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**Minimum allowable values of energy efficiency and
energy efficiency grades for hydrogen producing
systems by water electrolysis**

水电解制氢系统能效限定值及能效等级

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Minimum allowable values of energy efficiency and energy efficiency grades for hydrogen producing systems by water electrolysis

1 Scope

This Standard specifies the minimum allowable values of energy efficiency, evaluating values of energy conservation, energy efficiency grades, test methods, and inspection rules for hydrogen producing systems by water electrolysis (hereinafter referred to as hydrogen producing systems).

This Standard applies to fixed or mobile hydrogen producing systems. The structure of water electrolyser is bipolar, press-filtration, pressure type; the output is $\geq 5 \text{ m}^3/\text{h}$.

This Standard does not apply to atmospheric-pressure hydrogen producing equipment by water electrolysis, small-scale hydrogen producing equipment with an output $< 5 \text{ m}^3/\text{h}$, solid polymer electrolyte electrolyser (SPE), and hydrogen-oxygen generator.

2 Normative references

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

GB/T 19774 Specification of water electrolyte system for producing hydrogen

GB/T 24499 Technology glossary for gaseous hydrogen, hydrogen energy and hydrogen energy system

3 Terms and definitions

The terms and definitions defined in GB/T 24499 and the following ones apply to this document.

3.1 Specific energy consumption values for hydrogen producing systems by water electrolysis

h.

5.7 Based on the measured DC current value and the number of cells of the electrolyser, according to Appendix A, calculate the hydrogen output of hydrogen producing systems.

5.8 Based on the measured DC voltage value and the number of cells of the electrolyser, according to Appendix B, calculate the electrolyser's average cell voltage and unit DC energy consumption.

5.9 Based on the measured electric power for lye pump, make-up water pump, and the control, according to Appendix B, calculate the unit AC energy consumption of hydrogen producing systems.

The unit DC energy consumption plus the unit AC energy consumption obtains the specific energy consumption values for hydrogen producing systems.

5.10 Based on the specific energy consumption values for hydrogen producing systems, according to Appendix C, calculate the energy efficiency values for hydrogen producing systems. According to Table 1, determine the energy efficiency grades.

6 Inspection rules

6.1 The energy efficiency test of the product may be carried out at the manufacturer or the user. If the measured value of energy efficiency meets the specified requirements, it is regarded as a qualified product; otherwise it is regarded as an unqualified product. The test of batch products of the same model may be sampling inspection. If the requirements are not met, then another 2 are taken for inspection. The measured values shall meet the specified requirements. Otherwise, this batch of products is judged to be unqualified.

6.2 The test of energy efficiency grade for the product shall be carried out before the product's commissioning and acceptance. When the user and the manufacturer have objection to the test of energy efficiency grade for the product, it may be arbitrated by a third-party professional institution with relevant qualifications.

Appendix B

(Normative)

Calculation of specific energy consumption value

B.1 Calculation of specific energy consumption value W

The specific energy consumption value W consists of two parts, i.e. the DC unit energy consumption value W_d and the AC unit energy consumption value W_a .

B.2 Calculation of DC unit energy consumption value W_d

B.2.1 According to the DC voltage U of the electrolyser and the number n of electrolytic cells, according to the formula (B.1), calculate the average cell voltage E of the electrolyser.

$$E = \frac{U}{n} \quad \dots\dots\dots (B.1)$$

Where:

E - Average cell voltage, in volts (V);

U - The DC voltage of electrolyser, in volts (V);

n - Number of electrolytic cells.

Note: When the power-on mode is one positive and two negative (that is, the intermediate electrode is connected to the anode; the electrode at both ends is connected to the cathode), the number of electrolytic cells is halved.

B.2.2 The DC unit energy consumption value W_d is calculated according to formula (B.2).

$$W_d = \frac{2 \ 390 E}{1 \ 000} \quad \dots\dots\dots (B.2)$$

Where:

W_d - DC unit energy consumption value, in kilowatt hours per cubic meter (kW • h/m³);

2390 - See Appendix A;

1000 - Conversion factor.

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