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Replacing GB 21350-2013, GB 29137-2012, GB 29442-2012, GB 29443-2012, GB 32046-2015

The norm of energy consumption per unit production of wrought copper and copper alloy

铜及铜合金加工材单位产品能源消耗限额

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Foreword

This document was drafted in accordance with the provisions of GB/T 1.1-2020 *Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents*.

This document replaces GB 21350-2013 *The norm of energy consumption per unit products of copper and copper-alloy tube*, GB 29137-2012 *The norm of energy consumption per unit products of copper and copper-alloy wire*, GB 29443-2012 *The norm of energy consumption per unit product of copper and copper-alloy rod and bar*, GB 29442-2012 *The norm of energy consumption per unit products of copper and copper-alloy sheet, strip, foil*, and GB 32046-2015 *The norm of energy consumption per unit products of copper drawing stock for electrical purpose*; compared with GB 21350-2013, GB 29137-2012, GB 29442-2012, GB 29443-2012 and GB 32046-2015, except for structural adjustments and editorial changes, the main technical changes are as follows:

a) The "advanced value", "access value" and "limit value" are changed to "Level 1", "Level 2" and "Level 3" (see Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, and Table 10; see Chapter 4 of GB 21350-2013, Chapter 4 of GB 29137-2012, Chapter 4 of GB 29442-2012, Chapter 4 of GB 29443-2012, and Chapter 4 of GB 32046-2015);

b) The "allowance of energy consumption for hot working procedure", "allowance of energy consumption for cold working procedure", "allowance of energy consumption for finishing process" and "allowance of energy consumption for annealing process" in "allowance of energy consumption per unit throughput in an incomplete work company" are merged and changed to the "allowance of comprehensive energy consumption per unit throughput in processing procedures" (see Table 2; see Table 3, Table 5 and Table 7 of GB 21350-2013);

c) The requirements for "allowance of energy consumption per unit throughput in a complete work company" and "allowance of energy consumption per unit throughput in an incomplete work company" are unified (see Table 2; see Chapter 4 of GB 21350-2013);

d) "Unit energy consumption in melting and casting procedures" and "unit energy consumption in processing procedures" are changed to "allowance of comprehensive energy consumption for unit output of product in the melting and casting procedures" and "allowance of comprehensive energy consumption for unit output of product in processing procedures" (see Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, and Table 9; see Chapter

4 of GB 21350-2013, Chapter 4 of GB 29137-2012, Chapter 4 of GB 29442-2012, and Chapter 4 of GB 29443-2012);

e) The index requirements for "allowance of comprehensive energy consumption for unit output of product in the melting and casting procedures", "allowance of comprehensive energy consumption for unit output of product in processing procedures" and "allowance of comprehensive energy consumption for unit output of product in whole procedures" are changed (see Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, Table 8, and Table 9; see Chapter 4 of GB 21350-2013, Chapter 4 of GB 29137-2012, Chapter 4 of GB 29442-2012, and Chapter 4 of GB 29443-2012);

f) "Allowance of all comprehensive energy consumption" is deleted (see Chapter 4 of GB 21350-2013, Chapter 4 of GB 29137-2012, Chapter 4 of GB 29442-2012, and Chapter 4 of GB 29443-2012);

g) The index requirements for "Level 1", "Level 2" and "Level 3" of allowance of energy consumption for high copper tubes, high copper bars by the extrusion method, high copper wires, and high copper sheets, strips and foils by the hot rolling method are added (see table 2. Table 3, Table 4, and Table 7);

h) The footnotes "the allowance of energy consumption of finned tubes is 1.1 times the corresponding value in the table" and "the allowance of energy consumption of tubes with an outer diameter not larger than 4 mm is 1.2 times the corresponding value in the table" are added to the table (see Table 2);

i) The footnote "the allowance of energy consumption of products with the specifications of 0.2 mm$<\Phi\leq$0.8 mm is 2.4 times the corresponding value in the table; the allowance of energy consumption of products with specifications of 0.8 mm$<\Phi\leq$1.5 mm is 1.8 times of the corresponding value in the table; the allowance of energy consumption of products with specifications of 1.5 mm$<\Phi\leq$3.0 mm is 1.35 times the corresponding value in the table" is added to the tables (see Table 3, Table 4, Table 5, and Table 6);

j) The tables' footnotes "the allowance of energy consumption of foils with a thickness less than 0.06 mm is 1.5 times the corresponding value in the table" are deleted (see Table 2, Table 3, Table 5, Table 6, Table 8, and Table 9 of GB 29442-2012);

k) The footnote "the allowance of energy consumption of foils with a thickness less than 0.15 mm is 1.2 times the corresponding value in the table" is added to the table (see Table 9);

l) Product varieties and product standard numbers are added (see Table 11);

