National Environmental Protection Standards of

the People's Republic of China

HJ 2516-2012

Technical requirement for environmental labeling products

Projector

Issued on July3, 2012 Coming into force as of October 1, 2012

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Contents

This document is a translation of a Chinese original. In case of dispute, the original document should be taken as authoritative.

Foreword

This standard is formulated for the purposes of implementing the Environment Protection Law of the People's Republic of China, and reducing adverse impacts of projectors on the environment and human health in the process of production, use and recycling of projectors.

This standard specifies requirements for environmental design, energy consumption and noise during production and use, recovery, packaging and instruction manual of projectors.

This is the first version of the current standard.

This standard is applicable to the certification of both environmental labeling products and low-carbon labeling product in China.

This development of this standard is under the organization of the Department of Science, Technology and Standards of the Ministry of Environmental Protection of China.

The main organization involved in developing the standard are: Sino-Japan Friendship Center for Environment Protection, Display Equipment Branch of China Video Industry Association, China National Office Equipment and Consumable Quality Supervision and Onspection Center, China Culture & Office Equipment Association, Beijing Green Business Culture Development Center, Shenzhen Acto Digital Video Technology Co., Ltd., Delta Green Tech (China) Co., Ltd., Guangdong VTRON Technologies Ltd., and Ningbo GQY Video & Telecom Joint Stock Co., Ltd.

This standard was approved by the Ministry of Environmental Protection of China on July 3, 2012.

This standard comes into force as of October 1, 2012.

This standard shall be interpreted by the Ministry of Environmental Protection of China.

Technical requirement for environmental labeling products

Projector

1 Applicable Scope

This standard stipulates the terms and definitions, basic requirements, technical contents and test methods for projector as environmental labeling products.

This standard is applicable to all types of projectors.

2 Normative References

The contents of this standard quote the provisions of the following documents. The valid version of any quoted documents without a marked date shall be applicable to this standard.

GB 4943 Safety of Information Technology Equipment

GB 9254 Information Technology Equipment － Radio Disturbance Characteristics － Limits and Methods of Measurement

GB 17625.1 Electromagnetic Compatibility - Limits - Limits for Harmonic Current Emissions (equipment input current ≤ 16A per phase)

GB/T 14857 Specifications of Encoding Parameters of Digital Television for Studio

GB/T 16288 Labeling of Plastic Products

GB/T 18313-2001 Acoustics - Measurement of Airborne Noise Emitted by Information Technology and Telecommunications Equipment

GB/T 18455 Packaging Recycling Marking

GB/T 26572 Requirements of Concentration Limits for Certain Restricted Substances in Electrical and Electronic Products

GY/T 155 Video Parameter Values for the HDTV standards for Production and Program Exchange

HJ 2501 Technical Requirement for Environmental Labeling Products－ Electrical Wire and Cable

HJ/T 238 Technical Requirement for Environmental Labeling Products－ Rechargeable Battery

HJ/T 239 Technical Requirement for Environmental Labeling Products－ Mercury Free Dry Cells and Batteries

3 Terms and Definitions

The following terms and definitions shall applicable to this standard.

3.1 Projector

It refers to the display system designed to control light source with electronic image information, enlarge and project image onto a screen through optic lenses, which is powered by public power grid.

3.2 Active mode

It refers to the mode where the product is connected to power supply and forms images and/or sound.

3.3 Passive standby mode

It refers to the mode where the product is connected to power supply and produces neither sound nor image; users can use direct or indirect signal such as remote control to transfer the product to active mode.

3.4 Energy consumption of active mode

It refers to the energy consumption of the product obtained from per the test method and calculation method specified in Annex A of the current standard with the unit of lumens per watt (lm/W).

3.5 Energy efficiency

It refers to the ratio of light output to the power consumed by the whole projector under active mode and is expressed by Eff.

4 Basic Requirements

4.1 The product quality shall meet the requirements of corresponding product quality standard. The product safety performances shall meet the requirements of GB 4943 with electromagnetic compatibility meeting the requirements of GB 9254 and GB 17625.1.

