

ICS 27.010
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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 38449-2019

**Minimum allowable values of energy efficiency and energy
efficiency grade of regenerative rolling reheating furnace**

蓄热式轧钢加热炉能效限定值及能效等级

Issued on: December 31, 2019

Implemented on: July 1, 2020

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

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Foreword

This standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This standard was proposed by and is under the jurisdiction of the Standardization Administration of China.

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1 Scope

China's mandatory efficiency floor for the reheating furnaces that bring steel back up to rolling temperature. A rolling mill's reheating furnace is one of the largest single fuel consumers in a steelworks, and the regenerative type - which stores the heat of the flue gas in ceramic beds and gives it back to the incoming combustion air - is the design the industry moved to precisely to cut that fuel bill. This standard fixes how much energy such a furnace may spend per tonne of product, expressed in gigajoules per tonne, and grades furnaces into three classes with grade 1 the most efficient. Because the fuel needed depends on what is being heated and how hot it must come out, the grade table is broken down by product type - small and medium sections, large sections and plate coils, heavy

plate, and steel pipe - and by discharge temperature, and separate columns cover furnaces fired on blast furnace gas and on mixed gas and furnaces with single or double regenerators. Two correction factors, one for steel grade and one for temperature, bring a furnace heating alloy steel or charging hot stock back onto the same scale. The standard also sets out how output and fuel consumption are to be measured so that a claimed grade can be verified. It is used by steel plants, by furnace designers and by the auditors who check industrial energy performance.

This standard specifies the energy efficiency grades, the minimum allowable values of energy efficiency and the test method for regenerative rolling reheating furnaces.

This standard is applicable to continuously operated regenerative rolling reheating furnaces fired with blast furnace gas or mixed gas, including pusher-type reheating furnaces, walking-beam reheating furnaces and rotary-hearth reheating furnaces.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 13338 Basic rules for the measurement and calculation of the thermal balance of industrial fuel-fired furnaces.

GB 17167 General principles for equipping and managing of the measuring instrumentation of energy in energy using organization.

GB/T 17195 Terminology of industrial furnaces.

GB 50486 Code for design of industrial furnaces in iron and steel plants.

YB/T 4209 Technical specification for regenerative combustion in the iron and steel industry.

YB/T 4242 Technical specification for the energy saving design of rolling reheating furnaces in iron and steel enterprises.

3 Terms and definitions

The terms and definitions defined in GB/T 17195, YB/T 4242 and YB/T 4209, together with the following, apply to this document.

3.1 Minimum allowable values of energy efficiency of regenerative rolling reheating furnace

The highest energy consumption per unit of product allowed for a regenerative reheating furnace under rated working conditions and under the test conditions specified in this standard.

NOTE: the unit is GJ per tonne.

4 Energy efficiency grades

4.1 A regenerative rolling reheating furnace shall meet the requirements of GB 50486 and YB/T 4242.

4.2 The energy consumption per unit of product of a regenerative rolling reheating furnace is calculated by Formula (1) as the fuel unit consumption multiplied by the steel grade correction factor and by the temperature correction factor, all expressed in GJ per tonne. There are three energy efficiency grades, given in Table 1, grade 1 being the lowest consumption. Table 1 lists the permitted unit consumption by product type - small and medium sections, large sections and plate coils, heavy plate, and steel pipe - and by discharge temperature, separately for double-regenerative and single-regenerative furnaces and for firing on blast furnace gas and on mixed gas; the data apply to carbon steel, and when alloy steel is heated the limit values are multiplied by the steel grade factor. Table 2 gives the steel grade correction factors for four classes of steel and Table 3 the temperature correction factors by charging temperature and discharge temperature.

5 Technical requirements

The minimum allowable value of energy efficiency of a regenerative rolling reheating furnace shall meet the requirements of grade 3 in Table 1.

6 Test method

6.1 Test conditions. The test conditions shall conform to GB/T 13338 and GB 17167, and the steel grade tested shall follow the design steel grade.

6.2 Rated working conditions. 6.2.1 The dimensions of the billets shall be within the design size range. 6.2.2 The charging temperature of the billets shall be the temperature reached in steady operation. 6.2.3 The qualified billet output of the regenerative rolling reheating furnace shall be within the rated output range.

6.3 Measurement of output and fuel quantity. Under rated working conditions, the clause fixes the duration of the energy consumption test and the repeated measurement, during a stated interval of the test, of the qualified billet output and of the fuel consumed; the mass of the billets is taken as actually measured.

6.4 Determination of the energy consumption per unit of product. From the fuel consumption measured over the corresponding period, the net calorific value of the fuel and the output produced in the measuring period, the fuel unit consumption is calculated by Formula (2), the fuel volume being expressed in cubic metres, the calorific value in kJ per cubic metre and the output in tonnes; the average of the three measurements is taken as

the final result.

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