

诚信卓越 士林伟业
GOOD FAITH & GREAT SHILIN



FGM风电管型母线槽

FGM Wind Power Tubular Busbar



江苏士林电气集团有限公司
JIANGSU SHILIN ELECTRIC GROUP CO., LTD.

德者居上

智者在侧

能者居前



只有站在顾客的角度着想，
才能真正赢得市场。

士林严格按照国家规格的有关标准，
本着方便用户、服务大众的原则，
并根据客户的需求不断创新，
提高整体服务水平，
以优质的服务提升了品牌附加值。

Only from the customer's point of view,
only in this way can we really win the market.

Shilin strictly conforms to the relevant standards of the national specifications,
in line with the principle of user-friendly and public service,
and constantly innovate according to the needs of customers,
improve the overall service level,
with high quality service, the added value of the brand has been enhanced.



公司简介

在中国第一个生态环境市，长江中下游第二大岛-----江苏省扬中市境内有一家集输配电成套、电力电气、太阳能组件等产品研发、制造、销售、服务于一体的国家级高新技术企业，这就是-----江苏士林电气集团有限公司。

公司通过了ABS体系认证、ISO9001质量管理体系认证、ISO14001环境管理体系认证、ISO45001职业健康安全管理体系认证和“CQC”产品认证，全部产品均通过了国家或行业最新标准检测。公司被评为国家级专精特新“小巨人”企业、“质量信用AAA级”、“重合同守信用企业”及省市“AAA”资信企业。拥有九十余项自主知识产权，多项产品获得省和国家高新技术产品称号，自主研发的管型母线获省、市科技进奖，江苏省专精特新产品。

江苏士林电气集团有限公司与德国赛通电气、ABB电气、施耐德电气（中国）有限公司等企业强强联合，在国内外市场上共同生产和合作经营各类电气产品。长期以来，公司以“科技是第一生产力为指导思想，以不断创新的理念，精益求精的态度，现代化的管理手段，为广大用户专业化制造：高低压配电柜、高压绝缘管母线、风电专用管母线、照明母线、密集型母线槽、IP68防水、浇注、防腐母线槽、耐火电缆桥架、一次滚压成型环形筋节能高强电缆桥架、支架等系列产品。特别是公司生产的绝缘管母线、浇注防水母线是国内生产规模较大，产品系列齐全且专利技术在国内外处于领先地位的高新技术产品，在工控、供配电等领域享有较高的知名度和市场占有率。

公司先进的创新技术和卓越的品质，成就了“士林品牌”，遍布全国各大城市的营销服务网络，确保了“士林产品”和“士林服务”在行业中的排头兵地位；士林的产品被广泛应用于国内举世瞩目的大型项目——南京青奥会、田湾核电站.....士林的用户遍布：高铁、地铁、高速公路、发电系统、造船汽车、工矿、石油化工和政府工程等各项领域，并获得了一致好评！

“士林电气”始终秉承“专业、品质、共赢”的企业理念，汇集国内外精英才俊，走自主创新发展之路，实现士林电气工程技术和专业化服务技术的双提升，达到士林产品从“士林制造”到“士林创造”的新发展，在中国电气产业中，展示自己的综合实力和高端水平。

公司热烈欢迎与各大设计院所、广大用户和关心支持士林发展的社会精英真诚合作，携手致力于我国电气事业的发展 and 繁荣。

Company Profile

In the first ecological environment city in China, within the boundaries of Yangzhong City, Jiangsu Province, the second largest island in the middle and lower reaches of the Yangtze River, there is a national-level high-tech enterprise known as Jiangsu Shilin Electric Group Co., Ltd. This company specializes in the research and development, manufacturing, sales, and service of a complete set of power transmission and distribution equipment, power electrical products, solar modules, and other products.

The company has passed the ABS system certification, ISO9001 quality management system certification, ISO14001 environmental management system certification, ISO45001 occupational health and safety management system certification, and “CQC” product certification. All products have passed the latest national or industrial standard testing. The company has been recognized as a national-level specialized and innovative “Little Giant” enterprise, “Quality Credit AAA Grade” enterprise, “Contract-abiding and Trustworthy” enterprise, as well as a provincial and municipal “AAA” credit enterprise. With more than ninety independent intellectual property rights, multiple products have been awarded the title of provincial and national high-tech products, and the independently developed pipe-type busbar has won provincial and municipal scientific and technological progress awards, making it a specialized and innovative product in Jiangsu Province.

Jiangsu Shilin Electric Group Co., Ltd. has formed a strong alliance with enterprises, such as Germany System Electric, ABB Electric, and Schneider Electric (China) Ltd., engaging in joint production and cooperative operations of various electrical products in domestic and international markets. Upholding the guide thought that “science and technology constitute the primary productive force”, the company keeps making innovations, keeps improving, and uses a modernized management means to provide professional manufacturing for plenty of users. A series of products including high and low voltage distribution cabinets, high voltage insulated busbars, wind power dedicated busbars, lighting busbars, compact busways, IP68 waterproof and cast-in-place corrosion-resistant busways, fire-resistant cable trays, energy-efficient high-strength cable trays with once-rolled circular ribs, and supports. Particularly, insulated busbars and waterproof cast-in-place busbars are high-tech products with the larger production scale in China, complete product series, and cutting-edge patent technology, enjoying the higher popularity and market occupancy in the fields of engineering control, power supply and distribution.

Upholding the advanced innovative technology and excellent quality, the company creates “Shilin Brand”, spreading all over marketing service networks in various cities of China and ensuring the pacesetter position of “Shilin products” and “Shilin services” in the industry. Shilin products have been widely applied in prominent domestic mega-projects, such as the Nanjing Youth Olympic Games and the Tianwan Nuclear Power Plant. Shilin’s users span various sectors, including high-speed rails, subways, highways, power generation systems, shipbuilding, automobiles, industrial and mining sectors, petrochemicals, government projects, etc., earning unanimous praise!

“Shilin Electric” always upholds the professional ideas of “profession, high-quality, and win-win result”. Gathering elites at home and abroad and insisting on the independent and innovative development, the company realizes the double improvement on Shilin electrical engineering technology and professional service technology to realize new development of Shilin products from “Made in Shilin” and “Created in Shilin”. In the Chinese electrical industry, the company fully performs its comprehensive strength and high-end level.

