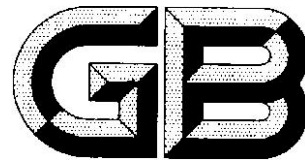


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Minimum allowable values of energy efficiency and energy
efficiency grades for Photocopiers

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Management Commission

Preface

It should be noted that Clauses 4.2 and 4.4 of this Standard are mandatory whilst the rest are recommended.

Appendix A to this Standard is a specification appendix.

This Standard is jointly enacted by the National Development & Reformation Commission and the National Standardisation Management Commission.

This Standard has been prepared and put forward by the National Energy Foundation & Management Standardization Technical Committee.

This standard is under the jurisdiction of the National Energy Foundation & Management Standardisation Technical Committee.

The units involved in preparing this Standard include: China Standardization Institute, China Copier Machine Quality Supervision & Inspection Centre, National Computer Quality Supervision Inspection Centre, China Hewlett Packard Corp., and the 5th Institute of Message Industrial Department.

The main drafters of this Standard are Zhang Guo-Qin, Chen Hai-Hong, Kuang Ya-Ming, Zhou Xing-Hua, Zhang Shu-Jie and Song Dan-Mei.

Minimum allowable values of energy efficiency and energy efficiency grades for Photocopiers

1 Scope

- 1.1 This Standard sets the minimum allowable energy efficiency values, energy conservation evaluation values, minimum allowable target energy values, test methods and inspection rules for general-purpose static photocopiers (hereafter ‘Photocopier’).
- 1.2 This Standard applies to static photocopiers using A3 copy size or smaller, and multi-function machines (e.g. multi-function digital photocopiers, multi-function printing copiers and colour photocopiers, etc.) focusing on copying as its basic function under normal working voltage of the electrical network.

2 Normative References

The provisions of the following documents become provisions of this Standard after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this Standard; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

GB4943 Message Technical Equipment Safety

GB9254 Message Technical Equipment Wireless Interference Limit Value and Measuring Method

GB/T10992.1 Static Copier Machine/Document Copier Machine

GB/T10992.2 Static Copier Machine/Portable Copier Machine

GB17625.1 Electromagnetic Capacitance Limit Value, Harmonic Current Emission Limit Value (per phase equipment input current•16A).

3 Terms and Definitions

The following terms and definitions apply to this Standard.

3.1 Off Mode

The status in which the power switch is set to “off” when power is connected to the Photocopier.

3.2 Active mode

The status in which the Photocopier is connected to the power and can be used for producing output or for other main functions.

3.3 Ready mode

The status in which the Photocopier has reached working conditions but is not producing any output and the working status can be reached in a short period of time.

3.4 Sleep mode

The status in which the Photocopier automatically enters a lower energy consumption mode without shutting down the power, after operation has been stopped for a certain period of time.

3.5 Typical Energy Consumption

The weekly energy consumption of the Photocopier obtained according to the test and calculation methods of this Standard, for which kWh expresses the unit.

3.6 Auto-Off Mode

The status in which the Photocopier automatically enters a much lower energy consumption mode than Sleep Mode, once used.

3.7 Minimum Allowable Energy Efficiency Values for Photocopiers

The allowable maximum TEC and maximum active power when in “off” mode achieved by the Photocopier when tested under the conditions set out in this Standard.

- 3.8 The allowable maximum TEC and maximum active power when “off” mode is achieved by the Energy Conservation Copier Machine when tested under the conditions set out in this Standard.

4 Technical Requirements

4.1 Copier Machine Energy Efficiency Grades

The energy efficiency of the Photocopier shall be divided into three grades, of which grade 1 indicates the highest level of energy efficiency. The TEC of each grade of Photocopier shall not exceed the requirements listed in Table 1, nor shall the energy consumption of each grade of Photocopier when in “off” mode exceed the requirements listed in Table 1.

Table 1: Typical Energy Consumption Categories

Copier Machine Type	Copying Speed (p)	Energy Efficiency Grade					
		Category 1		Category 2		Grade 3	
		TEC (kWh)	Off Mode Energy Consumption (W)	TEC (kWh)	Off Mode Energy Consumption (W)	TEC (kWh)	Off Mode Energy Consumption (W)
Single Colour Photocopier	p•12	1.2	1	1.5	2	1.8	3
	12•p •50	0.16p-0.8	1	0.20p-1	2	0.25p-1.25	3
	p•50	0.64p-25	1	0.80p-31	2	1.00p-38	3
Colour Photocopier	p•50	0.16p+1.5	1	0.20p+2	2	0.25p+2.5	3
	p•50	0.64p-22.5	1	0.80p-28	2	1.00p-35	3
Single Colour/ Multi-Function Copier Machine	p•20	0.16p+1.6	1	0.20p+2	2	0.25p+2.4	3
	20•p p•69	0.36p-2.2	1	0.44p-2.8	2	0.53p-3.4	3
	p•69	0.64p-22.4	1	0.80p-28	2	1.00p-34	3
Full Colour/ Multi-Function	p•32	0.16p+4.0	1	0.20p+5	2	0.24p+6.0	3
	32•p p•61	0.36p-2.2	1	0.44p-2.8	2	0.53p-3.4	3

	p• 61	0.64p-20	1	0.80p-25	2	1.00p-30	3
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4.2 Minimum Allowable Energy Efficiency Value

The minimum allowable energy efficiency value of the Photocopier shall be Grade 3 in energy efficiency grade.

