中国标准化研究院
CHINA NATIONAL INSTITUTE OF STANDARDIZATION

《充电桩能效限定值及能效等级》标准进展介绍

■ 时间：2024年11月5日

Introduction to the Preparation of the “National Standard for Minimum Allowable Values and Energy Efficiency Grades for Electric Vehicle Charging Piles”

■ Date：5 November 2024

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政策背景 Policy Background

1998年

《中华人民共和国节约能源法》

第13条 国务院标准化主管部门和国务院有关部门依法组织**制定**并适时修订有关**节能的国家标准**，建立健全节能标准体系。
第16条 国家对落后的**耗能过高的用能产品**、设备和生产工艺实行**淘汰**制度。 “

“Law of the PRC China on Energy Conservation”

Article 13: “The administrative department for standardization under the State Council and the relevant departments under the same shall, according to law, organize efforts to **formulate**, and modify in a timely manner, **national standards** for energy conservation, to set up a sound system of standards for energy conservation.”
Article 16: “The State applies an **elimination** system to the outdated products, equipment and production techniques which **consume excessive quantities of energy**.”

2022年

《关于进一步提升电动汽车充电基础设施服务保障能力的实施意见》

“十四五”末形成适度超前、布局均衡、智能**高效充电基础设施**体系，**满足**超**2000万辆**电动汽车充电需求。

“Implementation Opinions on Further Enhancing the Service Assurance Capacity of Electric Vehicle Charging Infrastructure”

Establishing a moderately advanced, well-balanced, intelligent, and **efficient charging infrastructure** system to meet the charging needs of over **20 million electric vehicles** by the end of the 14th Five-Year Plan

2021年

《关于完整准确全面贯彻新发展理念做好碳达峰碳中和工作的意见》

大幅**提升能源利用效率**，把**节能贯穿于**经济社会发展全过程和**各领域**，持续深化工业、建筑、**交通运输**、公共机构等重点领域节能。

"Guidelines on Fully, Accurately, and Comprehensively Implementing the New Development Concept for Carbon Peaking and Carbon Neutrality Work"

Significantly **enhancing energy efficiency**, **integrating energy conservation** throughout all stages and **sectors** of economic and social development, with a sustained focus on deepening energy-saving efforts in key areas such as industry, buildings, **transportation**, and public institutions.

2024年

国家发展改革委等部门发布《重点用能产品设备能效先进水平、节能水平和准入水平（2024年版）》

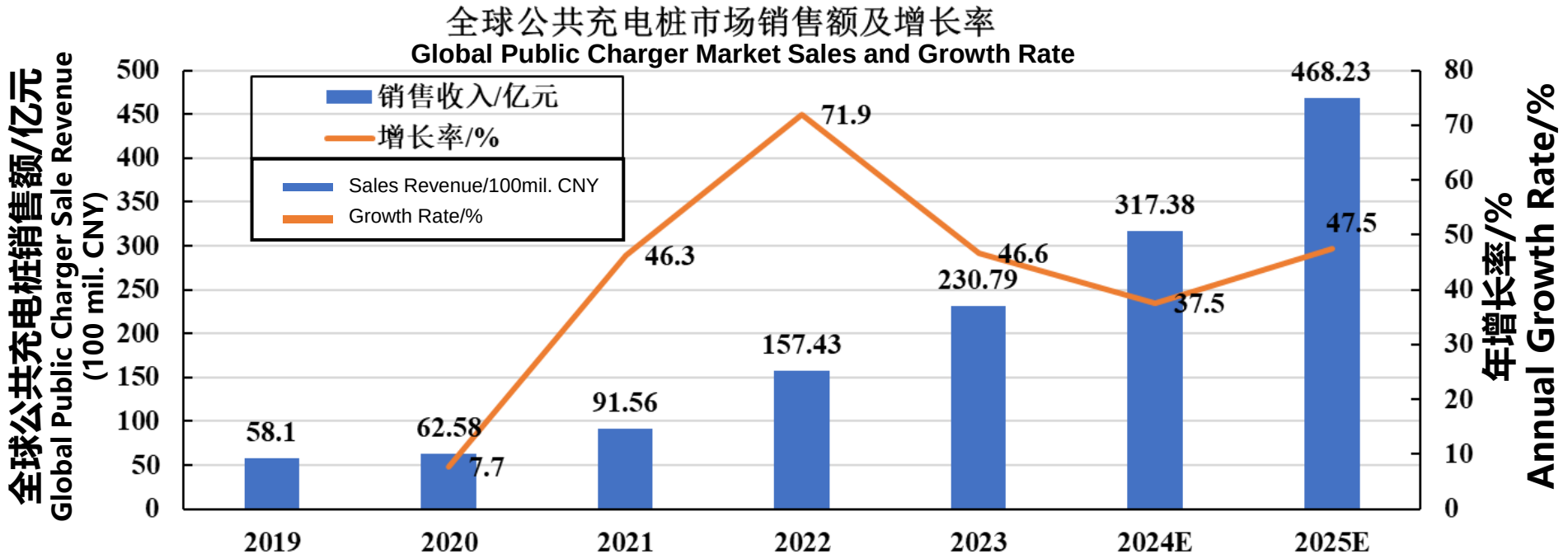
《重点用能产品设备能效先进水平、节能水平和准入水平（2024年版）》

依据团体标准提出**充电桩能效先进水平、节能水平**，要求加快强制性能效标准更新升级，填补信息通信、**交通运输**、新型家电、可再生能源等领域**强制性能效标准空白**。

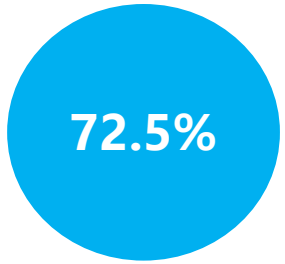
“Benchmarks for Key Energy-Consuming Products and Equipment: Advanced Energy Efficiency Level, Energy-Saving Level, and Baseline Level (2024 Edition)”

Based on group standards, the **advanced energy efficiency level and energy-saving level** for charging stations are proposed, requiring accelerated updates to mandatory efficiency standards and addressing **gaps in mandatory standards** across areas such as information and communication, **transportation**, new home appliances, and renewable energy.

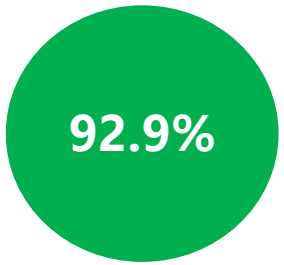
市场情况—全球市场规模 Market Overview—Global Market



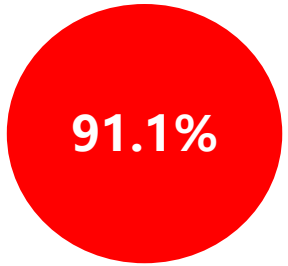
2023年 中国占比 China's Share 2023



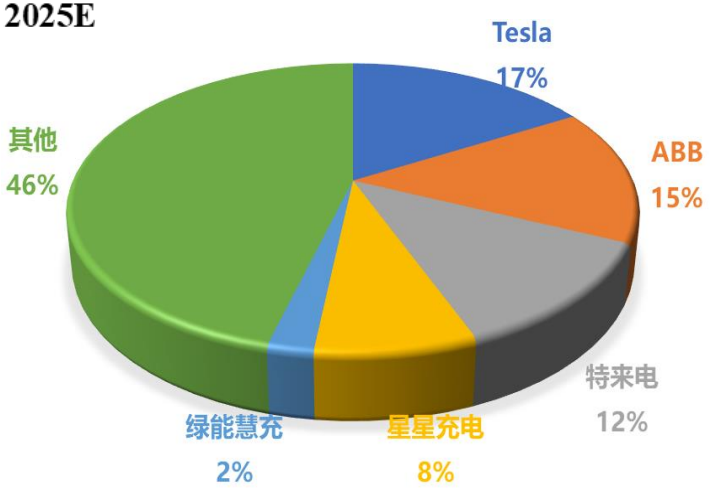
全球市场规模 Global Market Size



全球市场产量 Global Market Production



全球市场份额 Global Market Share



资料来源：第三方资料、新闻报道、业内专家采访及 QYResearch 整理研究，2024年

市场情况—中国市场规模 Market Overview—Chinese Market

- 2024年1-9月，充电基础设施增量为283.7万台，同比上升16.6%，其中公共充电桩增量60.3万台，同比下降9.3%，随车配建私人充电桩增量223.4万台，同比上升26.4%。
- 截止2024年9月底，中国充电桩保有量达到1143.3万台，同比增加49.6%。
- From Jan. to Sep. 2024, charging infrastructure increased by 2.837 million units, year-on-year growth of 16.6%. Among this, the increase in public chargers was 603,000 units, down 9.3% from previous year, while the increase in privately installed chargers that come with vehicles was 2.234 million units, up 26.4% year-on-year.
- At the end of Sep. 2024, the total number of chargers in China reached 11.433 million units, reflecting a year-on-year increase of 49.6%.