The norm of energy consumption per unit production of wrought copper and copper alloy

1 Scope

This document stipulates the levels of allowance, technical requirements, statistical scope, and calculation methods for energy consumption per unit throughput of wrought copper and copper alloy products (hereinafter referred to as energy consumption).

This document applies to the calculation and assessment of per unit throughput energy consumption of manufacturing enterprises that wrought copper and copper alloy ingots (billets), tubes, rods, wires, sheets, strips, foils, and the copper drawing stocks for electrical purposes, as well as energy consumption control for new and expansion projects.

This document is not applicable to the calculation and assessment of energy consumption of wrought copper and copper alloy products produced by special processes such as powder metallurgy, vacuum casting, multi-stage aging, etc.

2 Normative references

The following documents contain the provisions which, through normative reference in this document, constitute the essential provisions of this document. For the dated referenced documents, only the versions with the indicated dates are applicable to this document; for the undated referenced documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 2589 General rules for calculation of the comprehensive energy consumption

GB/T 12723 General principles for establishing allowance of energy consumption per unit throughput

3 Terms and definitions

The terms and definitions defined in GB/T 2589 and GB/T 12723 apply to this document.

6 Technical requirements

6.1 General rules

6.1.1 For comprehensive enterprises, assessments shall be conducted separately by varieties [ingot (billet), tube, bar, wire, sheet, strip, foil, copper drawing stock for electrical purposes].

6.1.2 Enterprises that only produce a single type of product, or in which the output of a certain type of product exceeds 80% of the total product output, will be assessed based on the comprehensive energy consumption for unit output of that type of product.

6.1.3 Manufacturing enterprises with only melting and casting procedures or processing procedures shall be assessed based on the unit energy consumption of the melting and casting procedures or processing procedures; manufacturing enterprises with BOTH melting and casting procedures AND processing procedures shall be assessed based on the comprehensive energy consumption for unit output of this product in whole procedures.

6.2 Copper and copper alloy tubes

6.2.1 The allowance of energy consumption per unit throughput of existing copper and copper alloy tube processing enterprises shall comply with Level 3 in Table 2.

6.2.2 The access value of energy consumption per unit throughput of newly built, renovated, and expanded copper and copper alloy tube processing enterprises shall comply with Level 2 in Table 2.

6.3 Copper and copper alloy bars and wires

6.3.1 The allowance energy consumption per unit throughput of existing copper and copper alloy bar processing enterprises shall comply with Level 3 in Table 3 and Table 5. The allowance energy consumption per unit throughput of existing copper and copper alloy wire processing enterprises shall comply with Level 3 in Table 4 and Table 6.

6.3.2 The access value of energy consumption per unit throughput of newly built, renovated, and expanded copper and copper alloy bar processing enterprises shall comply with Level 2 in Table 3 and Table 5. The access value of energy consumption per unit throughput of newly built, renovated, and expanded copper and copper alloy wire processing enterprises shall comply with Level 2 in Table 4 and Table 6.

6.4 Copper and copper alloy sheets, strips, and foils

6.4.1 The allowance of energy consumption per unit throughput of existing copper and copper alloy sheet, strip, and foil processing enterprises shall comply with Level 3 in Table 7, Table 8, and Table 9.

6.4.2 The access value of energy consumption per unit throughput of newly built, renovated, and expanded copper and copper alloy sheet, strip and foil processing enterprises shall comply with Level 2 in Table 7, Table 8, and Table 9.

6.5 Copper drawing stocks for electrical purposes

6.5.1 The allowance of energy consumption per unit throughput of existing Copper Drawing Stock for Electrical Purposes processing enterprises shall comply with Level 3 in Table 10.

6.5.2 The access value of energy consumption per unit throughput of newly built, renovated, and expanded Copper Drawing Stock for Electrical Purposes processing enterprises shall comply with Level 2 in Table 10.

