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CHANGE LOG

Rev.	Date	Description of Change
R02	25-07-2025	Modifying section 3. Electrical Characteristic Modifying logo

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1 总则 General

1.1 编制目的 Preparation purpose

为了规范本项目电气专业设计人员工作，满足项目合同要求；设计基础资料、设计数据选用正确；标准、规范应用协调一致；工程设计、文件编制风格、设备选型统一，并结合业主对设计方面的要求，特制定本规定。

In order to standardize the work of professional electrical designers in the project and meet the requirements of the project contract; basic design data and design data; standards and specifications; engineering design, document preparation style and equipment selection, and the owner's requirements for design.

2 标准规范、标准图集 Standard specification, standard atlas

设计的基本要求应符合国际标准，包括但不限于最新版的下述国际标准。如果两个或两个以上的参考文献规定了对同一主题的要求，则以限制性较强的参考文献为准。

The basic requirements of the design shall conform to the international standards, including but not limited to latest edition the international standards indicated below. Where two or more references define requirements for the same subject, the more restrictive reference shall govern.

IEC 60034	Rotating electrical machines
IEC 60072	Dimensions and output series for rotating electrical machines
IEC 60079	Electrical apparatus for explosive gas atmospheres
IEC 60085	Thermal evaluation and classification of electrical insulation
IEC 60317	Basic dimensions of winding wires
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60751	Industrial platinum resistance thermometer sensors.
IEC 60851	Winding wires – Test methods.
IEC 61000	Electromagnetic Compatibility
ISO 15	Rolling bearings-radial bearings- boundary dimensions
ISO 281	Rolling bearings-dynamic load ratings and rating life
ISO 1132	Rolling bearings-tolerances
ISO 1680	Acoustics-Test code for the measurement of airborne noise emitted by rotating electrical machinery
ISO 1940-1	Mechanical vibration- Balance quality requirements for rotors in a constant (rigid) state-Part 1: Specification and verification of balance tolerance

由于预计设备的采购通常是在“世界范围”的基础上进行的，将以包括上述在内的各种规范和标准为准，因此，只要设备和材料的结构符合制造商所在国家的规范和标准，并且质量等于或高于上述规范

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和标准，则设备和材料将是可接受的。但是，卖方应在报价中告知买方适用的规范、标准和其标准设计的主要特点。

Since it is anticipated that purchase of equipment will generally be on a “world-wide” basis where various codes and standards including the above will prevail, the equipment and materials will be acceptable provided that their construction conforms to the codes and standards of the country of the manufacturer which are equal to or higher quality than the above codes and standards. However, vendor shall inform purchaser of the applied codes, standards and principal features of his standard design in his quotation.

3 设计条件 Design Condition

环境条件 Environmental Condition

Location	Air-conditioned substation building and/or outdoor	
Site Ambient Temperature	Min : 22 °C	Max : 36 °C
Humidity	Max: 97.1%	Design: 99%
Atmosphere condition	Acid, moisture, dusty, rodents, insect, fungus and vermin	
Area Classification	Non-hazardous	
Site Elevation	<1000 meter above mean sea level	

电气条件 Electrical Characteristic

电动机

非重要设备<0.56kW: 220V AC, 1P, 50Hz

重要设备<0,55 kW 380VAC 50Hz

0.56kW-<90kW: 380VAC 50Hz

90kW-<200kW&Heavy duty equipment: 380VAC 50Hz soft starter

低压接地形式：中性点高电阻接地（2~10A）

Motor

Non critical process<0.56kW: 220V AC, 1P, 50Hz

critical process <0,55 kW 380VAC 50Hz

0.56kW-<90kW: 380VAC 50Hz

90kW-<200kW&Heavy duty equipment: 380VAC 50Hz soft starter

Low Voltage System Grounding: High resistance grounding through 2-10A resistor.

4 技术要求 Technical Requirements

4.1 低压电机 LV Motor

4.1.1 General

1. 所有低压电动机应符合 IEC 60034，效率等级为 IE3。

All low voltage electrical motors shall comply with IEC 60034, efficiency class IE3.

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2. 所有电机应按 IEC 设计编号提供。

All motors shall be provided as IEC Design N.

3. 大型电动机的设计和结构应使转子在启动和正常运行时不会发生电弧。

Large motors shall be of such design and construction that rotor arcing will not occur during start-up and normal operation.