4.3 Energy Conservation Evaluation Value

The minimum allowable energy efficiency value of the Photocopier shall be Grade 2 in energy efficiency grade.

4.4 Target Energy Efficiency Minimum Allowable Value

The minimum allowable energy efficiency value of the Photocopier shall be Grade 2 in energy efficiency grade three years after the implementation date of this Standard.

5 Test and Calculation Methods

5.1 Test Method:

The test shall be conducted for the TEC and “Off” mode according to the method set out in Appendix A.

5.2 Calculation Method

5.2.1 Typical energy consumption of the Photocopier:

(TEC): Calculated according to Formula (1)

$$TEC = [\bullet E_d \times 5 \bullet + \bullet P_{ao} \times 48h \bullet] / 1000 \dots\dots\dots \tilde{Z} 1 \bullet$$

Where,

E_d - Daily energy consumption of the Photocopier, in which “Wh” expresses the unit.

P_{ao} - The power of the Photocopier under automatic “Off” mode, in which “W” expresses the unit.

The daily energy consumption $\tilde{Z} E_d \bullet$ of the Photocopier shall be calculated according to Formula (2):

$$E_d = E_{dj} + 2E_f + E_{ao} \dots\dots\dots \tilde{Z} 2 \bullet$$

Where

E_{dj} - Energy consumption of the Photocopier when used for daily jobs, in which “Wh”

expresses the unit.

E_f - Energy consumption of the Photocopier from the point of finishing a job task to entering automatic “Off” mode each day, in which “Wh” expresses the unit.

E_{ao} - Energy consumption of the Photocopier under automatic “Off” mode each day, in which “Wh” expresses the unit.

The daily energy consumption \bar{E}_{dj} of the Photocopier shall be calculated according to Formula (3):

$$E_{dj} = E_{j1} \times 2 + [\bullet M_{jd} - 2 \bullet \times E_j] \dots\dots\dots \bar{E}_{j3} \bullet$$

Where,

E_{j1} – The energy consumption of the Photocopier when executing the first job task according to the requirements of the test method, in which “Wh” expresses the unit.

M_{jd} – The typical working count that should be finished by the Photocopier each day.

E_j – The average energy consumption of the Photocopier, in which “Wh” expresses the unit. The energy consumption (E_{ao}) of the photocopier when in “Off” mode shall be calculated according to Formula (4):

$$E_{ao} = \{ 24h - [\bullet M_{jd} / 4 \bullet + \bullet T_f \times 2 \bullet] \} \times P_{ao} \dots\dots\dots \bar{E}_{j4} \bullet$$

Where,

T_f - The time it takes for the Photocopier to enter automatic “Off” mode after finishing the fourth job task, according to the requirements of the test method, in which “h” expresses the unit.

The average working energy consumption \bar{E}_j of the Photocopier shall be calculated according to Formula (5):

$$E_j = \bar{E}_{j2} + E_{j3} + E_{j4} \bar{E}_{j3} / 3 \dots\dots\dots \bar{E}_{j5} \bullet$$

Where,

E_{j2} - Energy consumption of the Photocopier when executing the second job task according to the requirements of the test method, in which “Wh” expresses the unit.

E_{j3} - Energy consumption of the Photocopier when executing the third job task according to the requirements of the test method, in which “Wh” expresses the unit.

E_{j4} - Energy consumption of the Photocopier when executing the fourth job task according to the requirements set out in the test method, in which “Wh” expresses the unit.

The typical working count $\tilde{Z} \text{ Mjd} \bullet$ that should be finished by Photocopier shall be confirmed according to the requirements set out in Table 3:

Table 3: Typical Working Count to be finished by the Photocopier

P Printing	Daily Typical Working Count
$0 < p \bullet 8$	8
$8 < p \bullet 32$	p
$P > 32$	32

5.2.2 Calculation of “Off” Mode Power• Poff•

The Active Power of the Photocopier in “Off” mode shall be calculated according to Formula (6):

$P_{off} = E_{off} / 1000 T_{off} \dots \bullet 6 \bullet$

Where,

E_{off} - Actual measured energy consumption of the Photocopier in “Off” mode, in which “kWh” expresses the unit.

T_{off} - Actual measured time, in which “h” expresses the unit.

