

## 聚焦乘客出行体验 持续升级自动售检票系统标准

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由上海地铁联合国内 16 家单位共同修编的国家标准《城市轨道交通自动售检票系统技术条件》(GB/T 20907—2024)于 2024 年 9 月 29 日正式发布,并于 2025 年 4 月 1 日起正式实施。新标准的发布与实施,是对城市轨道交通自动售检票系统产品标准的一次全面升级,是顺应行业发展需求、推动技术进步的重要举措。

自动售检票(AFC)系统是城市轨道交通运营的核心基础设施之一。AFC 系统的运行效率和服务质量,直接体现了轨道交通运营企业的服务水平;AFC 系统所收集和处理的的数据,是轨道交通运营企业运营决策和资源配置的重要依据。近年来,随着互联网、移动支付技术的广泛应用,售票、检票等交易方式日益多元化,该标准的 2007 年版(GB/T 20907—2007)缺乏对虚拟票卡、新型设备系统的关键内容和关键指标的统一技术要求,已难以适应数字化、智能化的发展需求。2024 年版新标准的出台,不仅适应了互联网与移动支付技术广泛应用的新趋势,还针对票卡多元化、售检票设备更新迭代、网络安全等现实问题提出了规范要求。

上海地铁在 AFC 系统的发展进程中,始终致力于对技术的持续探索和优化。从国外磁票系统的引入到国产 AFC 系统非接触式 IC 卡的应用,从国内首个清分系统实现全网“一票换乘”到二维码乘车服务的率先运行,等等一系列技术创新和升级举措不断推动着上海地铁运营效率和服务水平的提升。当前,上海地铁日均客流量超千万人次已成为常态,为了更好地提升通行效率,在线网各站点逐步试行闸机常开门模式;随着移动支付方式占比的迅速攀升,进出站服务已不仅仅依赖于 AFC 系统自身的稳定性,上海地铁基于“大安全”理念,通过优化设计提升 AFC 系统的整体韧性;针对 AFC 系统终端设备量多面广的特点,上海地铁不断优化日常巡检和维护模式,通过数据驱动实现精准运维。

面向未来,上海地铁将以 AFC 系统 2024 年版标准为引领,持续推进 AFC 系统的能级提升。上海地铁将重点加强 AFC 系统韧性建设,提升应对突发事件的能力;优化用户体验,打造更加人性化的服务界面;加强数据安全,切实保障乘客个人信息安全。为助力长三角一体化发展,上海地铁将联合长三角内地铁公司,深入研究跨区域、跨制式轨道交通票制互通解决方案。

上海地铁致力于通过持续创新和标准化建设,为市民提供更加安全、便捷、舒适的出行服务,为我国城市轨道交通的高质量发展贡献力量。

## Commentary

## Focusing on Passenger Travel Experience: Continuous Upgrading of AFC System Standards

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The revised national standard "Technical specifications for automatic fare collection systems of urban rail transit" (GB/T 20907—2024), jointly compiled by Shanghai Metro and 16 domestic institutions, was officially released on September 29, 2024, and will take effect on April 1, 2025. The promulgation and implementation of the new standard represent a comprehensive upgrade to the product specifications for urban rail transit AFC systems, serving as a pivotal measurement to align with industry development demands and drive technological advancement.

As one of core infrastructures for urban rail transit operations, AFC systems directly reflect the service level of rail transit operating enterprises through system operational efficiency and service quality. The data collected and processed by AFC systems serve as a vital foundation for decision-making and resource allocation of rail transit operating enterprises. In recent years, with

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轨道交通行业对于各风险的动态监督与管控需求,为行业可靠性与风险评估提供新的思路。