充电设施分类 Charging Infrastructure Type	1-9月全国增量 Increase Nationwide（Jan-Sep）	同比 Year-on-Year Change	9月底全国累计保有量 Total Cumulative Units Nationwide (End of Sep)	同比 Year-on-Year Change
公共充电基础设施数量 Number of Public Charging Infrastructure Units	60.3万台 603,000 units	-9.3%	332.9万台 3,329,000 units	35.2%
随车配建充电基础设施数量 Number of Charging Infrastructure Units Installed with Vehicles	223.4万台 2,234,000 units	26.4%	810.4万台 8,104,000 units	56.4%
总计 Total	283.7万台 2,837,000 units	16.6%	1143.3万台 11,433,000 units	49.6%

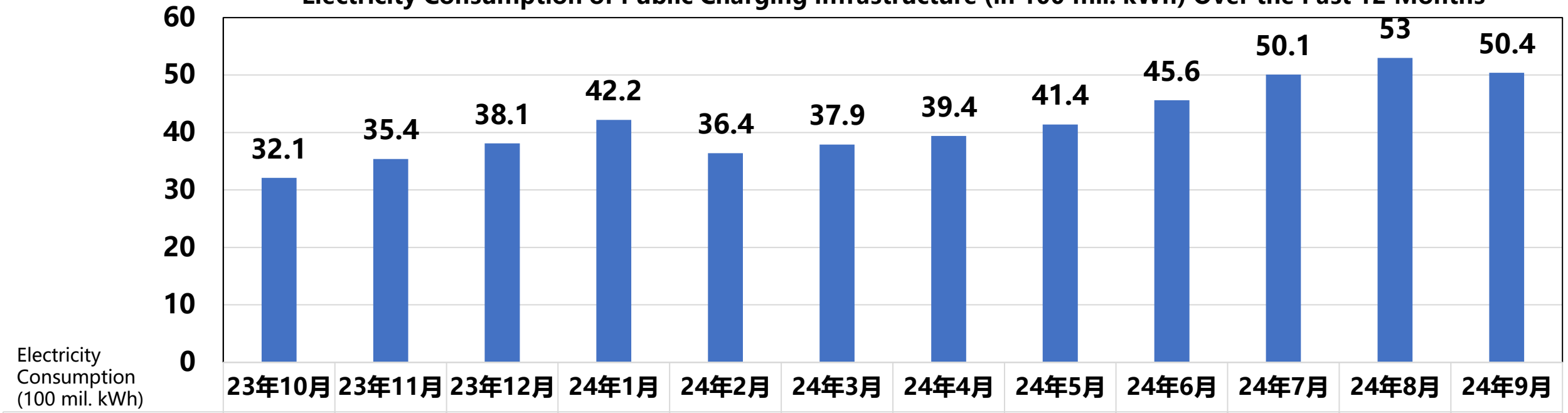
市场情况—中国用电规模 Market Overview—Energy Consumption in China

- 2024年9月，全国公共充电总电量约50.4亿度，较上月减少2.6亿度，同比增长58.6%。
- 近12月仅公共充电基础设施的充电电量已达到**502亿度。**

- In Sep. 2024, the total electricity consumption of public chargers nationwide was appr. 5.04 billion kWh, a decrease of 260 million kWh from the previous month, but an increase of 58.6% year-on-year.
- Over the past 12 months, the electricity consumed by the public charging infrastructure has reached 50.2 billion kWh.

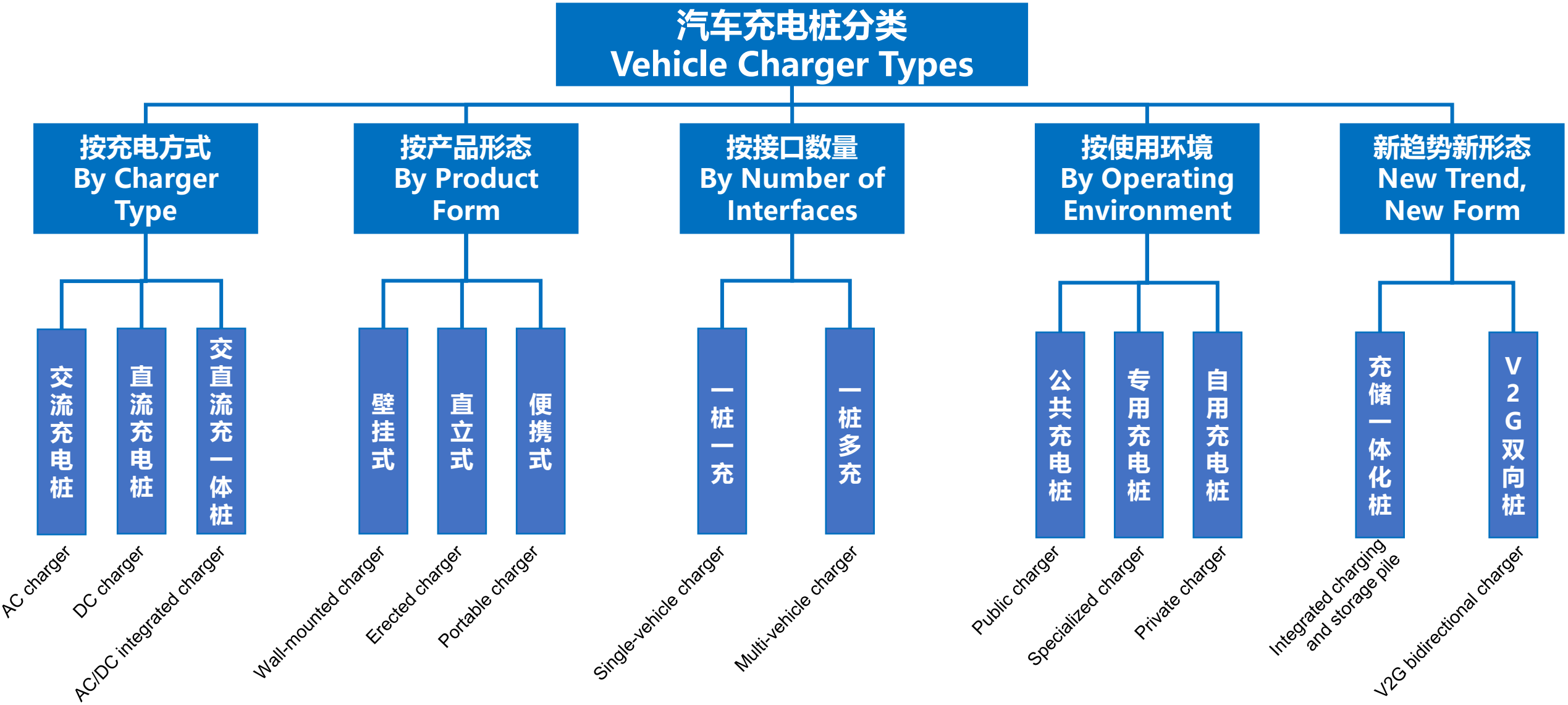
近12月公共充电基础设施充电电量（亿度）

Electricity Consumption of Public Charging Infrastructure (in 100 mil. kWh) Over the Past 12 Months



