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China automotive test cycle - Part 3: Engines

中国汽车行驶工况 第3部分：发动机

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Foreword

The test cycle is an important common basic technology in the automotive industry. It is the basis for the formulation of vehicle energy consumption and emission test methods and limit standards. It is an important technical support for the realization of the national energy conservation and emission reduction strategy and the choice of enterprise technology routes. The establishment of standards of China automotive test cycle can provide benchmarks for vehicle model development, so that the energy consumption and emission results of type approval are closer to the actual operating conditions of vehicles in China. It is conducive to the country's reasonable and effective assessment and supervision of the actual energy consumption and emissions of vehicles; is conducive to guiding the introduction, matching, and optimization of energy conservation and environmental protection technologies; to realize energy conservation and emission reduction in the true sense. GB/T 38146 aims to establish the test cycle which reflects the actual road traffic characteristics of vehicles in China. It consists of three parts: - Part 1: Light-duty vehicles; - Part 2: Heavy-duty commercial vehicles; - Part 3: Engine. The applicable objects of the cycle specified in each part are different: Part 1 is applicable to type M1, type N1, and to type M2 vehicles with a maximum design total mass not exceeding 3500 kg. Part 2 and Part 3 are respectively applicable to commercial vehicles with a maximum design total mass greater than 3500 kg and engines for commercial vehicles with a maximum design total mass greater than 3500 kg. Each part complements each other in the scope of applicable objects and constitutes China automotive test cycle standards. Engine test cycle is an important part of energy consumption and emission standards. The engine test cycle specified in this document is converted from the complete-vehicle test cycle of heavy-duty commercial vehicles developed based on actual road driving data in China. According to the analysis of China's heavy-duty commercial vehicle population and cycle characteristics, the test cycle (CHTC-HT) of trucks (GVW >5500 kg), which account for a relatively large share in China's heavy-duty commercial vehicle market and have a wider range of operation coverage, is used as a typical complete-vehicle cycle for the development of engine cycle. The issuance of this document will provide a basis for the development and

evaluation of China's heavy-duty commercial vehicles. With the continuous accumulation of industry data and experience in the future, according to industry needs, the engine cycle standards and China automotive test cycle standard systems will be further improved. China automotive test cycle - Part 3: Engine

1 Scope

Part 3 of the China Automotive Test Cycle, covering engines. It specifies the terms and definitions and the composition of the cycle. Engine cycles differ from vehicle cycles in what they are run on: the engine is tested alone on a dynamometer, following a sequence of speed and torque points rather than a road speed profile, because the vehicle it will be fitted to may not exist yet. That is how heavy-duty engines are certified worldwide - the engine is the type-approved item, and it may go into any of several vehicles. Deriving the engine cycle from the same body of Chinese driving data that produced the vehicle cycles is what keeps the two consistent, so that an engine certified on the bench behaves as expected in the vehicle. It also allows the engine's emissions control to be developed against conditions it will actually meet, which is where the discrepancies between laboratory and road figures have historically come from.

This document specifies the test cycle used in emission and fuel consumption tests for commercial vehicle engines. This document applies to engines for commercial vehicles with a maximum design total mass greater than 3500 kg.

2 Normative references

The contents of the following documents, through normative references in this text, constitute indispensable provisions of this document. Among them, for dated references, only the edition corresponding to that date applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 3730.1 Motor vehicles and trailers - Types - Terms and definitions

GB/T 3730.2 Road vehicle - Masses - Vocabulary and codes

GB/T 15089 Classification of power-driven vehicles and trailers

GB/T 17692 Measurement methods of net power for automotive engines

3 Terms and definitions

The terms and definitions defined in GB/T 3730.1, GB/T 3730.2, GB/T 15089 and GB/T 17692 and the following ones apply to this document.

3.1 Normalized speed factor Nenorm The percent formed by normalizing the actual engine speed. Its calculation formula is as follows: Where: Ne - Actual engine speed, in revolutions per minute (r/min); Neidle - Engine idle speed, in revolutions per minute (r/min); Nerate -

Rated engine speed, in revolutions per minute (r/min).

Note 1: The engine idle speed refers to the engine no-load operating state; that is, the speed when the clutch is in the engaged position, the transmission is in the neutral position, and the accelerator pedal is in the fully released position.

Note 2: The rated engine speed refers to the maximum full-load speed allowed by the governor specified by the manufacturer in its sales and service documents; or the speed corresponding to the maximum power of the engine when the governor is not installed, as specified by the manufacturer in its sales and service documents.

3.2 Percent load The maximum torque percent that can be achieved at a certain speed of the engine.

3.3 Engine test cycle The combination of time-normalized speed factor curve and time-percent load curve describing the operating characteristics of the engine.

4 Cycle composition

4.1 Overview China automotive test cycle is the general term for engine test cycle used in emission and fuel consumption tests for engines for commercial vehicles with a maximum design total mass greater than 3500 kg. It includes China engine transient test cycle and China engine steady-state test cycle. Among them, China engine transient test cycle refers to the engine test cycle specified in this document, including 1800 cycles that change from one second to another. China engine steady-state test cycle refers to the engine test cycle including 13 steady-state cycles specified in this document.