6 Inspection Rules

6.1 Ex-factory Inspection

- 6.1.1 The minimum allowable energy efficiency values shall be deemed as the item during the ex-factory inspection of the Photocopier, and the sampling plan shall be determined by Production Industrial Quality Inspection Department.
- 6.1.2 If the inspected minimum allowable energy efficiency values fail to meet the requirements set out in Clauses 4.2 and 4.4, then the ex-factory delivery of the said Photocopier shall not be permitted

6.2 Type Inspection

- 6.2.1 If any of the following happens to the product then a type inspection for the minimum allowable energy efficiency values shall be carried out:

- a) if new items are added after the pilot run;
- b) if the product design changes, or if the workmanship or materials used have noticeably affected the performance;
- c) When an inspection is required by the Quality & Technical Supervision Department.

6.2.2 Sampling Program for the Type Inspection

During the type inspection, one unit will be selected for each batch. If the minimum allowable energy efficiency value of the selected sample fails to meet the requirements set out in this Standard, then the said batch of products shall be deemed as noncompliant.

Appendix A

(Standardised Appendix)

Typical Energy and Off Mode Energy Consumption Test Method for Photocopiers**A.1 Test Conditions**

The test environment shall be as follows: room temperature, 23 ± 5 ; relative humidity, 10%~80%; atmospheric pressure, 86~106 kPa; test power source, AC voltage $220 \pm 1\%$; and frequency, 50 ± 0.5 Hz. If the nominal power of the tested equipment exceeds 1.5kW, then the test power shall be AC $220V \pm 4\%$.

The total harmonic distortion of the test power must not be over 3%. If the nominal power of the tested equipment is over 1.5kW, then the total harmonic distortion shall not be over 5%.

A.2 Test Instrument

When measured with Power Gauge in active power below 10W, the accuracy of the measuring result shall be 0.01W; when measured in active power of over 10W and below 100W, the accuracy of the measuring result shall be 0.1W; when measured with the active power set to over 100W, the accuracy of the measuring result shall be 1W.

A.3 Test Method**A.3.1 Test Setup**

- a) Test Paper: A4 size 70g general printing paper.
- b) Test Board: Static Photocopier developer consumption test board, in A4 size (image ratio: 6%).

Note 1: the main unit of the Photocopier should normally be tested, excluding external accessories such as the Sorter and Auto Feeder, etc. In the event that the Product Specification specifies that the external accessories belong to the standard equipment to be provided along with the Photocopier and where the basic power control wire is installed in the machine, then the entire unit and its accessories should be tested together.

Note 2: Before testing, the equipment and copying papers shall be placed in the specified environment conditions for 1 hour or longer.

A.3.2 Confirmation of Test Quantity**A.3.2.1 Confirmation of Daily Typical Printing Quantity**

The typical daily printing quantity of the tested product shall be $0.50p^2$ in which, “p” indicates the printing speed of the photocopier.

A.3.2.2 Confirmation of Test Quantity Per Time

The test quantity per time will be the result from dividing the daily typical printing quantity by the daily typical working count, and the result shall be rounded off to a whole number; however, it is required that one sheet of paper be guaranteed to be completed during each printing task.

Note: as limited by the feeder, etc., the printing count may be increased for high-speed photocopiers, so as to complete the printing task.

A.3.3 Typical Energy Consumption Test

- a) The tested Photocopier must be properly installed and sufficient test papers should be loaded into the paper tray.
- b) Connect the test equipment and the tested Photocopier and connect the power to the test equipment, then place them under the test conditions set out in this Standard.
- c) Start the tested Copier Machine and wait until it reaches ready mode.
- d) Select the printing quantity according to the speed of the Photocopier, and then carry out the test and record the length of time it takes to output the first sheet of paper. After the Photocopier enters sleep mode, proceed with the next step of the operation. mode then register the energy consumption used over 1 hour. If the machine enters automatic “off” mode during this period, then register the time taken for entering sleep mode and the energy consumption used in this mode; however, the required time must elapse. After the required one hour, proceed with the next step of the operation.
- e) Reset the reading of the test equipment to zero for the Photocopier to complete one round of printing, and then register the energy consumption (E_{j1}) used at the end of the task. After accumulating for 15 minutes starting from current task, proceed with the next operation step.
- f) Repeat Step (e) three times and register energy consumption E_{j2} , E_{j3} and E_{j4} respectively.
- g) Reset the reading of the test equipment to zero. Wait for the equipment to enter automatic “off” mode and register the energy consumption (E_f) and the time ($T_{f\bullet}$) taken from completing the previous job to entering automatic “off” mode.
- h) Test and register the power (P_{ao}) of the equipment under automatic “off” mode.

A.3.4 Energy Test under “Off” Mode

- a) Connect the power to all test equipment and adjust the voltage and frequency to the appropriate level.
- b) Maintain the tested Photocopier in “off” mode until the reading of the measured power values stabilises.

- c) Test the energy consumption of the Photocopier - the test time should not be less than 10 minutes.
- d) Register the energy consumption (E_{off}) and test duration (T_{off}) when the tested Photocopier is in “off” mode.