## 参考文献

- [1] 田茂. 城市轨道交通设备系统建设一体化关键技术研究[D]. 北京: 中国铁道科学研究院, 2019.  
TIAN Mao. Research on key technologies of urban rail transit equipment system construction integration [D]. Beijing: China Academy of Railway Sciences, 2019.
- [2] RONG Y P. International conference on measuring technology and mechatronics automation[C]//IEEE. 2016 International Conference on Advanced Robotics and Mechatronics (ICARM). Macau: IEEE, 2016: 375-378.
- [3] 姜源. 城市轨道交通运营设备稳健维护决策问题研究[D]. 长春: 吉林大学, 2020.  
JIANG Yuan. Research on robust maintenance decision of urban rail transit operation equipment[D]. Changchun: Jilin University, 2020.
- [4] 曾爱然. 城市轨道交通计算机联锁系统寿命预测与维修策略优化研究[D]. 南京: 南京理工大学, 2020.  
ZENG Airan. Study on life prediction and maintenance strategy optimization of urban rail transit computer interlocking system [D]. Nanjing: Nanjing University of Science and Technology, 2020.
- [5] YAO B, GE X, WANG H, et al. Multiscale reliability evaluation of DC-link capacitor banks in metro traction drive system [J]. IEEE Transactions on Transportation Electrification, 2020, 6 (1): 213.
- [6] Hou H T, Tian L. Architecture, building materials and engineering management [M]. Dürnten-Zürich, Switzerland: Trans Tech Publications Ltd, 2013: 357.
- [7] NING Z. IEEE international conference on automation and logistics [C]//IEEE. 2009 IEEE International Conference on Automation and Logistics (ICAL). Shenyang: IEEE, 2009: 1837-1842.
- [8] 李漫. AL 物业公司风险管理问题分析及应对策略研究[D]. 石家庄: 河北地质大学, 2017.  
LI Man. Analysis on risk management problems of AL property company and research on countermeasures [D]. Shijiazhuang: Hebei GEO University, 2017.
- 收稿日期: 2023-02-27 修回日期: 2023-04-07 出版日期: 2025-04-10  
Received: 2023-02-27 Revised: 2023-04-07 Published: 2025-04-10  
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## (Continued from Commentary)

the widespread adoption of internet and mobile payment technologies, transaction modalities for ticketing and fare verification have become increasingly diversified. However, the 2007 edition of the standard (GB/T 20907—2007) lacks unified technical requirements for critical content and parameters of virtual fare media and next-generation equipment systems, making it hard to adapt to the development demands of digitalization and intelligent. The 2024 edition new standard not only adapts to new trends in the proliferation of internet and mobile payment technologies but also proposes regulatory requirements for practical issues such as multi-modal fare media, update and iteration of fare collection devices, and cybersecurity.

Throughout the development of AFC systems, Shanghai Metro has consistently focused on continuous technological innovation and optimization. From the introduction of foreign magnetic ticket systems to the application of contactless IC card in domestic AFC systems, and from the realization of network-wide "one-ticket transfer" by the first domestic clearing system to the pioneering operation of QR code riding services, a series of technological innovations and upgrades have continuously driven the improvement of Shanghai Metro's operational efficiency and service level. At present, it has become the norm for Shanghai Metro's average daily passenger flow to be over 10 million. To further enhance traffic efficiency, the constant-open gate mode is gradually being piloted at various stations across the line network. With the rapid increase in the proportion of mobile payment methods, entry and exit services are no longer solely dependent on the stability of the AFC system itself. Based on the concept of "comprehensive security", Shanghai Metro improves the overall AFC system resilience through optimized design. In view of the large number and wide range of AFC system terminal equipment, Shanghai Metro has continuously optimized daily inspection and maintenance modes, and achieved data-driven precise operation and maintenance. Looking to the future, Shanghai Metro will drive continuous performance upgrade of AFC systems with the guide of 2024 version of the AFC system standard. Shanghai Metro will focus on strengthening the resilience of the AFC system and enhancing its emergency-responding ability; optimizing user experience and creating a more user-friendly service interface; strengthening data security management and effectively protecting the personal information security of passengers. In support to the integrated development of the Yangtze River Delta, Shanghai Metro will work with regional subway companies to conduct in-depth research on cross-regional and cross-modal rail transit ticket interoperability solutions.

Through continuous innovation and standardization construction, Shanghai Metro remains dedicated to delivering safer, more convenient, and comfortable travel services to citizens, while contributing to the high-quality development of urban rail transit industry in China.

(Translated by JIANG Na)