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

GB/T 47531-2026

Industrial design - Guidelines for product form design

工业设计 产品形态设计指南

Issued on: April 30, 2026

Implemented on: November 1, 2026

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

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents". Drafting. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed and is under the jurisdiction of the National Industrial Design Basic Standardization Working Group (SAC/SWG31). This document was drafted by: China National Institute of Standardization, Beijing Pulong Technology Co., Ltd., Hangzhou Inspection and Testing Co., Ltd., and Shaoxing Huayu Textile. Jiji Co., Ltd., Shenzhen Aisi Technology Co., Ltd., Jiaying Rongshuo Machinery Co., Ltd., Harbin Institute of Technology, Chengdu Potential Artificial Intelligence Technology Co., Ltd. Limited Liability Company, Man Wah Furniture Group (Huizhou) Co., Ltd., Guangdong Zhongse Yanda New Material Technology Co., Ltd., Hengjie Sanitary Ware Group Co., Ltd. The company, IAT Automotive Technology Co., Ltd., China Standard Technology Group Co., Ltd., Longkou Kenor Glass Technology Co., Ltd., Shandong Hunan Provincial Institute of Standardization, Shenyang Industrial Pump Manufacturing Co., Ltd., Hunan University, China Jiliang University, and the Computer Network Information Center of the Chinese Academy of Sciences Heart, Guangdong Hesheng Kitchen Appliance Technology Co., Ltd., China University of Mining and Technology (Beijing), Guangdong Marubi Biotechnology Co., Ltd., China International Engineering Consulting company. The main drafters of this document are. Xu Yingcheng, Pan Husheng, Zhong Hao, Gao Xiaohong, Wang Shasha, Pei Fei, Zhao Huan, Zhang Shijuan, Liu Guangrong, and Tian Hongwei. Liu Haitao, Yin Xueyuan, Zhu Xianghua, Wang

Zuhai, Wang Yanfeng, Zhang Xin, Yang Yuexiang, Wang Xiaoqiang, Chen Weiming, Zhong Hao, Li Jianping, Wang Wei, Liu Fang Li Ying, Zhang Bing, Suo Yiwei, Hao Yingyu, Liu Xinquan, Zhu Peiwu, Guo Chaowan. Industrial Design Product Form Design Guide

1.Scope This document establishes the basic principles of product form design in industrial design, and provides design elements, design process, design methods, and design... Recommendations regarding accounting management. This document applies to activities related to product form design in the field of industrial design.

4 Basic Principles

4.1 Functional Principle Form design serves the core function of the product, ensuring that the appearance, structure and function are highly matched and do not deviate from the product's essential purpose.

4.2 Aesthetic Principles The appearance, color scheme, and proportions are visually appealing and consistent with the brand style to enhance product attractiveness without sacrificing aesthetics. Practicality.

4.3 Principle of Practicality Form design focuses on the needs, usage habits, ergonomic characteristics, and emotional appeal of the target users, combined with real-world usage scenarios. The exhibition ensures that the products combine safety, comfort, and enjoyment.

4.4 Sustainability Principle Prioritize the use of environmentally friendly and recyclable materials, while also considering energy conservation and emission reduction, in line with green design trends and environmental regulations; and also take into account product lifespan. The impact on lifespan, maintainability, upgradeability, and emotional durability.

4.5 The Principle of Integration Form design is not isolated; it can be systematically integrated with human-computer interaction, color, materials, processes, production technology, cost control, packaging, and logistics. Link elements ensure the feasibility and operability of the design concept.