4.2 Pollutant emissions of product manufacturers shall meet national and local emission standards.

4.3 Product manufacturers shall strengthen clean production in the process of production.

5 Technical Contents

5.1 Design requirements for environmental protection

5.1.1 Easiness in dismantling

5.1.1.1 The product shall be designed for easy dismantling.

5.1.1.2 Lamp bulb should be easily separated from the product.

5.1.2 Easy recycling

Plastic parts over 25g of mass or more than 200 mm^2 in flat surface area shall adopt single type of polymer or blend polymer, and be labeled as per the requirements of GB/T 16288.

5.1.3 Requirements for hazardous substances in parts

5.1.3.1 No chlorine- or bromine-containing polymers shall be used in plastic parts, and no flame retardant containing organochlorine or organobromine compounds shall be added in plastic parts except the casing and frame plastic parts adjacent to heating and imaging components.

5.1.3.2 Plastic parts with a mass more than 25g shall not be added with phthalate listed in Annex B as plasticizer, except electric wire and cable.

5.1.3.3 The content of short-chain chlorinated paraffin (SCCPs) in plastic parts shall not exceed 0.1% (mass fraction) of the total amount of plastic parts.

5.1.3.4 Tributyl tin (TBT) and triphenyl tin (TPT) shall not be used in product components.

5.1.3.5 Wire and cable shall meet the requirements described in HJ2501.

5.1.3.6 The content of hazardous substances such as lead (Pb), cadmium (Cd), mercury (Hg), hexavalent chromium (Cr^{6+}), polybrominated biphenyl (PBBs) and polybrominated diphenyl ether (PBDEs) in plastic parts, metal parts, electronic parts, soldering tin and coating shall meet limits specified in GB/T 26572.

5.1.3.7 Mercury content of each lamp in the product shall not exceed 4mg.

5.1.3.8 Rechargeable battery in the product shall meet the requirements of HJ/T 238, and dry cells shall meet the requirements of HJ/T 239.

5.2 Requirements for production stage

Materials such as hydrochlorofluorocarbons (HCFCs), 1,1,1-trichloroethane ($C_2H_3Cl_3$), trichloroethylene (C_2HCl_3), dichloroethane (CH_3CHCl_2), dichloromethane (CH_2Cl_2), trichloromethane ($CHCl_3$), carbon tetrachloride (CCl_4) and bromopropane (C_3H_7Br) shall not be used as cleaning solvents.

5.3 Requirements for energy consumption

5.3.1 Power consumption of the product under active mode shall meet the requirements in Table 1.

Table 1 Limit of product power consumption under active mode

Category	Luminous flux (Φ_V)/ lm	Energy efficiency (Eff)/ lm/W
I	$\Phi_V \leq 1750$	≥ 6.7
II	$1750 < \Phi_V \leq 2750$	≥ 9
III	$\Phi_V > 2750$	≥ 11

5.3.2 Energy consumption under passive standby mode

The power consumption of the product under passive standby mode shall not exceed 1W.

5.4 Noise limit

Noise of different categories of projectors under active mode shall meet the requirements in Table 2, expressed by sound power level L_{WA}.

Table 2 Noise limits of the product under active mode

Category	Luminous flux (Φ_V)/lm	Sound power level (L_{WA})/dB (A)
I	$\Phi_V \leq 1750$	≤ 33
II	$1750 < \Phi_V \leq 2750$	≤ 35
III	$\Phi_V > 2750$	≤ 37

5.5 Requirements for product packaging

5.5.1 HCFCs shall not be used as foaming agent.

5.5.2 The total amount of heavy metals such as lead, cadmium, mercury and hexavalent chromium in package and packaging materials shall not exceed 100mg/kg.

5.5.3 Labeling shall be done based on GB/T 18455.

5.6 Requirements for product recycling

Enterprises should establish the management system for recycling and recovery of waste products and provide relevant information on product recovery and recycling.