	23年10月	23年11月	23年12月	24年1月	24年2月	24年3月	24年4月	24年5月	24年6月	24年7月	24年8月	24年9月
充电电量（亿度）	32.1	35.4	38.1	42.2	36.4	37.9	39.4	41.4	45.6	50.1	53	50.4

市场情况—产品类型 Market Overview—Product Types



市场情况—能效 Market Overview—Energy Efficiency

新能源汽车市场爆发式增长，对充电桩提出了更高要求。目前，**充电桩行业在能效方面**面临的**主要挑战**包括：

- **电能损耗大：**充电中存在变压器损耗、功率模块转换损耗、线缆端子损耗等，整机损耗约6%~8%。

- **产品质量存在差异：**不同生产企业充电设备的充电效率及功耗存在差异，用户无法识别。
- **对能效重视有待提升：**以往多关注车桩兼容性、用户便捷性、人机交互界面等，对能效重视程度有待提升。

The rapid growth of the electric vehicle market has raised demands for chargers. Currently, the charger industry faces several major challenges regarding energy efficiency:

- High Energy Loss: During charging, there are losses from transformers, power module conversions, cable terminals, etc., resulting in an overall energy loss of approximately 6% to 8%.
- Quality Variability: There are differences in charging efficiency and power consumption among charging equipment produced by different manufacturers, making it difficult for users to identify these discrepancies.
- Need for Greater Focus on Energy Efficiency: In the past, the emphasis was mainly on vehicle-to-charger compatibility, user convenience, and human-machine interaction interfaces, with insufficient attention paid to energy efficiency.

电能损失 Electricity Loss

随车配建私桩 Private chargers included with vehicle

Public chargers 公共桩

充电用户买单 Charger user covers costs

充电运营商买单 Charger operator covers costs

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节能潜力分析 Energy-Saving Potential Analysis

- ◆ 节能效益测算
- ◆ Energy-saving benefits assessment

2027年新能源车 5000万辆	EVs (2027) 50 million
2027年充电量 1000亿度	Charging volume (2027) 100 TWh
电价0.5元/kwh	Electricity price 0.5 CNY/kwh

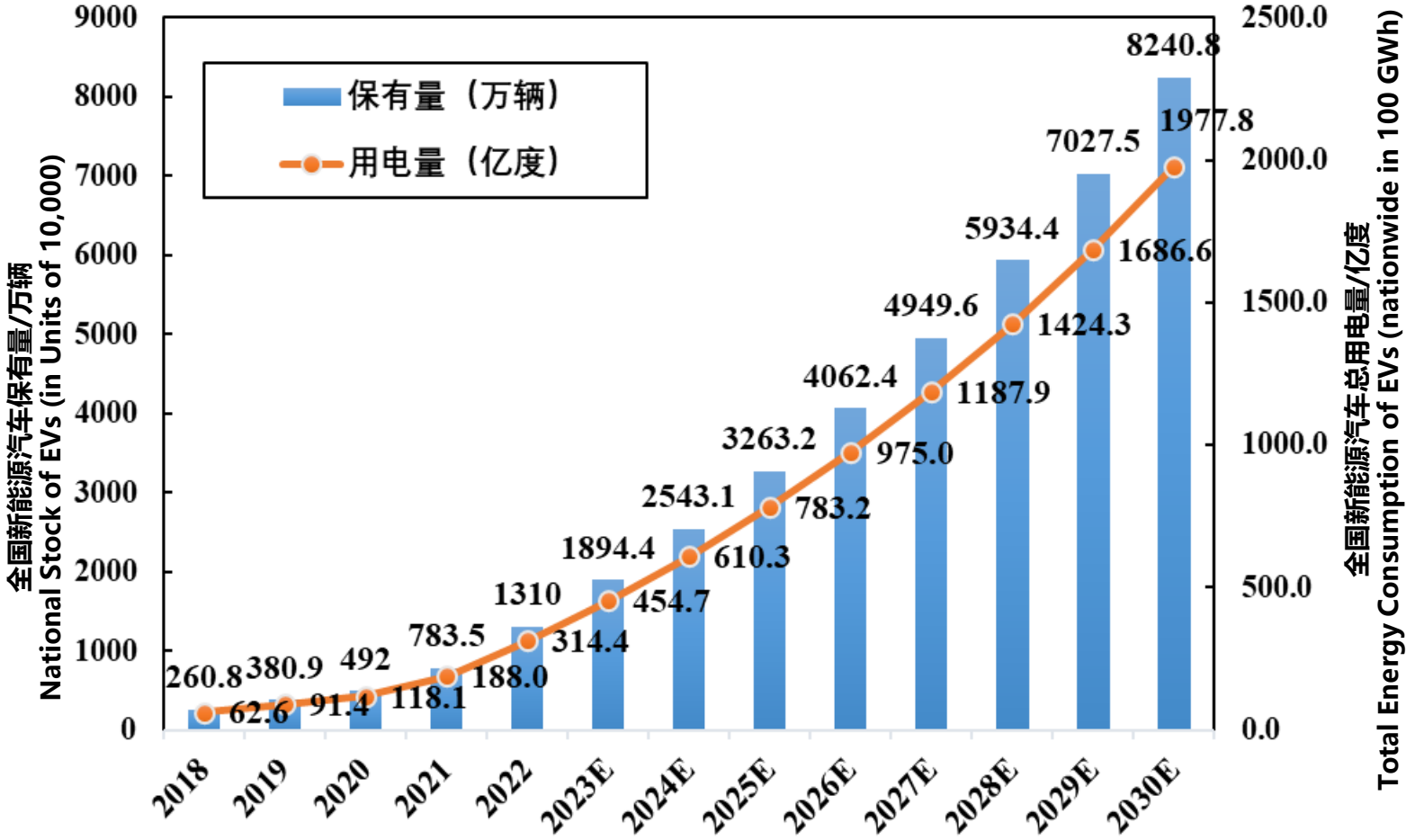
标准实施到2030年，产品能效提升1%，存量产品

By 2030, with the implementation of standards, product energy efficiency will be improved by 1%, focusing on existing products.

年节电量 10亿kWh Annual electricity savings 1 bn kWh	年经济效益 5亿元 Annual economic benefits 500 m CNY	年碳减排 59万吨 Annual carbon reduction 590 000 t

全国新能源汽车保有量及年用电量预测

National Stock of EVs and Annual Electricity Consumption Forecast



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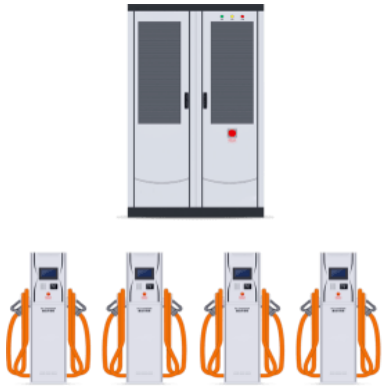
产品范围 Product Scope

- **标准名称：**电动汽车充电桩能效限定值及能效等级
- **产品范围：**电流控制和/或电压控制的非车载传导式供电设备，包括直流充电桩 （模式4连接方式C）与交流充电桩（模式3连接方式C ），其供电网侧额定电压不超过1000 V AC，电动汽车侧额定最大电压不超过1000 V AC或1500 V DC。

- Name of standard: Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Electric Vehicle Charging Piles
- Product scope: Non-vehicle conductive power supply equipment that features current control and/or voltage control, including DC chargers (Mode 4 Connection Type C) and AC chargers (Mode 3 Connection Type C). The rated supply voltage on the grid side does not exceed 1000 V AC, and the maximum rated voltage on the electric vehicle side does not exceed 1000 V AC or 1500 V DC.