7 Statistical scope and calculation methods

7.1 Statistical scope

7.1.1 Production system

7.1.1.1 Tubes, bars, wires, sheets, strips and foils

7.1.1.1.1 Melting and casting procedures

Energy consumption from the preparation of raw materials to the output of qualified ingots (billets), including various energy consumption by production systems such as batching (including the master alloy), melting, and casting.

7.1.1.1.2 Processing procedures

Energy consumption from the beginning of ingot (billet) casting to the output of qualified wrought products and warehousing of the finished products.

For tubes, bars and wires, the amount of various energy consumed by production systems such as ingot (billet) heating, extrusion, sawing, rolling, head making, continuous extrusion, drawing, forming, finishing, straightening and sizing, annealing, and packaging is included.

For sheets, strips and foils, the amount of various energy consumed by production systems such as ingot (billet) heating, hot rolling, shearing (sawing), cold rolling, shape

control (sizing), annealing, and packaging is included.

7.1.1.2 Copper drawing stocks for electrical purposes

7.1.1.2.1 Upward continuous casting method

Energy consumption by production systems from when the cathode copper is put into the furnace to when qualified drawing stocks are produced and moved into the finished product warehouse.

7.1.1.2.2 Continuous casting and rolling method

Energy consumption by production systems from when cathode copper (or secondary copper) is put into the shaft furnace (or reverberatory furnace) to when qualified drawing stocks are produced and moved into the finished product warehouse.

7.1.2 Auxiliary production system

The amount of energy consumed by equipment and facilities required to assist the production of wrought copper and copper alloy products, including energy consumed by wind, oil, water, gas, oxygen and other systems required for production, dust collection and smoke treatment equipment, instrumentation and environmental protection facilities, workshop lighting, and internal transportation.

7.1.3 Affiliated production systems

The amount of energy consumed by equipment and facilities required to provide services in the production process, including energy consumed by factory lighting, administrative management, physical and chemical testing, tool and mold manufacturing, maintenance, factory canteens, etc., but excluding household energy consumption and energy consumption by approved infrastructure (technical transformation) project.

NOTE: Household energy consumption refers to the energy consumed by dormitories, schools, culture and entertainment, medical care, business services, and childcare and early childhood education within the enterprise system.

7.1.4 Energy consumption apportionment and conversion

When calculating the energy consumption of production, auxiliary production, and affiliated production systems, if the same process route produces multiple types of products or the same variety of products is produced by multiple process routes, the total energy consumption of the production, auxiliary production, and affiliated production systems shall be apportioned and converted according to the output and the production difficulty of the product.

7.1.5 Energy consumption of waste heat utilization

The energy used by the waste heat utilization device shall be included in the energy consumption. The part of energy recovered for self-use shall be included in the energy consumption of the self-use process; the recovered energy shall be deducted if it is supplied externally or used for other non-production purposes; if it is transferred to other processes, it shall be included in the energy consumption of the accepting process (including transfer losses). The waste heat recovered by enterprises shall be counted according to the waste heat such as steam and hot water recovered and utilized during the statistical period or the energy converted through waste heat processing to avoid repeated statistics.

7.2 Calculation method

7.2.1 Comprehensive energy consumption for unit output of product

The comprehensive energy consumption for unit output of product is calculated according to formula (1):

$$e_z = \frac{\sum_{i=1}^{n}(k_i \cdot e_i) + E_{FZ} + E_{FS} - E_{HW}}{M_Z} \quad \cdots\cdots(1)$$

where:

e_z -- the comprehensive energy consumption for unit output of a certain type of a certain variety of wrought copper, in kilograms of standard coal per ton (kgce/t);

k_i -- the standard coal coefficient of the i-th type of energy (including energy-consumed mediums) consumed by the production systems during the statistical reporting period;

e_i -- the physical quantity of the i-th type of energy consumed by production systems (including the amount of energy consumed by energy-consumed mediums) during the statistical reporting period;

E_{FZ} -- energy consumption of auxiliary production systems during the statistical reporting period, in kilograms of standard coal (kgce);

E_{FS} -- energy consumption of affiliated production systems during the statistical reporting period, in kilograms of standard coal (kgce);

E_{HW} -- the amount of recovered energy supplied externally during the statistical reporting period, in kilograms of standard coal (kgce);

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