The company warmly welcomes sincere cooperation with major design institutes, extensive users, and socially elite individuals who care about and support Shilin’s development, devoting to realizing the development and prosperity of China’s electrical industry.



风电管型母线槽
Wind Power Tubular
Busbar

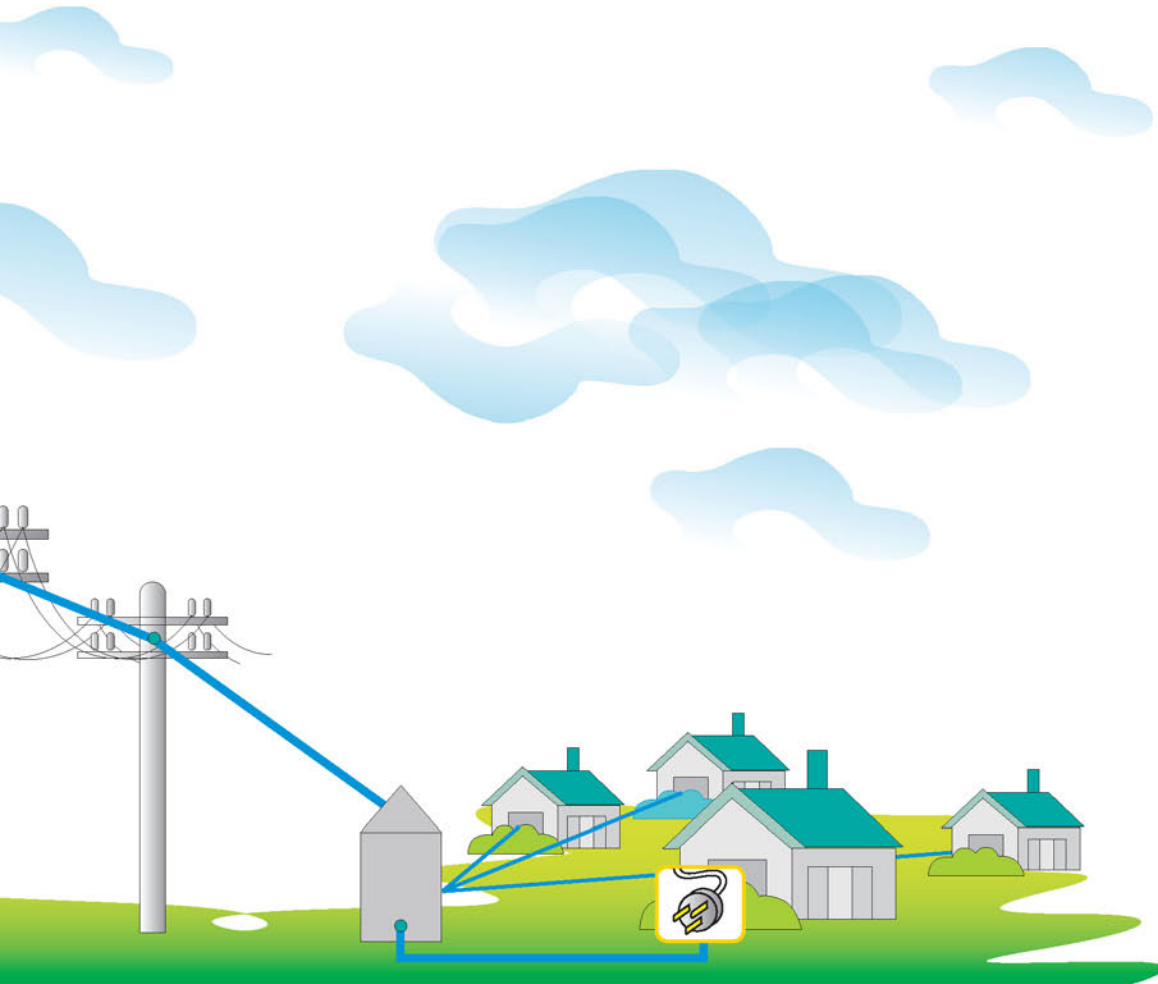
风吹动风电机组叶片使其旋转，并推动发电机将动能转化成电能。
The wind blows the blades of a wind turbine, causing them to rotate while driving a generator to convert the kinetic energy into electricity.

通过变压技术，电能通过电网传输到用电户。
Through a transformation technology, electric energy can be transferred to users through the power grid.

风电是洁净的可再生能源，发展风力发电对于保护环境，改善能源结构，节约常规能源等有着重要的战略意义。我国目前大批量用于风力发电塔筒内传输电流的产品主要有风电专用电缆和铝排结构风电母线槽两种产品，由于这两种输电产品在使用中分别存在着或多或少的弊端，势必会影响与制约着风力发电行业的健康发展，这就迫切需要一种简单、快捷、安全、可靠的输电设备来替代上述两种产品。

江苏士林电气集团有限公司根据风力发电行业的诸多特性，引进国际领先的风电管型母线槽技术开发了全新一代风电母线槽系统，该产品设计理念先进，技术性能安全可靠、安装方便快捷，解决了风场塔筒输电运行时多项技术难题，开创了国内风力发电母线槽技术先河。

江苏士林电气集团有限公司一直致力于高低压母线（槽）系统的升级创新及新产品的研发工作，愿与您携手，为风力发电行业提供高效节能、安全可靠的电力输送设备。



一台1.5兆瓦的风电机组可以供应1000户四口之家的电力消耗。

A 1.5MW wind turbine can provide electricity for the energy consumption of 1000 households with a family of four.

应用于风力发电机组的 FGM风电管型母线槽系统

The FGM wind-power tubular busbar system is applied for a wind turbine generator system

Wind power is a clean and renewable energy source. The development of wind energy is of significant strategic importance for environmental protection, energy structure improvement, and conservation of conventional energy resources. In China, there are currently two main products widely used for transmitting electricity within wind turbine towers: dedicated wind power cables and aluminum busways for wind power. However, both of these transmission products have their own shortcomings at varying degrees, which are likely to affect and restrict the healthy development of the wind power industry. Therefore, there is an urgent need for a simple, efficient, safe, and reliable transmission solution to replace the aforementioned two products. Jiangsu Shilin Electric Group Co., Ltd., taking into consideration various characteristics of the wind power industry, has introduced cutting-edge international wind-power tubular busway technology to develop a new generation of wind power busway system. This product features an advanced design philosophy, ensuring safe and reliable technical performance, easy and efficient installation. It effectively addresses multiple technical challenges encountered during the transmission operation within wind turbine towers, thereby pioneering domestic wind power busbar duct technology.