交流充电桩（单相/三相）
AC charger (single phase/three phase)

一体式直流充电桩
Integrated DC charger



分体式直流充电桩
Split DC chargers

=

分体式主机
Split main unit

+

分体式终端
Split terminal

不适用的产品范围：

- **供电网侧仅提供直流供电的供电设备;**
- **模式2充电的缆上控制与保护装置（IC-CPD）；**
- **具备放电功能的供电设备**
- **自动充电、顶部接触式充电的供电设备；**
- **具备储能功能的供电设备。**

Products Not Applicable:

- Power supply equipment that provides only DC power on the grid side;
- Cable control and protection devices for Mode 2 charging (IC-CPD);
- Power supply equipment with discharging capabilities;
- Power supply equipment for automatic charging and top-contact charging;
- Power supply equipment with energy storage capabilities.

产品范围 Product Scope

➢ CN-Standard

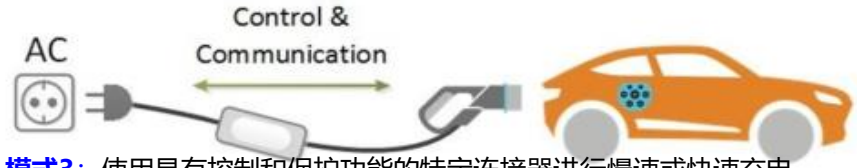
◆ **模式1**：从常规电源插座（单相或三相）缓慢充电，需要非常长的时间。

◆ **Mode 1:** Slow charging from a regular power outlet (single-phase or three-phase), requiring a very long time.

Mode 1 ✓ **Mode 1**

◆ **模式2**：从常规插座缓慢充电，但是带缆上保护盒。

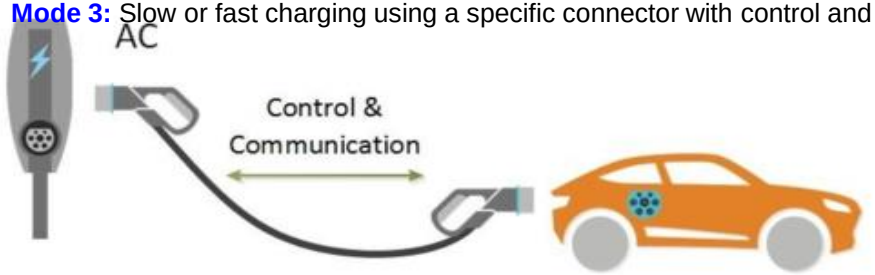
◆ **Mode 2:** Slow charging from a regular power outlet with an in-cable protection box



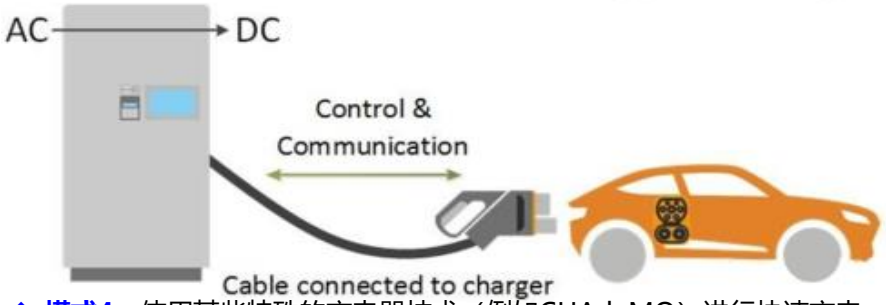
Mode 2 ✓ **Mode 2**

◆ **模式3**：使用具有控制和保护功能的特定连接器进行慢速或快速充电。

◆ **Mode 3:** Slow or fast charging using a specific connector with control and protection functions



Mode 3 ✓ **Mode 3**

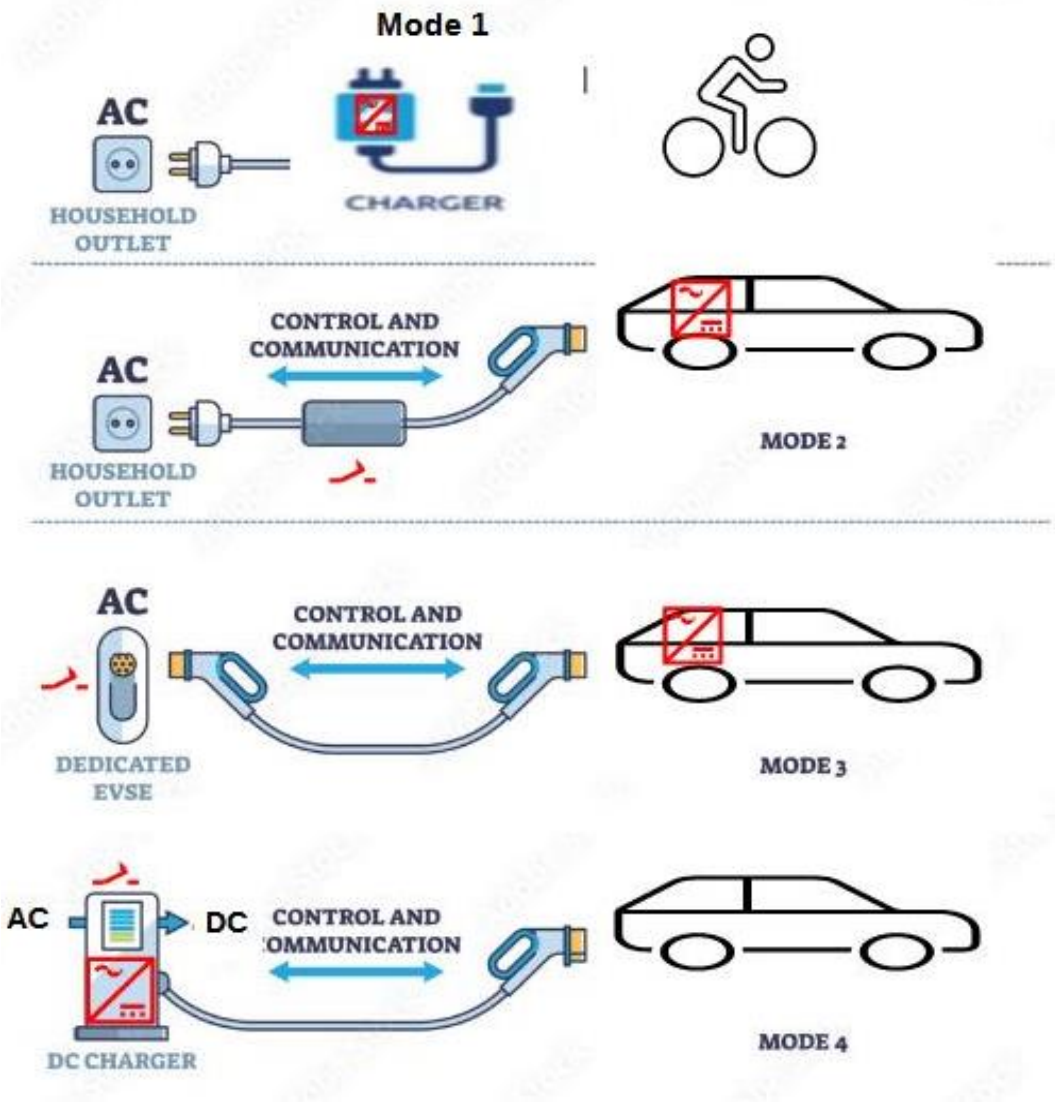


Mode 4 ✓ **Mode 4**

◆ **模式4**：使用某些特殊的充电器技术（例如CHAdeMO）进行快速充电，就是直流充电。

◆ **Mode 4:** Fast charging using certain specialized charging technologies (CHAdeMO), specifically for DC charging.

