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

GB/T 15911-2021

Replacing GB/T 15911-1995

**Monitoring and testing method for energy saving of industrial
electroheat devices**

工业电热设备节能监测方法

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1 Scope

GB/T 15911-2021 is the Chinese national standard on monitoring and testing method for energy saving of industrial electroheat devices, in the field of energy and heat transfer engineering. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 30 April 2021 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 November 2021. Classification: ICS 27.010, CCS F01. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This Standard specifies the monitoring content, monitoring methods and qualified indicators of the energy utilization status of industrial electroheat device. This Standard is applicable to the energy-saving monitoring of industrial electric baking furnaces (boxes), electric drying furnaces (kilns, chambers, boxes) and microwave- type electroheat device with rated power greater than or equal to 8kW and rated operating temperature less than or equal to 1500°C. This Standard is not applicable to the energy-saving monitoring of metal smelting, casting, heat treatment and other industries and mechanical forming processing systems and vacuum electroheat device.

2 Normative References

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

to this document.

GB/T 8222 The Principles for Electricity Balance of Equipment

GB/T 10066.1-2019 Test Methods for Electroheating and Electromagnetic Processing Installations - Part 1: General

GB/T 10066.4-2004 Test Methods for Electroheat Installations - Part 4: Indirect Resistances Furnaces

GB/T 15316 General Principles for Monitoring and Testing of Energy Saving

GB 17167 General Principle for Equipping and Managing of the Measuring Instrument of Energy in Organization of Energy Using

GB/T 30839.4 Energy Consumption Grading for Industrial Electroheat Installations -Part 4: Indirect Resistance Furnaces conditions.

4.3.5 Monitoring time Electroheat device for continuous production shall start monitoring when the thermal conditions reach normal working conditions; and the monitoring time shall be no less than 3h; the monitoring time of electroheat device for intermittent production shall be no less than 3 production cycles.

4.4 Determination of temperature-rise time

4.4.1 The determination of temperature-rise time shall comply with the relevant provisions of GB/T 10066.4-2004.

4.4.2 The electroheat device for continuous production (such as chains type, and tunnel type, etc.) may be exempted from the determination of temperature-rise time.

4.5 Determination of surface temperature-rise

4.5.1 The temperature measurement points on the outer surface of the electroheat device shall be separately on the outside of the furnace door, any optional 3~5 points on the insulation shell (side wall and top cover); but they shall not be located 120mm away from the furnace mouth (product entrance, heating element and thermocouple lead-out hole, vent hole, etc.) and the fastener penetrating the inner lining.

4.5.2 The measurement of ambient temperature shall comply with the provisions of 5.8 in GB/T 10066.1-2019.

4.5.3 The measurement of surface temperature-rise shall comply with the provisions of 6.17 in GB/T 10066.4-2004.

4.6 Determination of ratio of no-load power loss to rated power The measurement of ratio of no-load power loss to rated power, and the rated power shall be carried out respectively

according to

6.8 of GB/T 10066.4-2004.

5 Calculation of Monitoring for Energy Saving

5.1 Calculation of electric energy utilization The electric energy utilization rate shall be calculated according to Formula (1): Where: η - electric energy utilization rate; W_G - supply of electric energy, in kW·h; W_Y - Effective electric energy, in kW·h. The effective electric energy shall be calculated according to Formula (2): Where: m_1 - the mass of the product before processing, in kg; m_2 - the mass of the product after processing, in kg; t_1 - the temperature of the product before processing, in °C; t_2 - the maximum working temperature of product heating, in °C; c_2 - the average specific heat capacity of the product at $t_2 - t_1$, in [kJ/(kg·°C)]; c_1 - the average specific heat capacity of the volatile (evaporated) matter in the product at $t_1 - t_2$, in [kJ/(kg·°C)]; r - the latent heat of the volatile (evaporated) matter in the product during the phase change, in kJ/kg; c_1 , c_2 , r - constants, available by checking related manuals.