5.7 Requirements for instruction manual

The instruction manual shall be sold together with the product and shall include the followings:

a) Information about service life of projector lamp;

b) Information on shutting down the power supply in case of no application;

c) Information about lowering screen luminance can significantly reduce energy consumption of the projector in use, thus reducing the operating cost;

d) Information on product parts replacement, channel and methods;

e) Relevant information on recycling and recovery of waste products.

6 Test Methods

6.1 The test of Technical Content 5.3.1 shall be conducted based on the methods specified in Annex A.

6.2 The test of Technical Content 5.3.2 shall be conducted based on the methods specified in Annex C.

6.3 The test of Technical Content 5.4 shall be conducted based on the methods specified in Article 7 of GB/T 18313-2001.

6.4 Other requirements in the Technical Contents shall be verified by document review combined with site inspection.

Annex A

(Normative Annex)

Test Procedure for Energy Consumption under Active Mode

A.1 Test Conditions

A.1.1 Operating Condition

Projector shall be under active mode; all settings shall be adjusted in line with A.3.2 of the current annex. Explanations should be given in measurement results if the adjustment position is different.

A.1.2 Environmental Condition

The measurement shall be conducted in the following scopes of temperature, humidity and atmospheric pressure conditions.

a) Environmental temperature：18℃～28℃；

b) Relative humidity：25%～75%；

c) Atmospheric pressure：86kPa～106kPa.

A.1.3 Power supply

a) Test power supply should be AC 220 (1±1%) V with frequency at (50±0.5) Hz. Test power supply should be AC 220 (1±4%) V for any testing equipment with nominal power over 1.5kW.

b) Total harmonic distortion of the test power supply shall not be more than 3%; and the total harmonic distortion of the test power supply shall not be more than 5% for any testing equipment with nominal power more than 1.5kW.

A.1.4 Test venue

The test should be carried out in a dark room to avoid interference of stray light on the test results, and the dark room should meet the following condition: that is, stray light illumination should not exceed 1 lx.

A.1.5 Test device

The resolution of power meter is 0.01W when the active power measurement is not greater than 10W; 0.1W for the active power measurement more than 10W but less than 100W; and 1W for the active power measurements more than or equal to 100W.

A.2 Test Signal

A.2.1 Video test signal

A.2.1.1 Overview

Test signals should vary with different characteristics such as display definition and aspect ratio. The standard definition signals should comply with the requirements of GB/T 14857 and high definition test signals should meet relevant requirements of GY/T 155.

A.2.1.2 Extreme signal of eight grey scales

The extreme signal of eight gray scales is a luminance signal, which produces two rows of gray levels on a 50% gray background as shown in Figure A.1. The full-black pattern level =0%, full-white pattern level =100%, the first-row grayscales are: 0%, 5%, 10%, and 15%. The second-row grayscales are: 85%, 90%, 95% and 100%. Each gray rectangle takes up 5% of the full screen area with aspect ratio consistent with the entire display image. The signal is used to adjust the standard state of a projector. The extreme 8 grayscales signal is shown in Figure A.1.

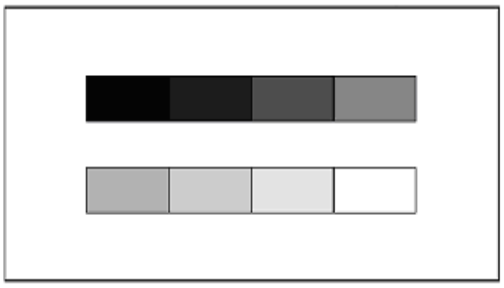

Fig.A.1 Extreme 8 grayscale signals

A.2.1.3 Full-white pattern signal and its test points

Take 100 % full-white pattern signal as the test signal, the projected area is 1 square meter, test 9 points from P_1 to P_9 in the screen with p5 being the image center point; $P_1 – P_4$ and P_6 - P_9 are 1/6 of the image width and height respectively as shown in Figure A.2.