Jiangsu Shilin Electric Group Co., Ltd. has consistently dedicated itself to the upgrading and innovation of high and low-voltage busbar(busway) systems and the research and development of new products. We are eager to collaborate with you in supplying the wind power industry with efficient, energy-saving, safe, and reliable electrical transmission equipment.



FGM风电管型母线槽系统优势

Advantages of the FGM Wind-power Tubular Busbar System

1. 管型母线槽管状导体与铝排结构母线槽导电排相比：同等截面管状导体载流量大，管导体表面电流密度分布均匀，特别适合工作电流大的回路；

2. 管状导体集肤效应系数低、交流电阻小；且三相导体呈“品”字布局，结构合理，导体邻近效应系数低，母线槽电损小，高效节能；

3. 管型母线槽采用网状防护罩，导体通电运行时产生热量直接向大气中散发，使母线槽系统整体散热性能好，导体温升低；

4. 管型母线槽接头采用柔性铜质软连接，载流能力强，并可消除安装误差及塔筒宽幅摆动带来的安全运行隐患，彻底解决接头发热问题；

5. 管型母线槽标准段长度达6米，整个塔筒内母线槽系统接头数量少；无论直驱还是双馈型风电机组，定子及转子母线均通过共用支撑形成一整体部件，且塔筒段间母线连接采用软连接，使得母线槽系统安装更加省时、方便快捷；

6. 管型母线槽三相导体全长封闭绝缘，不受高原凝露、海洋盐雾、灰尘等恶劣环境的影响，适合任何地域环境下使用；

7. 管型母线槽三相导体外表采用绝缘薄膜加绝缘套管包覆双重绝缘方式，导体相间再通过绝缘套及支撑夹相互隔开，保持足够大的电气间隙与爬电距离，使得产品电气绝缘性能强，安全可靠；

8. 管型母线槽产品投入使用20年内不需要维修，真正实现免维护，大大降低了风场运营维护成本，提高发电效率。



FGM风电管型母线槽系统
FGM wind-power tubular busbar system

1. Compared to the aluminum busway structure, tubular conductors in busway ducts offer the following advantages: Tubular conductors have a higher current-carrying capacity for the same cross-section, and their surface current density distribution is uniform. This makes them particularly suitable for circuits with high operating currents.

2. Tubular conductors exhibit low skin effect coefficient and low alternating current resistance. Additionally, the three-phase conductors are arranged in a "cloverleaf" pattern, which results in a well-structured design. The low proximity effect coefficient between conductors leads to reduced power loss in the busway system, enhancing efficiency and energy conservation.

3. The tubular busway system incorporates a mesh protective cover, allowing the heat generated during conductor operation to dissipate directly into the atmosphere. This design enhances the overall heat dissipation performance of the busway system, resulting in the lower temperature rise of conductors.

4. The joints in the tubular busway system utilize flexible copper connectors, which offer a robust current-carrying capacity. These joints also have the ability to mitigate installation errors and potential safety hazards caused by tower sway. Furthermore, they completely resolve the issue of heat generation at the joints.

5. The standard segment length of the tubular busway system reaches 6 meters, leading to fewer joints within the entire tower. Whether for direct-drive or doubly-fed wind turbine generators, both stator and rotor busbars are integrated through shared supports, forming a cohesive unit. Additionally, soft connectors are adopted for inter-tower section busbar connections, facilitating quicker and more convenient installation of the busway system.

6. The entire length of the three-phase conductors in the tubular busway is enclosed with insulation, rendering it immune to adverse conditions such as high-altitude condensation, ocean salt spray, dust, and so on. This design makes it suitable for operation in diverse geographic and environmental settings.

7. The three-phase conductors of the tubular busway system are externally covered with an insulating film and an insulating sleeve, providing double insulation. The conductors are further separated by using insulation sleeves and support clamps, ensuring a significant electrical gap and creepage distance. This design maintains strong electrical insulation performance of the product, ensuring safety and reliability.

8. The tubular busway product requires no maintenance within the first 20 years of usage, truly achieving a maintenance-free operation. This significantly reduces the operational and maintenance costs of wind farms while enhancing power generation efficiency.

风电电缆 Wind Power Cable

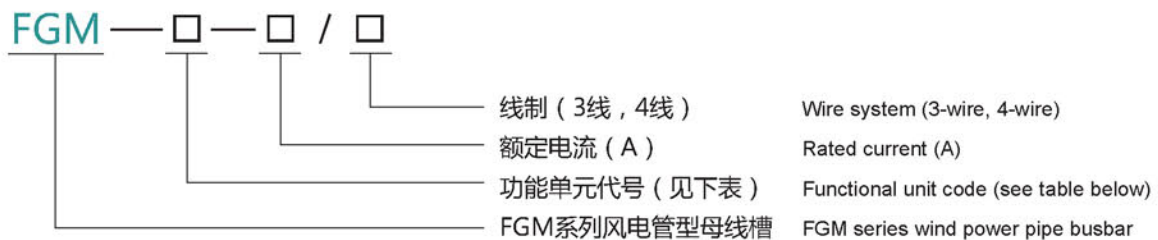
1. 采用单芯小截面铜电缆，载流量受限制（ < 400A ），每相导体需配多根电缆，占用空间大，且受自重及固定因素影响，在塔筒内敷设难度大，周期长。
2. 电缆绝缘防护层（ 聚乙烯、聚氯乙烯等 ）属于隔热材料，散热性能差，运行时温升较高，线路损耗大。
3. 电缆外部无外壳防护，在敷设过程中易出现刮、擦等机械性损伤而不被发现，引起绝缘降低而出现安全隐患。
4. 铜芯电缆成本高，且耐候性差，电缆绝缘层易老化，使用寿命一般 10 ~ 15 年，后期还存在故障测寻、修复困难等问题，后期投入大。
5. 需定期对电缆接头进行检查维护，维护成本高。



风电电缆
Wind power cable

1. Using single-core small cross-section copper cables results in limited current-carrying capacity (<400A). Each phase conductor requires multiple cables, occupying a significant amount of space. Additionally, these conductors are influenced by their own weight and fixation factors, which makes their installation within the tower challenging and time-consuming.
2. The insulation protective layer of the cables (such as polyethylene, polyvinyl chloride, etc.) acts as thermal insulators, leading to poor heat dissipation performance. This results in higher temperature rises during operation and increased line losses.
3. Cables lack external casing protection, making them susceptible to mechanical damage such as scraping and rubbing during installation without immediate detection. This can lead to reduced insulation and pose safety risks.
4. Copper-core cables are expensive and have poor weather resistance. The insulation layer of these cables is prone to aging, resulting in a typical lifespan of 10 to 15 years. Additionally, there are challenges related to fault detection, locating issues, and repairs, leading to substantial maintenance costs in the long run.
5. Cable joints should be regularly checked and maintained, with high maintenance costs.

型号说明 Model Description



单元代号 Unit code	单元名称 Unit name
A	直通母线 Direct-connected busbar
S	始端母线 Initial busbar
JXP	电缆进线盘 Cable inlet coil
RLJ	软连接 Flexible connection
ZJ	安装支架 Mounting bracket

风电管型母线槽与风电铝排母线槽比较

Comparison Between Wind Power Pipe Busbar and Wind Power Aluminum Busbar

风电管型母线槽
The wind-power tubular busbar

对比
Comparison

风电铝排母线槽
The wind power aluminum busbar

导体集肤效应及邻近效应系数低，单相导体载流量大，垂直安装无需降容使用。

The conductors exhibit low skin effect and proximity effect coefficients, allowing for high current-carrying capacity for single-phase conductors. When vertically installed, there is no need to de-rate the capacity due to these effects.

载流
Load current

导体集肤效应及邻近效应系数较高，单相导体载流量低，垂直安装需降容使用。

The conductor exhibits relatively high skin effect and proximity effect coefficients, leading to a lower current-carrying capacity for single-phase conductors. When vertically installed, de-rating of capacity is necessary due to these effects.

外壳采用防护网，散热性能好，运行时导体温升低。

The casing is equipped with a protective mesh that enhances heat dissipation performance, resulting in lower temperature rise of conductors during operation.

温升
Temperature rise

外壳全封闭，母线槽内部导体热量不易散出，散热性能差，运行温升高。

The fully enclosed casing traps heat within the busway, resulting in poor heat dissipation performance. Consequently, there is a higher temperature rise during operation.

对塔筒厂安装支柱焊接精度要求低，接头数量少，定子与转子母线整体安装，安装更方便。

The installation of tower factory support columns requires low welding precision, and the system has fewer joints. The integration of stator and rotor busbars simplifies the installation process, making it more convenient.

安装
Installation

对塔筒厂安装支柱焊接精度要求较高，接头数量较多，定子与转子母线分别安装，安装费时。

The installation of tower factory support columns requires higher welding precision, and the system has more joints. The installation gets involved in separate installations of stator and rotor busbars, which can be time-consuming.

适合任何地域、环境下使用。

It is suitable for any areas and environments.

适用
Applicability

适合低海拔、内陆环境下使用。

It is suitable for being used in low-altitude and inland environments.

接头为柔性连接，可消除安装误差、热胀冷缩及超高塔筒宽幅摆动带来的不利影响，安全可靠。

The flexible connections at joints can mitigate the effects of installation errors, thermal expansion and contraction, as well as wide swinging motions in ultrahigh towers. This ensures a safe and reliable operation.

安全
Safety

接头为刚性连接，母线运行受安装误差、热胀冷缩及超高塔筒宽幅摆动带来的影响，易出现发热烧坏现象，可靠性差。

The rigid connections at joints are susceptible to the effects of installation errors, thermal expansion and contraction, as well as wide swinging motions in ultrahigh towers. This can lead to overheating and failure, resulting in poor reliability.

产品20年内不需要维修，真正免维护。

The product has no need to be maintained within 20 years, realizing the real maintenance free.

维护
Maintenance

产品投入运行每年都需要定期检查维护，维护成本高。

The product requires regular inspections and maintenance every year after being put into operation, leading to high maintenance costs.

产品特点 Product Features

可满足不同容量风电机组需求 It can satisfy the demand of wind turbine generators with different capacities

FGM 风电管型母线槽系统额定工作电压 690 (1000) V , 额定绝缘电压 1000 (1500) V , 频率 50 ~ 60Hz , 线制有三相三线、三相四线制可选。产品绝缘性能可靠, 运行温升低, 抗过载流能力强, 我们将依据项目实际情况配套相应电流等级的定子及转子母线。

The FGM wind-power tubular busway system has a rated operating voltage of 690 (1000) V and a rated insulation voltage of 1000 (1500) V, with a frequency of 50 to 60Hz. It offers both three-phase three-wire and three-phase four-wire configurations. The product boasts reliable insulation performance, low temperature rise during operation, and strong overload current resistance. We will tailor the stator and rotor busbars to the corresponding current rating based on the actual project requirements.

绝缘性能可靠 Reliable insulating property

FGM 风电管型母线槽 A、B、C 三相导体全部采用绝缘薄膜加高分子热缩套管作为主绝缘材料进行封闭, 母线金属夹具与导体间衬有工程塑料模压成型的绝缘护套, 导体相间保持空气间隔, 以空气介质作为附加绝缘, 绝缘性能优越可靠, 并能有效避免因异物导致相间短路现象, 彻底消除安全隐患。

In the FGM wind-power tubular busway system, all three-phase conductors A, B, and C are enclosed by using the insulating film and high molecular shrinkable sleeves as the primary insulation materials. The metal clamps and conductors within the busbars are covered with an insulating sheath molded from engineering plastics. Air gaps are maintained between the conductors, utilizing air as an additional insulating medium. This setup ensures superior and reliable insulation performance. It effectively prevents phase-to-phase short circuits caused by foreign objects and eliminates potential safety hazards.

防电磁干扰 Anti-electromagnetic interference

FGM 风电管型母线槽采用特殊防腐处理钢板网作为防护罩, 具有低导磁, 防腐蚀性强等特性, 能减少母线外壳涡流损耗, 同时对电磁场有一定的屏蔽作用, 确保整个系统运行稳定可靠。

The FGM wind-power tubular busway system utilizes specially treated steel plate mesh as a protective cover. This cover exhibits characteristics, such as low magnetic permeability and strong corrosion resistance. It reduces eddy current losses in the busbar casing, while also providing a certain level of electromagnetic field shielding. This ensures the stability and reliability of the entire system during operation.



抗震 Anti-shock

FGM 风电管型母线槽接头均采用软接头，并采取可靠的防松措施，能有效消除强风、地震等情况下塔筒晃动对母线系统造成的应力损害及接头松动过热现象。

In the FGM wind-power tubular busway system, flexible connectors are used for all joints, along with reliable anti-loosening measures. These measures effectively mitigate the stress damage and overheating caused by tower swaying during strong winds, earthquakes, and other conditions that could affect the busbar system.

耐候性强 Strong weather resistance

FGM 风电管型母线槽在高原、山脉、戈壁、平原、丘陵、岛屿、滩涂等各种地域下均能保持正常稳定运行，无需采取任何附加措施。

The FGM wind-power tubular busway system can maintain normal and stable operation in various geographical areas, such as plateaus, mountains, deserts, plains, hills, islands, and tidal flats, without requiring any additional measures.

高原环境 The altitude environments

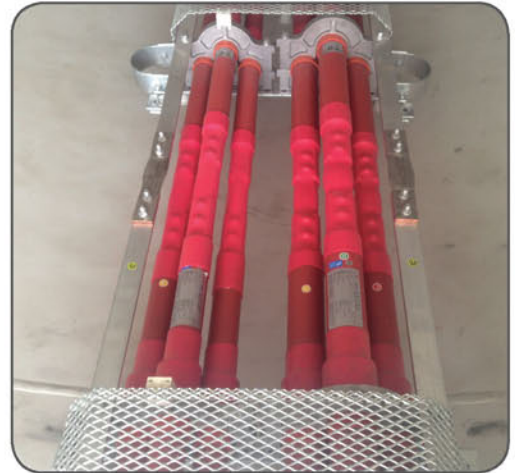
FGM 风电管型母线槽系统的三相导体为全长封闭绝缘，在海拔 4000 米左右环境下能继续保持可靠运行，不受高原凝露、低气压带来的不利影响。

The FGM wind-power tubular busway system is featured with fully enclosed insulation for its three-phase conductors. This design allows it to maintain reliable operation even in environments at an altitude of around 4000 meters, unaffected by adverse conditions like high-altitude condensation and low air pressure.

海洋环境 The marine environments

FGM 风电管型母线槽系统采用的绝缘材料及组件均有很强的耐湿热、防腐蚀、抗老化能力，且三相导体全长封闭绝缘，完全能够适应于海洋环境下使用。

The insulation materials and components used in the FGM wind-power tubular busway system possess strong resistance to humidity, heat, corrosion, and aging. Moreover, the fully enclosed insulation of the three-phase conductors makes the system well-suited for operation in marine environments.



技术参数 Technical Parameter

通用参数表 General parameter table

风机形式 Fan type	0.75~3.6MW双馈及直驱式风电机组 0.75-3.6MW doubly-fed and direct-drive wind turbine generators
管型母线槽型号 Model of tubular busbar	FGM
执行标准 Executive standards	IEC60439-1、2; GB7251.1、2
适用电流 Applicable current	700~3600A
额定工作电压 Rated operational voltage	690 (1000) V
额定绝缘电压 Rated insulation voltage	1000 (1500) V
线制 Wire system	三相三线制, 三相四线制 Three-phase three-wire system, three-phase four-wire system
相导体材质 Phase conductor material	铝 Aluminium
接头导体材质 Joint conductor material	铜 Copper
转子回路电流 Stator circuit current	1)
定子回路电流 Stator loop current	1)
耐压 Withstand voltage	3750V
额定频率 Rated frequency	50~60Hz
运行温度 Operating temperature	-50~+60°C
生存温度 Survival temperature	-50~+65°C (无电源) -50~+65°C (without power supply)
材料组别 Material group	II
污染等级 Pollution degree	3级 Level 3
过电压类别 Overvoltage category	IV类 Class IV
触电保护类别 Touch protection category	I类 Class I

注释：1) 根据不同容量风电机组，请参照下列具体技术参数表。

Note: 1) For wind turbine generators of different capacities, please refer to the specific technical parameter table below.

FGM 风电管型母线槽技术参数表

Technical Parameters of FGM Wind Turbine Tubular Busbar

表一 (Table 1)

机组容量 (MW) Generating unit capacity	1.5MW双馈风电机组 Doubly-fed wind turbine generator		1.5MW直驱风电机组 Direct-drive wind turbine generator	2.0MW直驱风电机组 Direct-drive wind turbine generator	2.5MW直驱风电机组 Direct-drive wind turbine generator
	额定电流 (Ie) A Rated current	700A	1350A	2×900A	2×1150A
外形尺寸 mm Overall dimensions	288×217	320×249	2-288×217	2-320×249	2-320×249
短时耐受电流 (Icw) kA Short time withstand current	30	40	30	40	40
峰值耐受电流 (Ipk) kA Peak withstand current	63	84	63	84	84
电阻 (R20) mΩ/m Resistance	0.05	0.025	0.039	0.03	0.025
电抗 (X20) mΩ/m Reactance	0.015	0.018	0.016	0.017	0.018
阻抗(Z20) mΩ/m Impedance	0.052	0.031	0.042	0.034	0.031
电压降 V/m Voltage drop	0.063	0.071	0.066	0.069	0.071
重量 kg/m Weight	4.92	9.78	2×6.25	2×8.13	2×9.78

表二 (Table 2)

机组容量 (MW) Generating unit capacity	3.0MW双馈风电机组 Doubly-fed wind turbine generator		3.0MW直驱风电机组 Direct-drive wind turbine generator	3.6MW直驱风电机组 Direct-drive wind turbine generator
	额定电流 (Ie) A Rated current	1150A	2×1600A	2×1600A
外形尺寸 mm Overall dimensions	320×249	2-352×282	2-352×282	2-352×282
短时耐受电流 (Icw) kA Short time withstand current	40	50	50	50
峰值耐受电流 (Ipk) kA Peak withstand current	84	105	105	105
电阻 (R20) mΩ/m Resistance	0.03	0.021	0.021	0.018
电抗 (X20) mΩ/m Reactance	0.017	0.019	0.019	0.02
阻抗(Z20) mΩ/m Impedance	0.034	0.028	0.028	0.027
电压降 V/m Voltage drop	0.069	0.075	0.075	0.079
重量 kg/m Weight	8.13	2×12.06	2×12.06	2×13.58

注：我们会根据不同容量的风电机组以及项目的特殊需求配套相应的母线解决方案。

Note: We will provide the corresponding busbar solutions based on the specific requirements of wind turbine generators with different capacities and projects.

系统部件 System Parts

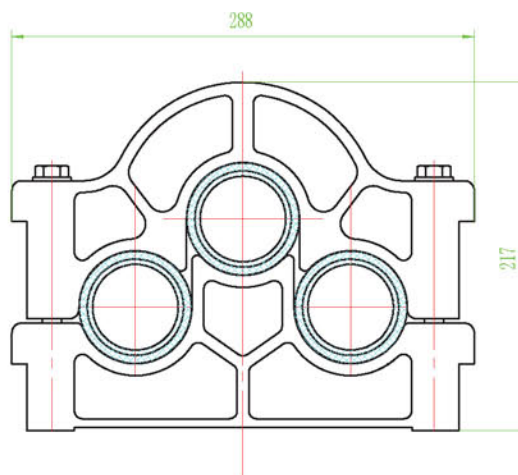
FGM 风电管型母线槽封装尺寸和组态 The package dimension and configuration of the FGM wind-power tubular busbar

根据电流等级配有两种尺寸：

Two dimensions were configured according to the current grade:

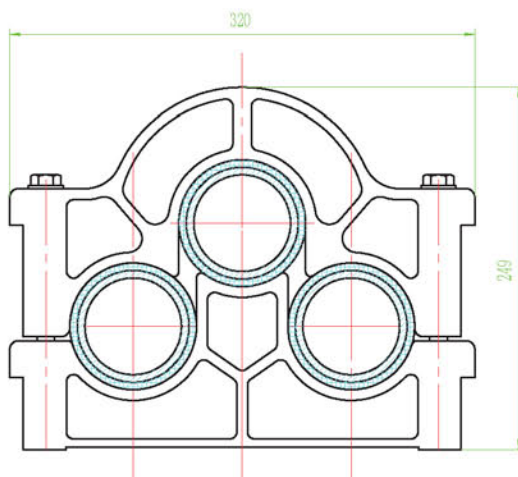
700-900A管型母线槽：

700-900A tubular busbar:



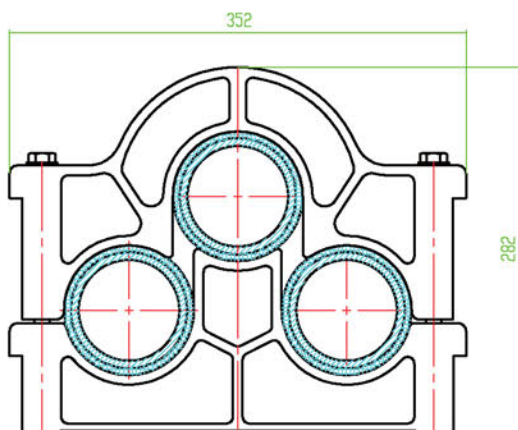
1150-1350A管型母线槽：

1150-1350A tubular busbar:



1600-1800A管型母线槽：

1600-1800A tubular busbar:



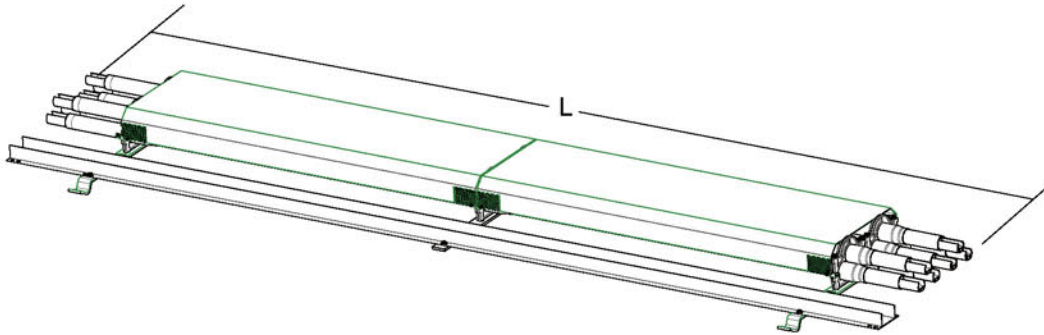
直通式母线单元 The direct-connected busbar unit

标准长度L：3m/4m/5m/6m

Standard length L: 3m/4m/5m/6m

可选长度L：1.3m ~ 6m

Optional length L: 1.3m-6m



接头单元 The joint unit

FGM风电管型母线槽接头采用柔性铜质软连接，每相导体搭接部位分别采用两套高强螺栓紧固，并采用进口防松垫圈或防松螺母等措施确保连接处在震动环境下仍处于锁紧状态；接头部位每相导体单独采用绝缘套管绝缘，从而使得每相导体全长封闭绝缘，不受凝露、灰尘、盐雾等气候环境的影响。

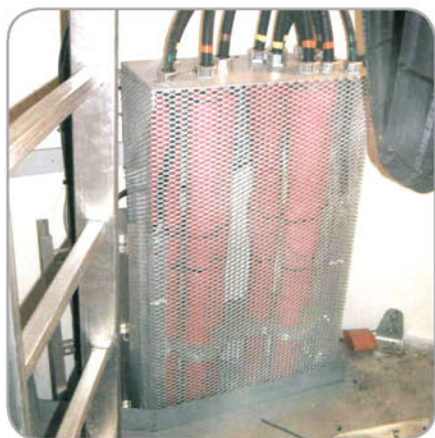
The FGM wind-power tubular busway system utilizes flexible copper connectors for joints. Each phase conductor overlap section is secured with two sets of high-strength bolts, along with measures like imported anti-loosening washers or nuts to ensure a tightened connection even in vibrating environments. At the joint area, each phase conductor is individually insulated with insulating sleeves, resulting in fully enclosed insulation for each phase conductor. This design protects the system from the impact of condensation, dust, salt spray, and other climatic conditions.



电缆进线盘单元 The cable inlet coil unit

FGM风电管型母线槽与电缆相连接是在塔筒的顶端与底端，将电缆穿进过电缆进线盘上的电缆护套后与母线接线桩头连接，再通过绝缘套管或绝缘带包覆绝缘。

The connection between the FGM wind-power busway system and the cables occurs at the top and bottom of the tower. The cables are threaded through the cable sheath on the cable entry panel and connected to the busbar terminal head. This connection is then insulated with insulating sleeves or insulating tape.



FGM风电管型母线槽系统在塔筒顶端
The FGM wind-power tubular busway system is situated at the top of the tower



FGM风电管型母线槽系统在塔筒底端
The FGM wind-power tubular busway system is located at the bottom of the tower

安装支架单元 The mounting bracket unit

FGM风电管型母线槽系统安装支架单元中配有柔性支撑件，在有效支撑固定住母线的同时保持整个母线系统不受塔筒晃动带来的应力影响。

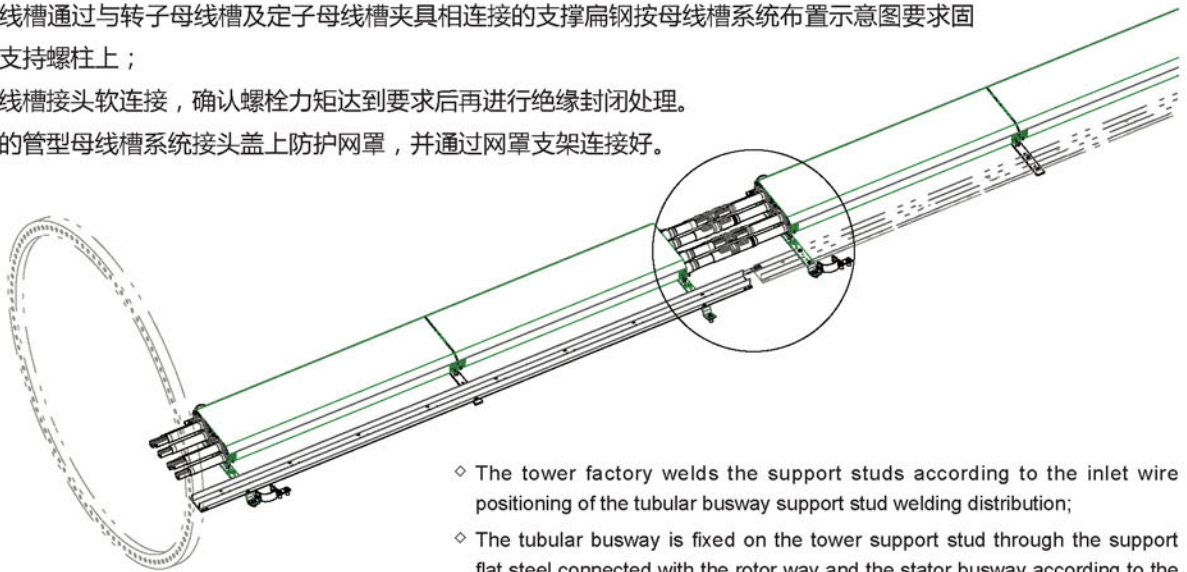
The mounting bracket unit of the FGM wind-power tubular busway system includes flexible support components. These components effectively secure and stabilize the busbars while preventing the entire busbar system from being affected by the stress caused by tower swaying.



系统安装 System Installation

在塔筒厂安装 The installation in the tower factory

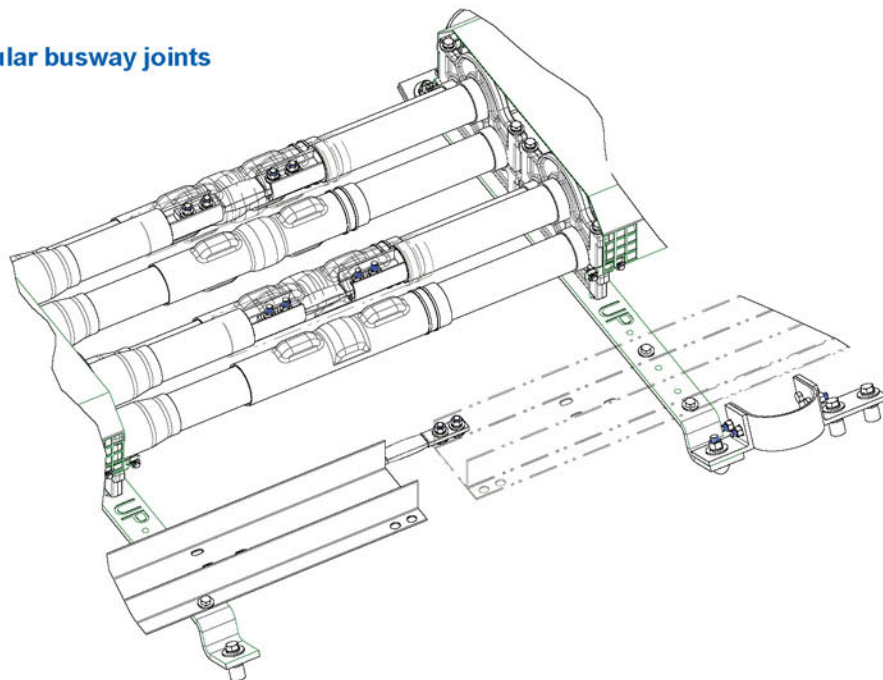
- ◇ 塔筒厂根据管型母线槽支架螺柱焊接分布图进线定位焊接支持螺柱；
- ◇ 将管型母线槽通过与转子母线槽及定子母线槽夹具相连接的支撑扁钢按母线槽系统布置示意图要求固定在塔筒支持螺柱上；
- ◇ 安装上母线槽接头软连接，确认螺栓力矩达到要求后再进行绝缘封闭处理。
- ◇ 将安装好的管型母线槽系统接头盖上防护网罩，并通过网罩支架连接好。



- ◇ The tower factory welds the support studs according to the inlet wire positioning of the tubular busway support stud welding distribution;
- ◇ The tubular busway is fixed on the tower support stud through the support flat steel connected with the rotor way and the stator busway according to the requirements of the busway system layout diagram;
- ◇ The flexible connection of busway connector is installed. Then insulating sealing treatment is conducted after bolt torque reaches the requirements.
- ◇ A protective screening cover is put for the installed tubular busway system. It is connected through the mesh bracket.

