steel strip and longitudinally-cut steel strip (hereafter known as "steel plate and strip" for short) for the production of automobile structural parts and reinforcements.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the versions with the dates indicated are applicable to this document. For the undated references, the latest version (including all the amendments) are applicable to this document.

GB/T 222 Permissible Tolerances for Chemical Composition of Steel Products

GB/T 223.5 Steel and Iron - Determination of Acid-Soluble Silicon and Total Silicon Content - Reduced Molybdosilicate Spectrophotometric Method

GB/T 223.9 Iron Steel and Alloy - Determination of Aluminum Content - Chrome Azurol S Photometric Method

GB/T 223.11 Iron, Steel and Alloy - Determination of Chromium Content - Visual Titration or Potentiometric Titration Method

GB/T 223.17 Methods for Chemical Analysis of Iron Steel and Alloy - The Diantipyrylmethane Photometric Method for the Determination of Titanium Content

GB/T 223.26 Iron, Steel and Alloy - Determination of Molybdenum Content - The Thiocyanate Spectrophotometric Method

GB/T 223.40 Iron, Steel and Alloy - Determination of Niobium Content by the Sulphochlorophenol S Spectrophotometric Method

GB/T 223.58 Methods for chemical analysis of iron, steel and alloy - The sodium arsenite-sodium nitrite titrimetric method for the determination of manganese content

GB/T 223.59 Iron, steel and alloy - Determination of phosphorus content - Bismuth phosphomolybdate blue spectrophotometric method and antimony phosphomolybdate blue spectrophotometric method

GB/T 223.60 Methods for chemical analysis of iron, steel and alloy - The perchloric acid dehydration gravimetric method for the determination of silicon content

GB/T 223.68 Methods for chemical analysis of iron, steel and alloy - The potassium iodate

titration method after combustion in the pipe furnace for the determination of sulfur content

GB/T 223.69 Iron, steel and alloy - Determination of carbon contents - Gas- volumetric method after combustion in the pipe furnace

GB/T 223.75 Iron, steel and alloy - Determination of boron content - Methanol distillation-curcumin photometric method

3 Terms and definitions

The following terms and definitions are applicable to this document.

3.1 Complex phase steel; CP The microstructure of the steel is a small amount of martensite, retained austenite, or pearlite distributed on the ferrite or bainite matrix. Fine-grain strengthening or precipitation strengthening by microalloying elements. Compared with dual phase steels with the same tensile strength, it has higher yield strength and certain flanging hole expanding property.

4.1 Classification

4.1.1 The steel sheet and strip can be classified into hot-rolled surface and hot- rolled pickling surface as per the surface states. When the surface state is hot- rolled pickling surface, it shall be denoted by Code "P". products shall be supplied as per hot rolled surface, ordinary thickness accuracy, ordinary surface (FA), edge-cutting state, and oil-coated. For hot- rolled pickling surface, if the surface quality level and oil use are not specified, the products shall be supplied as per relative-high surface (FA) [should be. FB] and oil-coated.

6 Dimensions, shape, weight

The dimensions, shape, weight, and permissible tolerances of steel sheet and strip shall comply with the provisions of GB/T 709.

7.1 Chemical composition

7.1.1 Reference values for chemical composition (melting analysis) of steel are given in Appendix A. If the demand side has a requirement for chemical composition, it shall be negotiated when ordering. Approximate comparison between designations in domestic and foreign standards is shown in Appendix B.

7.1.2 The permissible tolerances for chemical composition of steel products shall comply with the provisions of GB/T 222.

7.2 Smelting method The steel used for steel sheet and strip is smelted using an oxygen converter or an electric furnace. Unless otherwise specified, the smelting method shall be selected by the supplier.

7.3 Delivery state

7.3.1 Steel sheet and strip are usually delivered in hot rolled state.

7.3.2 When the steel plate and strip have a hot-rolled pickling surface, they are usually supplied oiled. The oil film coated shall be able to be removed with aqueous alkali. Under normal package, transport, loading-unloading, and storage conditions, the supplier shall ensure that, within 3 months from the date of completion of manufacture, the surface of steel sheet and strip does not rust. If negotiated by both sides of the supply and demand and indicated in the contract, hot-rolled pickling surface may be supplied without oil-coated.

Note. For non-oiled products required by the demand side, there may be corrosion; and during transport, loading-unloading, storage, and use, the surface may be slightly

9 Inspection rules

9.1 The inspection and acceptance of steel sheet and strip shall be performed by the supplier's inspection department.

9.2 The steel sheet and strip shall be accepted in batches. Each batch shall consist of steel sheets and strips of the same designation, the same furnace number, the same thickness, and the same rolling mechanism with a weight of no more than 60 t. For the steel strip and continuously rolled sheet with roll weight greater than 30 t, each two rolls shall be regarded as one batch.

9.3 The sampling quantity and sampling methods for steel sheet and strip shall conform to the provisions of Table 3.

9.4 The re-inspection and judgement rules of steel sheet and strip shall conform to the provisions of GB/T 17505.

9.5 The test results of chemical composition and mechanical properties shall be rounded off according to the rounding off value comparison method. The rounding off rules shall be in accordance with the provisions of GB/T 8170.