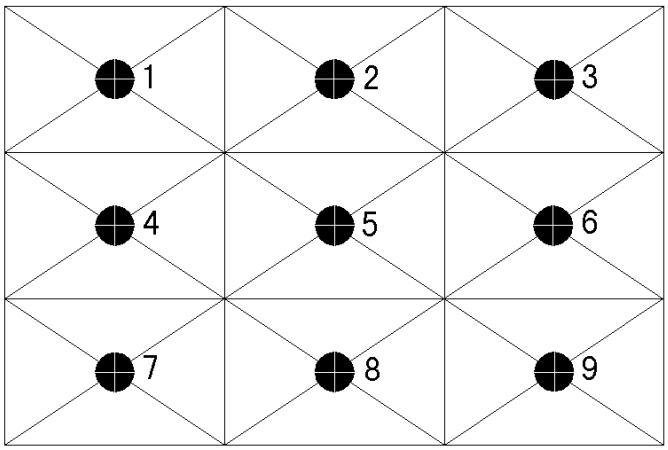

Fig.1.2 Test points of full-white pattern signal

A.3 Test conditions

A.3.1 Test interface and electrical level

The energy efficiency test of projector employs Y, $P_{B,}$ P_R component signal interfaces with the voltage of the input signal as the follows:

Y: 700mV_{P-P} (excluding synchronizing signal);

P_B: ±350 mV_{P-P} (excluding synchronizing signal);

P_R: ±350 mV_{P-P} (excluding synchronizing signal).

Signal Y shall contain synchronizing signal.

Synchronizing signal (Tri-level): 300mV.

The energy efficiency test of the projector without Y, PB, PR component signal interfaces adopts VGA interface with voltage of input signal as the follows:

R/G/B/: 700 mV_{P-P} (excluding synchronizing signal).

A.3.2 Adjustment of projector standard active mode

A.3.2.1 Adjust image contract ratio and luminance

Input the extreme 8 grayscale signal, change the position of contrast ratio and brightness controller, and adjust to the extreme state where the extreme 8 grayscale signals can be exactly visible. If the above state cannot be obtained, adjust to the best image quality with indications in the measurement results.

A.3.2.2 Adjust color temperature

Set the projector color temperature at factory default position, if there is no preset position, set it to the best image quality.

A.3.2.3 Image (quality intensification) control or switch

Set the projector control switch at factory default position, if there is no preset position, adjust it to shutoff state.

A.3.2.4 Color (saturation) and hue control

Set the projector controllor at factory default position, if there is no preset position, adjust it to the center position.

A.3.2.5 Control of ambient light

It refers to the function that automatically adjusts image brightness and color output through ambient light. Adjust it to shutoff state.

A.3.2.6 Adjustment of JND (Just Noticeable Difference)

a) Adjust the “luminance” setting so that the two ultimate white gray levels of 0% and 5% in the first row can be exactly visible. The best state is to make the luminance difference of the two squares between 2 and 20 JND.

b) Reduce the “contrast ratio” gradually from maximum value until the two ultimate black gray levels of 100% and 95% in the second row can be just distinguished from each other. Similarly, the luminance difference between them should be between 2 and 20 JND.

c) Repeat the above process until the exactly distinguishable requirements of two ultimate gray scales can be achieved simultaneously. If it fails, the best JND between adjacent gray scale squares should be recorded in the experimental report. During the entire adjustment process, differentiating the four squares of 10%, 15%, 85% and 90% can be used to avoid giddiness or as a reference for brightness differences (when adjusting the difference between ultimate black and white squares, the gap between other gray squares can be uneven.)

A.3.2.7 Other controls

If there are other user controls, set them at the factory default positions. If there is no preset position, adjust them to the position with the best image and sound.