管型母线槽接头图示

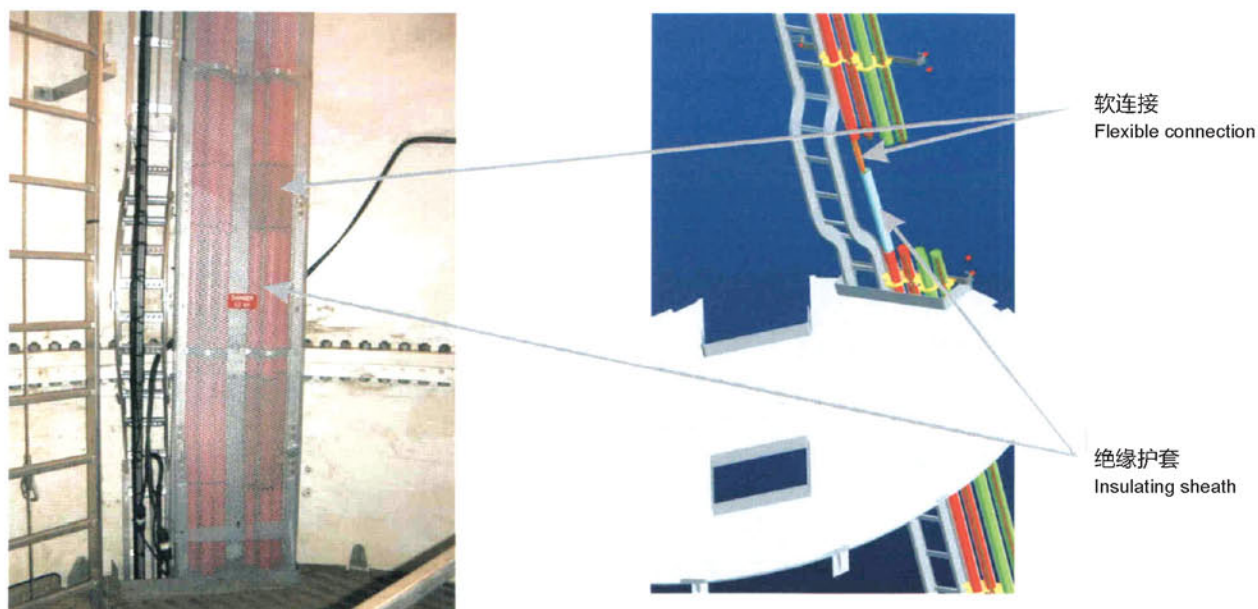
The diagram of the tubular busway joints



在风场塔筒结合处连接 Connection at the wind tower joints

FGM风电机型母线槽系统在塔筒结合处无需设置预留段母线槽，仅需在母线槽接头处装上软连接，然后作绝缘处理即可，安装工作量很小，安装精度要求低。

The FGM wind-power tubular busway system has no need to set up the reserved busway at the tower joints. It only needs to install flexible connection at the busway joints and then insulating treatment should be conducted. The installation workloads are very tiny and installation precision shows lower requirements.



管型母线槽运输及安装过程中防护 The protection during the transportation and installation process of the tubular busbar

- ◇ 使用合适的装卸设备进行装卸，避免损坏母线槽导体表面的绝缘材料和防护网罩，建议采用叉车或吊机装卸。
- ◇ 在搬运管型母线槽单元时，应轻拿轻放，且必须两个端部同时搬运，不可以将母线槽的端头作为支点搬运母线，禁止在地面上或塔体之间拖拉母线。
- ◇ 管型母线槽在塔筒厂安装完毕，在塔筒法兰处的母线槽端部要用塑料薄膜包裹严实，要防雨水、潮气、灰尘、异物侵入母线导体内部，直至风场连接时方可拆除。
- ◇ 管型母线槽在搬运、安装过程中均禁止人踩踏在母线槽本体及其任一部件上，确保母线槽整体完好无损。
- ◇ Suitable handling facilities should be used for loading and unloading, in case of damaging the insulating materials and protective screening cover on the surface of busway conductors. It suggests forklifts or cranes for loading and unloading.
- ◇ As carrying the tubular busway unit, it should handle gently. Both ends should be carried at the same time. Do not use the end of the busway as the pivot to carry busbars. Do not drag busbars on the ground or between the towers.
- ◇ The tubular busway should be installed in the tower factory. The busway end at the tower flange should be tightly covered by plastic films. It should prevent rainwater, humidity, dust, and foreign matters from entering the busbar conductors and it can be dismantled until the wind field is connected.
- ◇ Do not tread on the busway body or any part during the process of carrying and installing the tubular busway to ensure the busway in good condition.

产品服务 Product Services

我们会为每一个客户设立专项服务小组。

We will establish a dedicated service team for each customer.

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We will provide the best model selection and design scheme for users, fully conduct technical exchange with users, introduce product properties in detail, and provide the most satisfactory product for users.

◇ 培训服务 Training services

我们会免费提供产品技术培训，现场安装培训等，方便客户的了解产品性能特点及正确使用产品。

We will provide the product's technical training and on-site installation training for free, so that clients will know well with product properties and learn to operate the product correctly.

◇ 指导安装 Guidance of installation

产品安装期间，我公司会派遣资深技术工程师常驻项目现场提供安装技术指导，通电调试等服务。

During the process of installing the product, we will dispatch senior technical engineers to provide technical guidance of installation and power-on debugging on the spot permanently.

◇ 售后服务 After-sales services

我们会为每一位用户提供专业的风电管型母线槽安装手册，作为用户安装及使用时的参照。当您提出相关服务需求时，我们会在两小时内给您满意的答复。

We will provide professional user manual of the wind-power tubular busways for every user as the reference for users' installation and use. When you propose relevant service demands, we will give you a satisfactory answer within two hours.

◇ 客户回访 Client callback

我们会在产品质保期内定期进行客户回访，并提供产品终身跟踪服务。打造五星级全程管家体系的服务水平是我们的不懈追求！

We will regularly conduct client callback within the warranty period of the product and offer lifelong tracking services of the product. To create the five-star housekeeping services is our unremitting pursuit!



部分销售业绩 Partial Sales Performance

江苏士林电气集团有限公司长期与广大知名高校以及国家重点项目部进行广泛的“产学研”合作,形成完整的科研开发体系,以科技引领风电母线槽行业的发展。

Jiangsu Shilin Electric Group Co., Ltd. has long-term extensive cooperation with well-known universities and national key project departments, forming a complete scientific research and development system, and leading the development of the wind power tubular busbar trunking industry with science and technology.

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www.cnshihlin.com

地址：江苏省扬中市新坝镇江城路28号
电话：0511-88418040
传真：0511-88416878
邮箱：SL9540@126.com

Add: No. 28 Jiangcheng Road, Xinba, Yangzhong city,
Jiangsu Province, China
T e l: 0511-88418040
F a x: 0511-88416878
E-mail: SL9540@126.com

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