5 Design Elements

5.1 Structural Elements The structural elements of form, through the systematic design of geometric shapes, structural layouts, and proportional dimensions, lay the foundation for the physical framework of the product's form, ensuring its stability. The form meets functional requirements while providing stable structural support and efficient space utilization. The structural elements of product form design include, but... Not limited to.

a) Geometric Form Shaping. Determine the core geometric language of the product (e.g., straight lines, curves, irregular shapes) and clarify the overall outline of the form. (e.g., square, round, streamlined) and core features (e.g., sharp angles, curves, hollow

structures);

b) Proportion and Dimension Optimization. Considering the dimensions of functional modules and aesthetic principles, design the product's length, width, and height ratios, as well as the dimensional proportions between components, to ensure... The form is harmonious and balanced, while also ensuring ease of use;

c) Structural layout design. Integrating the spatial layout of internal functional modules and external operating components, while taking into account the compactness of internal space (reducing redundancy). Spare space and external accessibility (common components are placed in easily accessible areas) are considered to avoid functional failures or deformations caused by structural conflicts. bloated;

d) Connection and Transition Design. Design the connection methods and transition forms between various components of the product to ensure structural stability while improving aesthetics. The integrity and refinement of the state.

5.2 Elements of Aesthetic Expression Aesthetic elements, through the comprehensive use of color, material, and detailed textures, endow product forms with visual beauty and emotional value, thereby fulfilling user needs. Emotional resonance, while simultaneously enhancing brand recognition and market differentiation. Aesthetic elements of product form design include, but are not limited to.

a) Form and semantic design. conveying product function, usage logic, and aesthetic features through form elements, allowing users to anticipate the product's meaning visually. Product usage (e.g., raised shapes indicate buttons, recessed shapes indicate placement areas, streamlined shapes indicate mobility functions), reducing the need for... While reducing user learning costs, it also conveys the brand's core values (such as a minimalist design conveying environmental protection and a robust design conveying safety). Achieving aesthetic appeal;

b) Color System Design. Develop a product color scheme, including the selection and combination of primary, secondary, and accent colors, while also considering the color... Stain resistance, versatility, and cultural adaptability;

c) Material Selection and Texture Matching. Based on product positioning, functional requirements, and cost budget, select suitable materials and design the material application. Use the method;

d) Detailed Texture and Decorative Design. Enhance the visual hierarchy of the form through surface texture and decorative elements. Detailed design should meet functional requirements. Consistency and refinement are required; meaningless decorative designs should be avoided.

5.3 Elements of Human-Computer Interaction Human-computer interaction elements are user-centric, based on human physiological characteristics and psychological cognitive

habits, and designed to adapt to user behavior. The human-computer interaction elements of product form design ensure comfort, safety, and efficiency during grip, operation, and use. But not limited to.

a) Operational adaptation design. Based on the physiological data of the target user group, design the product's grip shape and the shape of operating components (such as buttons). The height of the protrusion, the diameter of the knob, and the size of the touch area ensure a comfortable grip that conforms to the curve of the hand, reducing concentrated pressure; during operation... Smooth operation avoids accidental touches or difficult operation; low physiological fatigue after prolonged use;

b) Cognitive guidance design. through visual differences in form, spatial layout (such as linear guidance of the operation process, and proximity of frequently used functions) (The layout guides users to quickly understand the product's usage logic, conforming to the principle of "intuitive operation");

c) Safety Protection Design. Based on the product's usage scenarios and potential risks, design protective forms, such as rounded corners to prevent bumps and knocks. Concealed design of sharp parts, anti-slip bottom of heavy products, anti-electric shock design of interfaces in electrical products, and insulation of high-temperature components. Thermal properties, shock-resistant properties for outdoor products, and waterproof and sealing properties for products used in humid environments;

6 Design Process

6.1 Overview The product form design process can be divided into five stages. preliminary preparation stage, idea generation stage, scheme selection and confirmation stage, and scheme verification stage. The phase and iterative optimization phase are shown in Figure 1.

6.2 Preliminary Preparation Stage

6.2.1 Functional Requirements Analysis In conjunction with the product and engineering teams, we conducted an in-depth analysis of product functional requirements, clarified the core and auxiliary functions of the product, and determined the technical specifications of the functional modules. Technical parameters and performance requirements.

6.2.2 User and Scenario Analysis Build target user profiles through user research (interviews, questionnaires, behavioral observations), including age, physiological characteristics, usage habits, and aesthetic preferences. Analyze product usage scenarios and special environmental requirements to create a requirements analysis document.

6.2.3 Constraints are clearly defined Taking into account factors such as product cost budget, mass production scale, brand positioning, and constraints such as existing technological level and material properties, the product should be clearly defined. Market