A.4 Test of energy consumption under active mode

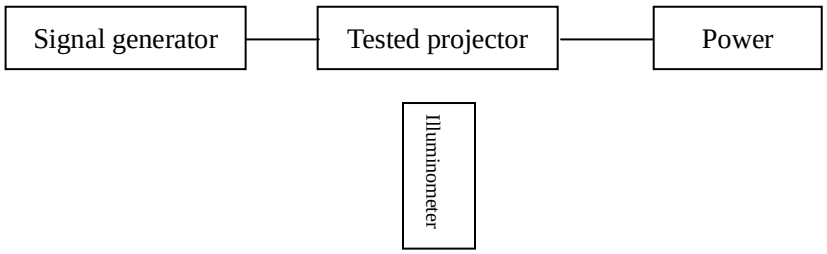

Fig.A.3 Power consumption test under active mode

A.4.1 Connect the test system as shown in Figure A.3, switch on the power supply for all test equipment, properly adjust power supply voltage and frequency (if the projector needs two or more independent power supply parts to work simultaneously to achieve general-purpose projector function, namely receiving input signal and generating images, etc., these parts need be connected to the power meter to calculate total power consumption);

A.4.2 Adjust the projector to the standard active mode specified in 3.2 of Annex A, input the full-while pattern signal described in 2.1.3 of Annex A, maintain the mode for no less than 30 minutes for warming up;

A.4.3 Input the signal required by 2.1.3 of Annex A, measure the illuminance values L_1-L_9 at P_1 *to* P_9 points specified in Figure A.2, calculate the average illuminance value with Formula A.1.

$$L = \frac{1}{9}\sum_{i=1}^{9} Li \qquad (A.1)$$

Where：L ——average illuminance value, lx;

L_i——illuminance at No.i point, lx;

i ——serial number of measured points.

Use Formula A.2 to calculate luminous flux output of the projector:

$$\Phi_V = L \times S \quad (A.2)$$

Where: Φ_V ——luminous flux output by the projector, lm;

L ——average illuminance value, lx;

S ——effective screen area, m^2.

A.4.4 Use signal generator to make the 100% full-white pattern test signal specified in Annex A.2.1.3 and measure the energy consumption of the product to play this signal for 30 minutes with a power meter. Calculate energy consumption under active mode with Formula A.3:

$$P_K = E / T_K \quad (A.3)$$

Where: P_K——energy consumption under active mode, W;

E——integral power value measured by an electrometer when playing standard video, Wh;

T_K ——energy consumption measuring time under active mode, h.

A.5 Energy efficiency index

Calculate product energy efficiency index with Formula A.4:

$$Eff = \Phi_V / P_K \quad (A.4)$$

Where: *Eff*——energy efficiency index, lm/W;

Φ_V——luminous flux output by projector, lm;

P_K ——active mode energy consumption, W.

Annex B

(Normative Annex)

Banned Phthalates

Chinese Name	English Name	Abbreviation
邻苯二甲酸二异壬酯	Di-iso-nonylphthalate	DINP
邻苯二甲酸二正辛酯	Di-n-octylphthalate	DNOP
邻苯二甲酸二（2-乙基己基）酯	Di-（2-ethylhexy）-phthalate	DEHP
邻苯二甲酸二异癸酯	Di-isodecylphthalate	DIDP
邻苯二甲酸丁基苄基酯	Butylbenzylphthalate	BBP
邻苯二甲酸二丁酯	Dibutylphthalate	DBP

Annex C

(Normative Annex)

Test Procedure for Power under Standby Mode

C.1 Test conditions

C.1.1 Environmental conditions

The same as Annex A 1.2.

C.1.2 Power source

The same as Annex A 1.3.

C.2 Test device

The same as Annex A 1.5.

C.3 Test of the power under standby mode

C.3.1 Switch on power supply of all test equipment, and properly adjust working range (if the projector needs two or more independent power supply parts to work simultaneously to achieve general-purpose projector function, namely receiving input signal, generating images, etc., these separate parts need be connected to the power meter to calculate total power consumption).

C.3.2 Connect the projector with test device

C.3.3 Set the projector under standby mode (refer to 3.2 of this standard) for 10 minutes, then measure 10 minutes by a power meter, calculate the power under standby mode with Formula C.1:

$$P_{\mathrm{d}} = \frac{E}{T_{\mathrm{d}}} \qquad (C.1)$$

Where

P_{d} ——power under standby mode, W with accuracy at 0.01W；

E ——Tested power consumption, Wh;

T_{d} ——Measurement time under standby mode, h.