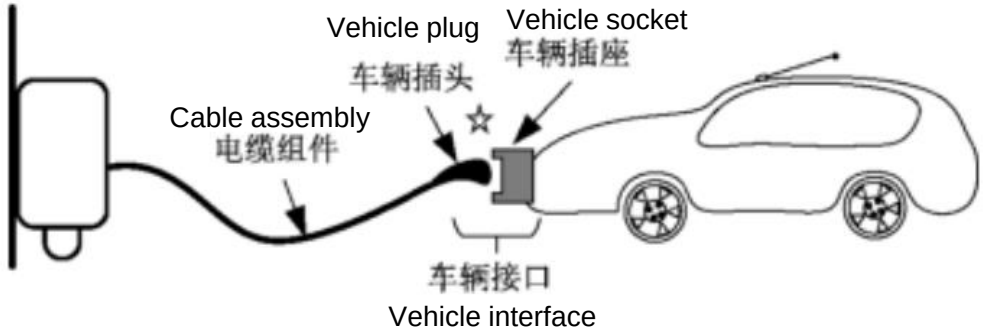
➢ EU-Standard



产品范围 Product Scope

连接方式 C　case C connection

将电动汽车与供电网连接时，使用了和供电设备永久连接在一起的带有车辆插头的电缆组件，见图 3。



标引序号说明：

☆——连接点。

注：电缆组件是供电设备的一部分。

Labeling Sequence Description:

☆ Connection point

Note: The cable assembly is a part of the power supply equipment.

图 3　连接方式 C

Figure 3: Connection Method C

Connection Method C

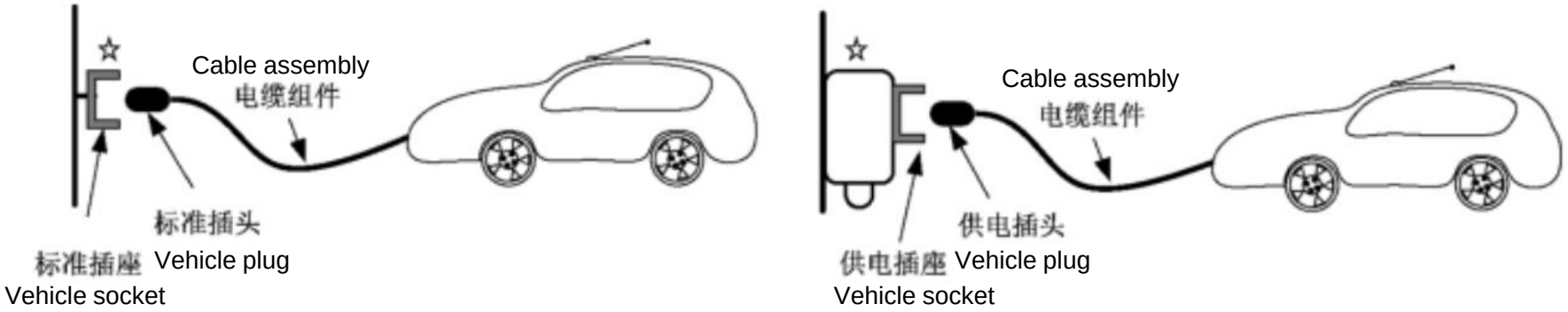
When connecting an electric vehicle to the power grid, a cable assembly with a vehicle plug, permanently connected to the power supply equipment, is used (see Figure 3).

产品范围 Product Scope

3.1.5.1

连接方式 A　case A connection

将电动汽车与供电网/供电设备连接时，使用和电动汽车永久连接在一起的带有标准插头/供电插头的电缆组件，见图 1。



标引序号说明：

☆——连接点。

注：电缆组件是电动汽车的一部分。

Labeling Sequence Description:

☆ Connection point

Note: The cable assembly is a part of the power supply equipment.

图 1　连接方式 A

Figure 1: Connection Method A

Connection Method A

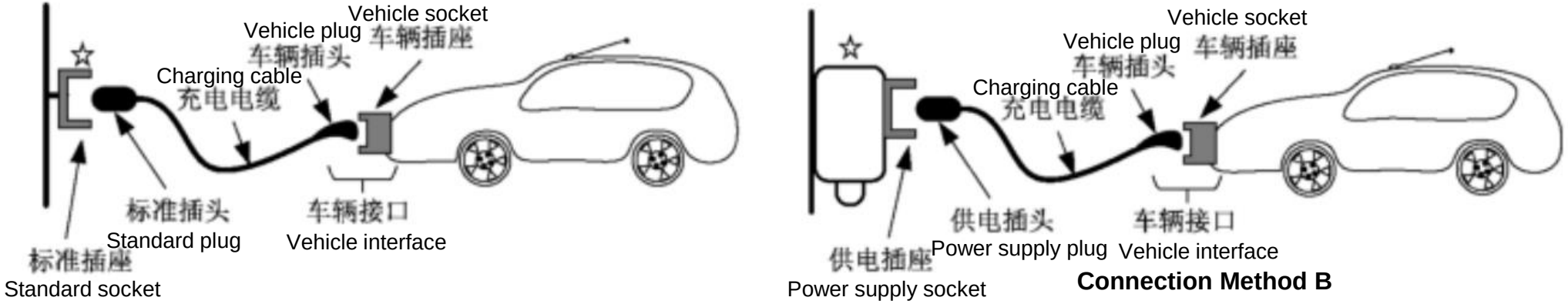
When connecting an electric vehicle to the power grid/power supply equipment, a cable assembly with a standard plug/power plug, permanently connected to the electric vehicle, is used (see Figure 1).

产品范围 Product Scope

3.1.5.2

连接方式 B　case B connection

将电动汽车与供电网/供电设备连接时，使用带有车辆插头和标准插头/供电插头的独立的可拆卸电缆组件，见图 2。



标引序号说明：

☆——连接点。

注：可拆卸电缆组件不是电动汽车或者供电设备的一部分。

Labeling Sequence Description:

☆ Connection point

Note: The standard socket, charging cable, and detachable cable assembly are not part of the electric vehicle or the power supply equipment.

图 2　连接方式 B

Figure 2: Connection Method B

Connection Method B

When connecting an electric vehicle to the power grid/power supply equipment, a separate, detachable cable assembly with a vehicle plug and a standard plug/power plug is used (see Figure 2).

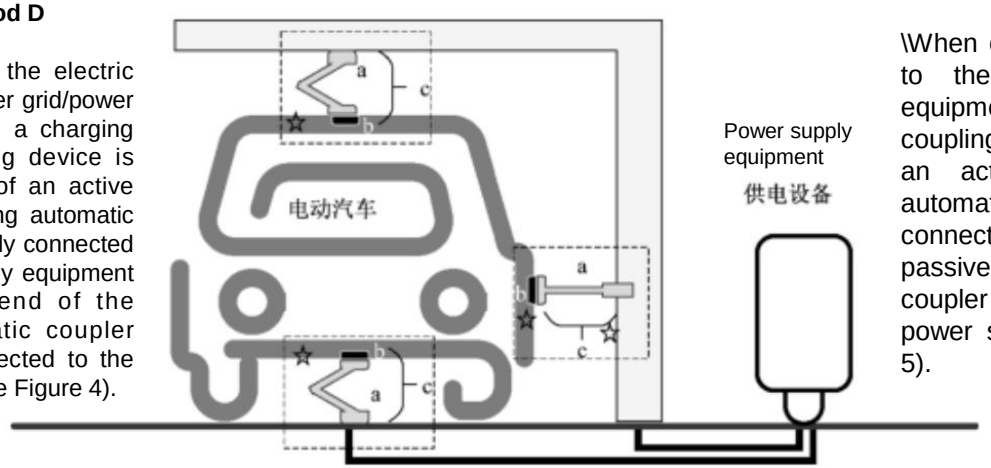
产品范围 Product Scope

连接方式 D　case D connection

将电动汽车与供电网/供电设备连接时，使用了与供电设备永久连接的充电自动耦合器主动端和与电动汽车永久连接的充电自动耦合器被动端组成的充电自动耦合器，见图 4。

Connection Method D

When connecting the electric vehicle to the power grid/power supply equipment, a charging automatic coupling device is used, consisting of an active end of the charging automatic coupler permanently connected to the power supply equipment and a passive end of the charging automatic coupler permanently connected to the electric vehicle (see Figure 4).



