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**Test methods for durability of fuel cell engine and its key
components**

燃料电池发动机及关键部件耐久性试验方法

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Foreword

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1 Scope

This document sets out the test methods for the durability of fuel cell engines and their key components, and applies to proton exchange membrane fuel cell engines used in vehicles - covering the engine itself, the stack, the membrane electrode assembly, the air compressor and the hydrogen recirculation pump. Durability is the number on which hydrogen mobility is won or lost. A fuel cell that meets its power target and dies at 3 000 hours is not a product; the whole commercial case rests on hours of operation, and until they are measured the same way no two claims can be compared. At 22 500 words this is the longest guiding document in the catalogue, because each of those five components needs its own protocol. Issued on 28 May 2024 by SAMR and SAC, in force from the same day, under the technical jurisdiction of the Ministry of Industry and Information Technology. It is the reference for anyone specifying, procuring or benchmarking a Chinese fuel cell powertrain.

This document describes the durability test methods for fuel cell engines, fuel cell stacks, membrane electrode, air compressors, and hydrogen circulation pumps: This document applies to automotive proton exchange membrane fuel cell engines and key components:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document:

GB/T 8170 Rules for rounding off values and expression and determination of limit values

GB/T 20042:2-2023 Proton exchange membrane fuel cells Part 2: General technical requirements for cell stacks

GB/T 24548 Terminology for Fuel Cell Electric Vehicles

GB/T 24554-2022 Fuel cell engine performance test method

GB/T 36288-2018 Safety requirements for fuel cell stacks of fuel cell electric vehicles

GB/T 37244 Hydrogen fuel for proton exchange membrane fuel cell vehicles

3 Terms and definitions

The terms and definitions defined in GB/T 24548 and the following apply to this document: 3:

1 Average cell voltage $\bar{U}_{\text{cell}}$ The ratio of the voltage of a fuel cell stack to the number of cells in the fuel cell stack:

Note: If there are single cells in the fuel cell stack that do not output electrical energy, they are not included in the number of single cells: 3:

3 The fuel cell stack current corresponding to the selected power point when the fuel cell engine is subjected to a steady-state characteristic test before the durability test:

Note: PE is the rated power (initial value) of the fuel cell engine: This document selects the fuel cell engine at 100% PE, 50% PE and 10% PE corresponding to the rated power (initial value): The fuel cell stack currents I_{100} , I_{50} , and I_{10} are used as reference currents: 3:

3 In the durability test, the initial polarization curve test of the fuel cell stack corresponds to an average single cell voltage of $0.700\text{V} \pm 0.005\text{V}$: Electric current: 3:4 A device for circulating the fluid medium at the anode outlet of the fuel cell stack to the anode inlet of the fuel cell stack:

Note: It is generally composed of a single or multiple combination of hydrogen circulation pumps and ejectors: