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Replacing GB 28380-2012

**Minimum allowable values of energy efficiency and energy
grades for microcomputers**

微型计算机能效限定值及能效等级

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Foreword

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

This document replaces GB 28380-2012 "Minimum allowable values of energy efficiency and energy grades for microcomputers". Compared with GB 28380-2012, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) Deleted the definition of "microcomputer energy-saving evaluation value" (see 2.6 of Edition 2012);
- b) Added definitions for "slates/tablets", "long idle", "short idle", and "alternative low power mode" (see Chapter 3 of this Edition);
- c) Deleted the "energy-saving evaluation value" (see 3.4 of Edition 2012);
- d) Changed the classification and energy efficiency grade indicators of microcomputers (see 4.1 and 4.2 of this Edition; 3.1 and 3.2 of Edition 2012);
- e) Changed the calculation method for typical energy consumption of microcomputers, the percentage of time occupied by each mode of microcomputers, and the power factor of additional functions (see 5.1 of this Edition; 4.2 of Edition 2012);
- f) Changed the test methods (see Annex A of this Edition; Annex A of Edition 2012);
- g) Deleted the inspection rules (see Chapter 5 of Edition 2012).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing authority shall not be held responsible for identifying any or all such patent rights.

This document was proposed by and shall be under the jurisdiction of Standardization Administration of China.

Versions of standard substituted by this document are:

- It was first published in 2012 as GB 28380-2012;
- This is the first revision.

Minimum allowable values of energy efficiency and energy grades for microcomputers

1 Scope

This document specifies the technical requirements, calculation methods, and test methods for desktop microcomputers, all-in-one desktop microcomputers with display functions (referred to as "all-in-one computers"), and portable microcomputers (referred to as "microcomputers").

This document is applicable to general-purpose microcomputers.

This document is not applicable to:

- a) Slates/tablets, desktop/rack mounted workstations, and industrial application microcomputers;
- b) A microcomputer with two or more independent display units;
- c) Microcomputer with a rated output power greater than 500 W;
- d) All-in-one computers and portable microcomputers with a diagonal size of less than 294.6 mm (11.6 in) on the display screen.

2 Normative references

The following referenced 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 9813.1, *General specification for computer -- Part 1: Desktop microcomputer*

GB/T 9813.2, *General specification for computer -- Part 2: Laptop microcomputer*

GB/T 9813.4, *General specification for computers -- Part 4: Industrial application microcomputer*

IEC 61966-2-1, *Multimedia systems and equipment -- Colour measurement and management -- Part 2-1: Colour management -- Default RGB colour space-sRGB*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 9813.1, GB/T 9813.2, and GB/T 9813.4 as well as the followings apply.

3.1 slates/tablets

Computer equipment that meets all of the following criteria:

- a) includes an integrated display with a diagonal dimension greater than 177.8 mm (7 in) and less than 442.0 mm (17.4 in);
- b) does not include an integrated physical keyboard or a detachable physical keyboard as shipped;
- c) includes and primarily relies on a touchscreen for input;
- d) includes and primarily relies on a wireless network connection;
- e) includes and primarily relies on an internal battery pack for power;
- f) is primarily operated by gripping.

3.2 off mode

A mode that the microcomputer is connected to the mains power supply and the product is in the system off mode.

NOTE: For microcomputers that support the advanced configuration and power management interface (ACPI), the off mode corresponds to the S5 mode in ACPI.

3.3 sleep mode

A mode in which a microcomputer consumes less energy without shutting down.

NOTE 1: This mode is selected by the user to enter, or automatically entered by the microcomputer after a period of inactivity.

NOTE 2: For microcomputers that support the advanced configuration and power management interface (ACPI), the sleep mode corresponds to the S3 mode in ACPI, which is also called "standby mode" or "suspend" in some operating systems.

3.4 idle

A mode that the microcomputer is not in use and is waiting to be assigned tasks or instructions.

3.5 long idle

A mode when the microcomputer enters the idle mode and the computer's main display enters a low power mode where the screen content cannot be seen (for example: the backlight is turned off), but is still in working mode (ACPI G0/S0).

NOTE 1: If power management features are active in the scenarios described by this definition, they are enabled before evaluating extended idle (for example, the display is in a low power mode and the hard drive may be turned off), but the computer needs to be prevented from entering a sleep mode.

NOTE 2: Working mode (ACPI G0/S0) refers to the mode in which the computer is actively working in response to a) user input or b) network input. This mode includes active processing and searching for data from storage, memory, or cache. It also includes waiting for further user input and the standby mode before entering low power mode.

3.6 short idle

A mode when a microcomputer enters the idle mode, the screen is on, and the long idle power management function is not activated (for example, the hard disk drive is spinning and the computer cannot enter sleep mode).

3.7 alternative low power mode; ALPM

A low power mode that replaces sleep and extended idle periods.

NOTE: This mode is entered automatically by the computer after a period of inactivity, or by user selection. The computer's screen is off. However, the computer remains responsive to network connections and user interface devices. This mode is enabled by default.

3.8 typical energy consumption; TEC

The annual energy consumption of a microcomputer obtained according to the test and calculation methods specified in this document.

NOTE: The unit is kilowatt-hour (kWh).

3.9 the minimum allowable values of energy efficiency for microcomputers

The maximum typical energy consumption allowed by a microcomputer under specified test conditions.