标引序号说明：

a ——充电自动耦合器主动端；

b ——充电自动耦合器被动端；

c ——充电自动耦合器；

☆ ——连接点。

Labeling Sequence Description:

a -- Charging automatic coupler active end
b -- Charging automatic coupler passive end
c -- Charging automatic coupler
☆ -- Connection point

充电自动耦合器主动端可以地面安装（包括嵌入安装和表面安装）、壁挂式安装、建筑物内顶部安装。

充电自动耦合器主动端中的车辆插头可被运动操控。

图 4　连接方式 D 示意图

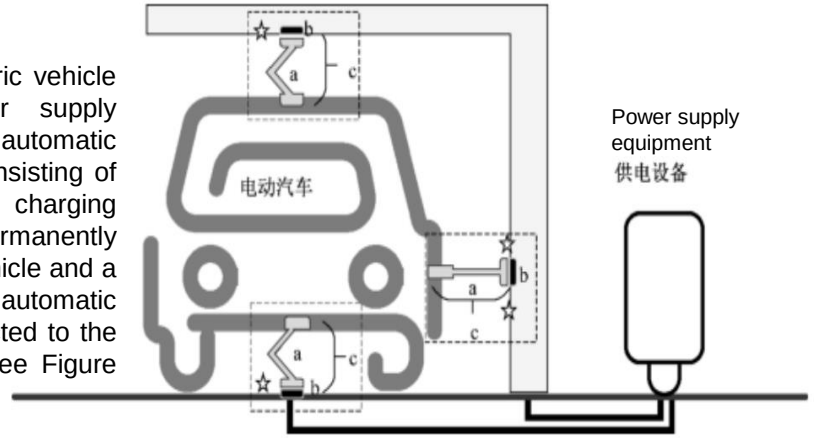
The active end of the charging automatic coupler can be installed on the ground (including embedded and surface installations), wall-mounted, or mounted on the top of a building. The vehicle plug in the active end of the charging automatic coupler can be controlled by motion.

连接方式 E　case E connection

将电动汽车与供电网/供电设备连接时，使用了与电动汽车永久连接的充电自动耦合器主动端和与供电设备永久连接的充电自动耦合器被动端组成的充电自动耦合器，见图 5。

Connection Method E

\When connecting the electric vehicle to the power grid/power supply equipment, a charging automatic coupling device is used, consisting of an active end of the charging automatic coupler permanently connected to the electric vehicle and a passive end of the charging automatic coupler permanently connected to the power supply equipment (see Figure 5).



标引序号说明：

a ——充电自动耦合器主动端；

b ——充电自动耦合器被动端；

c ——充电自动耦合器；

☆ ——连接点。

Labeling Sequence Description:

a -- Charging automatic coupler active end
b -- Charging automatic coupler passive end
c -- Charging automatic coupler
☆ -- Connection point

充电自动耦合器主动端可以车身下安装、侧面安装（包括车身前面、后面或侧面安装）、壁挂式安装、建筑物内顶部/嵌入屋顶安装。

充电自动耦合器主动端中的车辆插座可以被运动操控。

图 5　连接方式 E 示意图

The active end of the charging automatic coupler can be installed under the vehicle, on the side (including installations on the front, rear, or side of the vehicle), wall-mounted, or on the top/embedded in the roof of a building. The vehicle socket in the active end of the charging automatic coupler can also be controlled by motion.

产品范围 Product Scope

Content 内容	GB/T 国标	EU 欧盟	US 美国	Japan 日本
AC Connector 交流电接头				
AC Parameter 参数	1. Single/Three Phase 单相/三相 2. 250/440V 3. Max. 32/63A最高32/63A	1. Single/Three Phase单相/三相 2. 250/480V 3. Max. 32/63A	1. Single Phase单相 2. 120/240V 3. Max. 16/80A	1. Single Phase单相 2. 120/240V 3. Max. 16/80A
DC Connector 直流电接头				
DC Parameter 参数	1. DC-750V/1000V 2. Normal. 250A/600A 3. Max. 800A/1000A*	1. DC-850V/1000V 2. Normal. 200A 3. Max. 500A	1. DC-600/1000V 2. Normal. 200A 3. Max. 500A	1. DC-600/1000V 2. CHAdeMO1.0 125A 3. CHAdeMO2.0 400A

产品范围 Product Scope

规范性引用文件：

GB/T 18487.1　电动汽车传导充电系统 第1部分：通用要求

GB/T 29317　电动汽车充换电设施术语

GB/T 40432　电动汽车用传导式车载充电机

NB/T 33001　电动汽车非车载传导式充电机技术条件

NB/T 33002　电动汽车交流充电桩技术条件

术语和定义：

- ✓ 直流充电桩
- ✓ 一体式直流充电桩
- ✓ 分体式直流充电桩
- ✓ 充电终端
- ✓ 充电桩主机
- ✓ 交流充电桩
- ✓ 运行模式
- ✓ 充电效率
- ✓ 运行功耗
- ✓ 待机模式
- ✓ 待机功耗

Normative References：

GB/T 18487.1 Electric vehicle conductive charging system – Part 1: General requirements

GB/T 29317 Terminology of electric vehicle charging/battery swap infrastructure

GB/T 40432 Conductive on-board charger for electric vehicles

NB/T 33001 Specification for electric vehicle off-board conductive charger

NB/T 33002 Specification for electric vehicle AC charging spot

Terms and Definitions:

- ✓ DC charger
- ✓ Integrated DC charger
- ✓ Separated DC charger
- ✓ Charging terminal
- ✓ Charger host
- ✓ AC charger
- ✓ Operating mode
- ✓ Charging efficiency
- ✓ Operating power consumption
- ✓ Standby mode
- ✓ Standby power consumption

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4. 能效评价指标
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3. Product Scope
4. Energy Efficiency Evaluation Metrics
5. Energy Efficiency Testing Method

能效评价指标 Energy Efficiency Evaluation Metrics

编号 No.	产品类型 Product Type	能效评价指标 Energy Efficiency Evaluation Metric	
1	一体式直流充电桩 Integrated DC Charger	充电效率 Charging efficiency η_{DC}/%	待机功耗 Standby power consumption P_o/W
2	分体式直流充电桩主机 Separated DC Charger Host	充电效率 Charging efficiency η_{DC}/%	待机功耗 Standby power consumption P_o/W
3	分体式直流充电桩终端 Separated DC Charger Terminal	充电效率 Charging efficiency η_{DC}/%	待机功耗 Standby power consumption P_o/W
4	交流充电桩（单相、三相） AC Charger (single-phase, three-phase)	运行功耗 Operating power efficiency P_{I_AC}/W	待机功耗 Standby power consumption P_o /W

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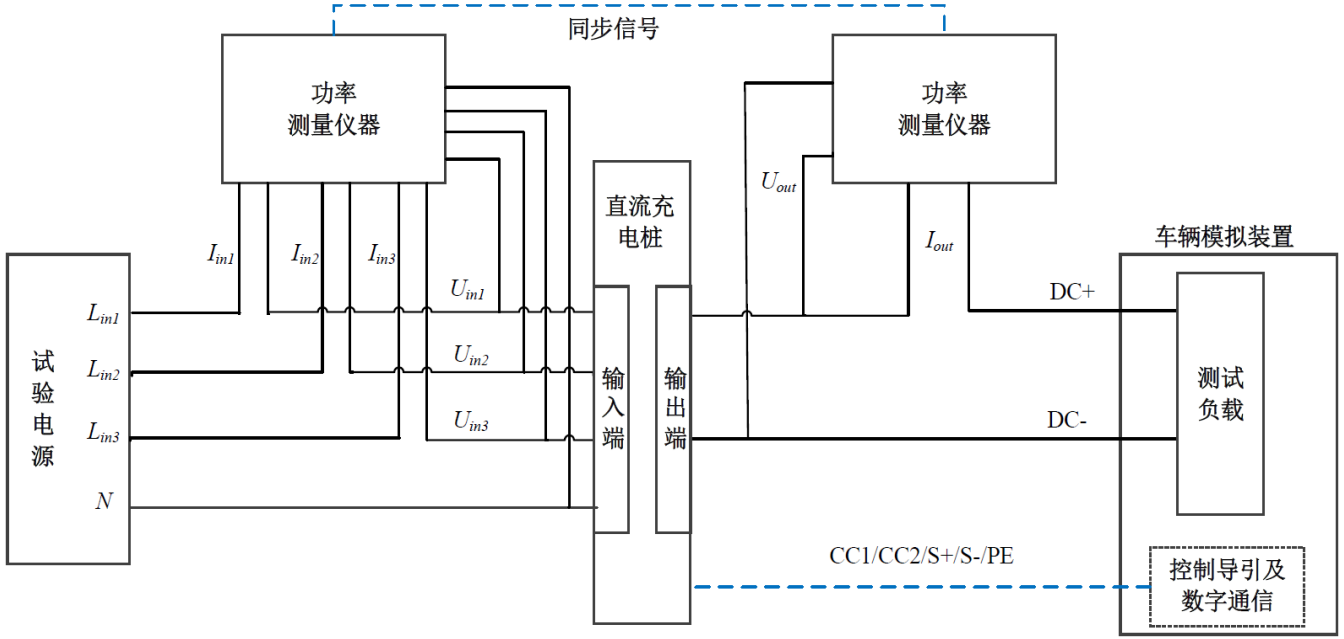
能效测试方法——一体式直流充电桩

Energy Efficiency Testing Method —Integrated DC Charger

一体式直流充电桩能效测量原理图
Energy Efficiency Measurement Schematic for Integrated DC Chargers



充电效率计算公式
Formula for Calculating Charging Efficiency

$$\eta_t = \frac{\int_0^T P_{out}(t)\,dt}{\int_0^T P_{in}(t)\,dt} \times 100\%$$

待机功耗计算公式
Formula for Calculating Standby Power Consumption

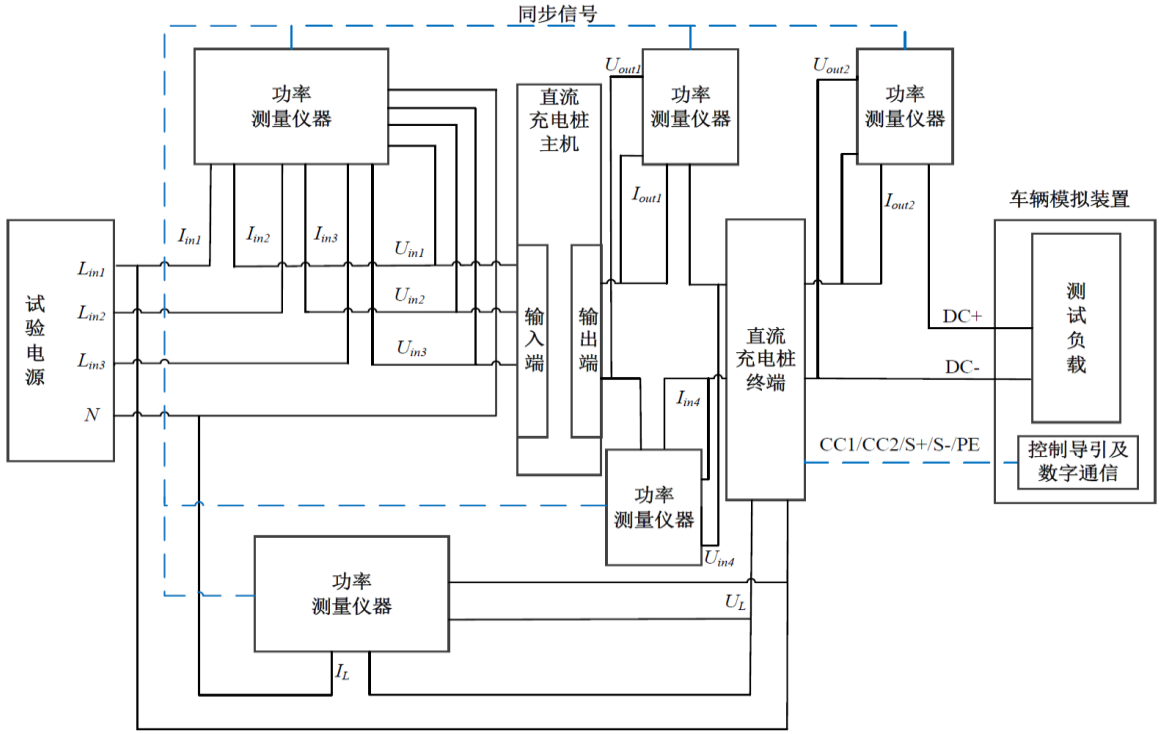
$$P_o = \frac{\int_0^T U_{in} I_{in}(t)\,d(t)}{T}$$

能效指标 Metrics	测试条件 Testing Conditions	测试步骤 Testing Steps
充电效率 Charging Power	**环境条件**：温度15-35℃；湿度45%RH~75%RH；大气压86 kPa~106 kPa；海拔不超过2000m。 **供电电源**：50Hz 220 V/380 V交流源。 **仪器误差**：充电效率与待机功耗测量误差分别不高于0.1%、0.5W。 **测试前准备**：关闭与充电无关的附加功能，如广告显示屏、指示灯、Wi-Fi热点、蓝牙；预热运行5分钟。 **Environmental Conditions:** Temperature: 15–35°C; Humidity: 45–75% RH; Atmospheric Pressure: 86 kPa–106 kPa; Altitude: Not exceeding 2000m. **Power Supply:** 50Hz, 220V/380V AC source. **Instrument Error:** Charging efficiency and standby power measurement error must be within 0.1% and 0.5W, respectively. **Preparation Before Testing:** Turn off non-charging-related functions such as advertising displays, indicator lights, Wi-Fi hotspots, and Bluetooth. Run a 5-minute preheating operation.	① 连接并调节样品、车辆模拟设备和测试负载。调节被测产品输出电压Ui至U1、U2、U3，并使样品负载电流工作在20%、50%、100%的Pmax/Ui。 ② 运行不低于5分钟，累积输入及输出电能。 ③ 计算不同负载及电压工况下样品的加权充电效率。 ① Connect and adjust the sample, vehicle simulation equipment, and test load. Adjust the output voltage UiU_iUi of the product under test to U1U_1U1, U2U_2U2, U3U_3U3, and set the sample load current to operate at 20%, 50%, and 100% of Pmax/UiP_{\text{max}} / U_iPmax/Ui. ② Operate for at least 5 minutes to accumulate input and output energy. ③ Calculate the weighted charging efficiency of the sample under different load and voltage conditions.
待机功耗 Standby Power Consump -tion		① 断开车辆或车辆模拟设备和测试负载。 ② 待机不低于30分钟，累积输入电能。 ③ 计算待机状态下样品的功率损耗。 ① Disconnect the vehicle or vehicle simulation equipment and test load. ② Enter standby mode for at least 30 minutes, accumulating input energy. ③ Calculate the power loss of the sample in standby mode.

能效测试方法—分体式直流充电桩主机+终端

Energy Efficiency Testing Method —Split-Type DC Charger Main Unit + Terminal

分体式直流充电桩能效测量原理图
Energy Efficiency Measurement Schematic for Split-Type DC Charger Main Units + Terminals



主机充电效率计算公式
Main Unit Charging Efficiency Calculation Formula

$$\eta_t = \frac{\int_0^T P_{out}(t)\,dt}{\int_0^T P_{in}(t)\,dt} \times 100\%$$

待机功耗计算公式
Standby Power Consumption Calculation Formula

$$P_o = \frac{\int_0^T U_{in} I_{in}(t)\,d(t)}{T}$$

终端运行功耗计算公式
Terminal Operating Power Consumption Calculation Formula

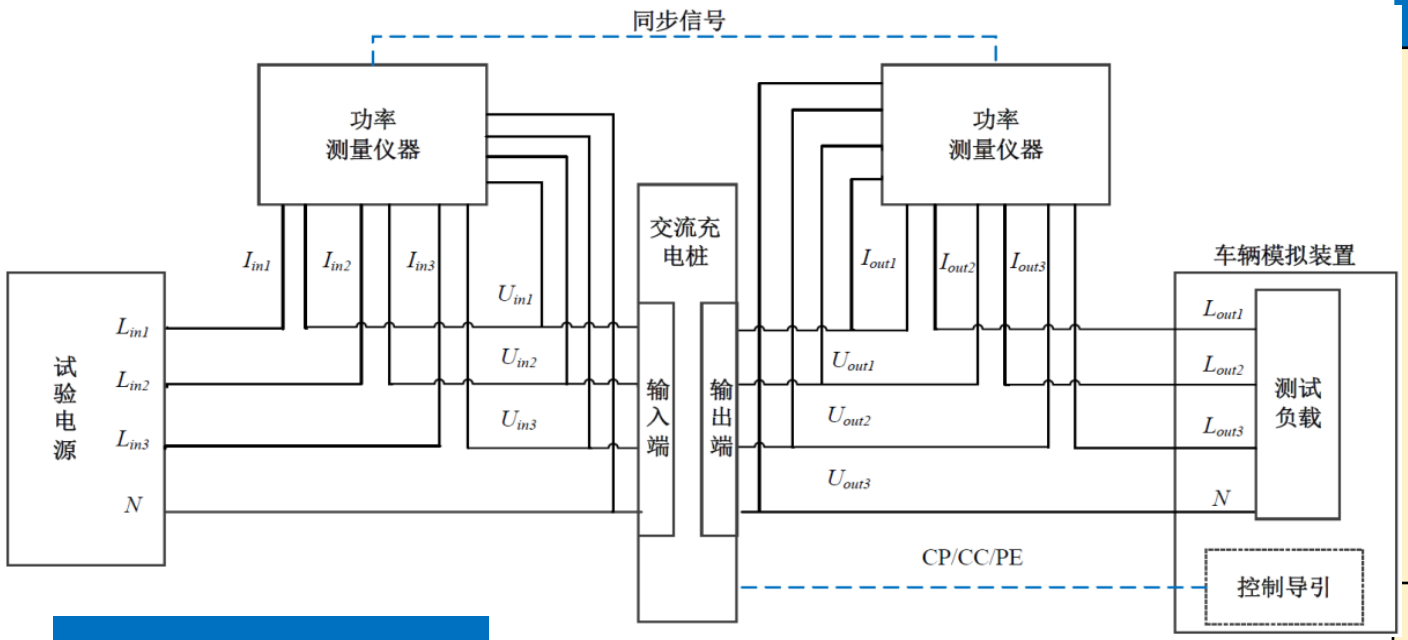
$$P_{l_DC} = \frac{\int_0^T P_{L_AC}(t)\,d(t)}{T} + \frac{\int_0^T P_{in_DC}(t)\,d(t)}{T} - \frac{\int_0^T P_{out_DC}(t)\,d(t)}{T}$$

能效指标 Metrics	测试条件	测试步骤
主机充电效率 Main Unit Charging Efficiency	**环境条件**：温度15-35℃；湿度45%RH~75%RH；大气压86 kPa~106 kPa；海拔不超过2000m。 **供电电源**：50Hz 220 V/380 V交流源。 **仪器误差**：充电效率与待机功耗测量误差分别不高于0.1%、0.5W。 **测试前准备**：关闭与充电无关的附加功能，如广告显示屏、指示灯、Wi-Fi热点、蓝牙；**预热运行5分钟。** **Environmental Conditions:** Temperature 15-35℃; Humidity 45%RH75%RH; Atmospheric Pressure 86 kPa106 kPa; Altitude not exceeding 2000m. **Power Supply:** 50Hz, 220V/380V AC. **Instrument Error:** Measurement errors for charging efficiency and standby power consumption should not exceed 0.1% and 0.5W, respectively. **Preparation Before Testing:** Disable any non-charging related features, such as advertisement displays, indicator lights, Wi-Fi hotspots, and Bluetooth; preheat for 5 minutes.	① 连接并调节样品、车辆模拟设备和测试负载。调节被测产品输出电压Ui至U1、U2、U3，并使样品负载电流工作在20%、50%、100%的Pmax/Ui。 ② 运行不低于5分钟，累积输入及输出电能。 ③ 计算不同负载及电压工况下样品的加权充电效率。 ① Connect and adjust the test sample, vehicle simulation device, and test load. Adjust the output voltage UiU_iUi of the product being tested to U1U_1U1, U2U_2U2, and U3U_3U3, and set the sample load current to operate at 20%, 50%, and 100% of Pmax/UiP_{max}/U_iPmax/Ui. ② Operate for no less than 5 minutes to accumulate input and output energy. ③ Calculate the weighted charging efficiency of the sample under different load and voltage conditions.
终端运行功耗 Terminal Operating Power Consumption		① 连接并调节样品、车辆模拟设备和测试负载，使样品工作在单枪满额输出电流。 ② 运行不低于5分钟，累积输入及输出电能。 ③ 计算额定最大输出电流下样品的运行功耗。 ① Connect and adjust the sample, vehicle simulation device, and test load to ensure the sample operates at its maximum single-output current. ② Run for at least 5 minutes to accumulate input and output energy. ③ Calculate the operating power consumption of the sample at the rated maximum output current.
待机功耗 Standby Power Consumption		① 断开车辆或车辆模拟设备和测试负载。 ② 待机不低于30分钟，累积输入电能。 ③ 计算待机状态下样品的功率损耗。 ① Disconnect the vehicle or vehicle simulation device and test load. ② Remain in standby mode for at least 30 minutes to accumulate input energy. ③ Calculate the power loss of the sample in standby mode.

能效测试方法—交流充电桩

Energy Efficiency Testing Method —AC Chargers

交流充电桩能效测量原理图
Energy Efficiency Measurement Schematic for AC Chargers



交流充电桩运行功耗计算公式
AC Charger Operating Power Consumption Calculation Formula

$$P_{l_AC} = \frac{\int_0^T P_{in_AC}(t)\square d(t)}{T} - \frac{\int_0^T P_{out_AC}(t)\square d(t)}{T}$$

交流充电桩待机功耗计算公式
AC Charger Standby Power Consumption Calculation Formula

$$P_o = \frac{\int_0^T U_{in}\square I_{in}(t)\square d(t)}{T}$$

能效指标 Metrics	测试条件 Testing Conditions	测试步骤 Testing Steps
运行功耗 Operating Power Consumption	**环境条件**：温度15-35℃；湿度45%RH~75%RH；大气压86 kPa~106 kPa；海拔不超过2000m。 **供电电源**：50Hz 220 V/380 V交流源。 **仪器误差**：运行功耗与待机功耗测量误差分别不高于0.1%、0.5W。 **测试前准备**：关闭与充电无关的附加功能，如广告显示屏、指示灯、Wi-Fi热点、蓝牙。 **Environmental Conditions**: Temperature 15-35°C; Humidity 45%RH75%RH; Atmospheric Pressure 86 kPa106 kPa; Altitude not exceeding 2000m. **Power Supply**: 50Hz, 220 V/380 V AC source. **Instrument Error:** Measurement error for operating power consumption and standby power consumption shall not exceed 0.1% and 0.5W, respectively. **Preparation Before Testing:** Disable additional functions unrelated to charging, such as advertising displays, indicator lights, Wi-Fi hotspots, and Bluetooth.	① 连接并调节样品、车辆模拟设备和测试负载，使样品工作在额定最大输出电流。 ② 运行不低于5分钟，累积输入及输出电能。 ③ 计算额定最大输出电流下样品的运行功耗。 ① Connect and adjust the sample, vehicle simulation equipment, and test load, ensuring the sample operates at the rated maximum output current. ② Run for no less than 5 minutes, accumulating the input and output electrical energy. ③ Calculate the operating power consumption of the sample at the rated maximum output current.
待机功耗 Standby Power Consumption		① 断开车辆或车辆模拟设备和测试负载。 ② 待机不低于30分钟，累积输入电能。 ③ 计算待机状态下样品的功率损耗。 ① Disconnect the vehicle or vehicle simulation equipment from the test load. ② Allow to remain in standby for no less than 30 minutes, accumulating input electrical energy. ③ Calculate the power loss of the sample in standby mode.

Sino-German Expert Workshop on Current Development of Energy Efficiency Standards for EV Chargers

05 November 2024