4 Technical requirements

4.1 Classification of microcomputers

The type of microcomputer is determined according to Table 1.

4.2 Energy efficiency grades for microcomputers

Microcomputer energy efficiency grades are categorized into three grades, with Grade 1 having the lowest typical energy consumption. Microcomputers equipped with CPUs with a unit transistor density greater than 30 Mtr/mm² must not exceed the typical energy consumption specified in Table 2 for each energy efficiency grade. Microcomputers equipped with CPUs with a unit transistor density less than or equal to 30 Mtr/mm² or manufactured using non-extreme ultraviolet (EUV) lithography equipment must not exceed the typical energy consumption specified in Table 3 for each energy efficiency grade.

4.3 Minimum allowable values of energy efficiency for microcomputers

The minimum allowable value of energy efficiency for microcomputers is Grade 3 of the energy efficiency grades in Table 2 or Table 3.

5 Calculation methods and test methods

5.1 Calculation methods

5.1.1 Calculation method for typical energy consumption

The typical energy consumption of a microcomputer is calculated according to formula (1). For microcomputers that use ALPM to replace sleep modes and long idle times, calculate according to formula (2):

$$TEC = (8\,760/1\,000) \times (P_{\text{off}} \times T_{\text{off}} + P_{\text{sleep}} \times T_{\text{sleep}} + P_{\text{long_idle}} \times T_{\text{long_idle}} + P_{\text{short_idle}} \times T_{\text{short_idle}}) \quad \dots\dots (1)$$

$$TEC = (8\,760/1\,000) \times (P_{\text{off}} \times T_{\text{off}} + P_{\text{ALPM}} \times (T_{\text{sleep}} + T_{\text{long_idle}}) + P_{\text{short_idle}} \times T_{\text{short_idle}}) \quad \dots\dots (2)$$

Where,

TEC - Typical energy consumption of a microcomputer, in kilowatt-hours (kWh);

8760 - Annual hours, in hours (h);

Annex A

(normative)

Test method for typical energy consumption of microcomputers

A.1 Test conditions

When testing, the ambient temperature is 15°C~35°C, the relative humidity is 25%~75%, and the atmospheric pressure is 86 kPa~106 kPa. The test power supply is AC 220 V $\pm$ 2.2 V, and the power frequency is 50 Hz $\pm$ 1 Hz.

The total harmonic distortion of the test power supply is no more than 2%.

A.2 Test instruments

When the power meter measures at an active power of no more than 10 W, the measurement results are accurate to 0.01 W. When it measures at an active power greater than 10 W and less than 100 W, the measurement results are accurate to 0.1 W. When it measures at an active power greater than 100 W, the measurement results are accurate to 1 W.

The measurement range of the luminance colorimeter must be at least 0.02 cd/m²~2000 cd/m². The luminance resolution must be at least 0.01 cd/m².

A.3 Test method

A.3.1 Settings of testing microcomputer

The settings of the testing microcomputer are as follows:

- a) The testing microcomputer shall use the standard keyboard, mouse and other accessories. For desktop microcomputers and all-in-one computers that do not include accessories, a mouse and keyboard without additional functions shall be configured;
- b) Microcomputers (excluding all-in-one computers and portable microcomputers) shall be equipped with an external monitor. The energy consumption of the external monitor shall not be included in the energy consumption of the testing microcomputer;
- c) For portable computers with pointing sticks, trackpads, or touch screens, no separate keyboard or mouse is required;

- d) Computers powered by external power adapters shall use the standard external power supply. The battery pack shall not be installed during testing. For computers where removing the battery may affect product performance or where the battery pack cannot be operated without it, or where the battery requires opening the case to be removed, testing shall be performed with the battery fully charged, and this shall be noted in the report;
- e) After restoring the microcomputer to exit-factory default settings, set the monitor desktop background to fixed color bitmap (red, green, and blue (RGB) values are 130, 130, and 130). Turn off additional features, such as automatic dimming. If this is not possible, adjust the power consumption to the minimum and indicate this in the report;
- f) The long idle mode test shall start within 20 min after the input stops. If the default settings cause the testing microcomputer to enter the long idle mode after 20 min, the measurement shall start 20 min after the input stops. The alternative low power mode test shall start within 20 min after the input stops. If the default settings cause the testing microcomputer to enter the alternative low power mode after 20 min, the measurement shall start 20 min after the input stops. The short idle mode test shall start within 5 min after the input stops. During the short idle mode test, the display sleep mode shall be set to disabled. If the default settings cause the testing microcomputer to exit the short idle mode during the measurement, the relevant settings shall be modified so that the testing microcomputer remains in the short idle mode during the measurement;
- g) The microcomputer uses the operating system that the manufacturer declares to support. If the product supports multiple operating systems, the manufacturer shall specify an operating system.

A.3.2 Test of typical energy consumption

The typical energy consumption of a microcomputer is tested according to the following steps.

- a) After the testing microcomputer has been initially installed, it shall be connected to an active Ethernet network. The microcomputer's wireless network module and inter-device wireless transmission protocol module shall be disabled. If the microcomputer only provides wireless network or inter-device wireless transmission protocol access, only one active wireless access method shall be connected. If multiple network interfaces are available, connect them according to the priority order in Table A.1 during testing;

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