4. 所有电机应适合在潮湿的热带腐蚀性大气和现场气候条件下使用。

All motors shall be suitable for use in a humid tropical corrosive atmosphere and climatic conditions at site.

5. 除非另有规定，所有电动机应 S1 工作制设计。

All motors shall be designed for continuous running duty (S1) with maximum continuous rating unless otherwise specified.

6. 电机机架应设置外部接地。

Motor frames shall be provided with an external earthing boss.

7. 所有立式电机都应配备 IEC IM V 安装法兰，并配有罩盖。

All vertical motors shall be provided with IEC IM V mounting flanges and equipped with canopy.

8. 除有特殊要求的单向电机外，所有电机均为双向旋转。

Rotation of all motors shall be bi-directional except that unidirectional motors may be provided with specific requirements.

9. 电动机一般为鼠笼感应式。在经济和实用的情况下，可以使用带有驱动器或无刷型同步电机的磁阻电机 (IE5)，并使用安装在电机上的静态整流装置。

Motors shall generally be of the squirrel cage induction type. Reluctance motors (IE5) complete with drives or synchronous motors of the brushless type utilizing static type rectification devices mounted on the motor may be used when economical and practical.

10. 采用变速传动系统的电机应符合下列要求：

Motor that applied variable speed drive system shall comply to the following requirements:

- Motor shall have Inverter duty rating and the service factor shall be 1.15.
- Motors shall comply with IEC 60034-25.
- Motor turn to turn insulation shall rated for peak voltage due to rapid switching of the VSD converter.
- Where required, built-in thermal overload protection shall be included for motors in hazardous locations to ensure that temperature limits are not exceeded.
- Motors shall have insulated motor bearings.
- Motors shall be capable of adequate cooling when running at the minimum operating speed listed in the data sheets.
- Grounding brush on NDE side.

4. 1. 2 绝缘 Insulation System

1. 低压电机应配备 F 级绝缘系统，除非受到粉尘环境的限制。绝缘分类应符合 IEC 60034。

Low voltage electrical motor shall be provided with Class F insulation systems, except where restricted by dust atmospheres. Insulation classifications shall be in accordance with IEC 60034.

2. 电机温升不应超过 IEC B 级。

Motor temperatures rise shall not exceed IEC Class B.

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3. 如果需要，绝缘系统应完全封装在环氧树脂中。绕组的浸渍应确保环氧树脂完全渗透到绕组的所有区域，并消除所有空隙。环氧树脂应与卷绕的化学和物理特性完全相容。

When required insulation systems shall be completely encapsulated in an epoxy resin.

Impregnation of the windings shall assure complete penetration of the epoxy to all areas of the windings and elimination of all voids. The epoxy shall be entirely compatible with the chemical & physical characteristics of the winding.

4. 应确保绕组的环氧树脂完全永久粘合。

Complete and permanent bonding of the epoxy of the windings shall be assured.

4. 1. 3 电机启动 **Motor Starting**

1. Generally, motors shall be designed for full voltage starting (direct online) except when variable speed is required by process design.

2. Motors shall be suitable for the following starting conditions :

- Two (2) consecutive starts, the first from a cold condition with a coast down to rest before an immediate second start.
- Three (3) consecutive starts, the first from a cold condition with a coast to rest and a 20-minute idle period before each of the second and third starts.

3. Where two speed motors are provided, consideration shall be given to the provision of automatic down shift in motor speed upon high speed over load trip. Two speed pole-changing motors shall be provided with speed indicating lights located adjacent to the motor so that it is possible to determine immediately the speed at which the motor is running.

4. 1. 4 轴承和润滑 **Bearing and Lubrications**

1. 低压电机应配备滚珠或滚柱轴承，或两者都配备。

Low voltage motors shall be provided with ball or roller bearings or both.

2. 润滑脂润滑轴承应该安装在带有润滑脂配件的插装式外壳中，或者安装有油嘴润滑脂。

Grease lubricated bearings shall be mounted in cartridge type housings incorporating grease fittings or provided with nipple grease.

3. 油润滑轴承应配备恒定液位的注油器。

Oil lubricated bearings shall be provided with constant level oilers.

4. 用于无损检测和无损检测的特殊轴承尺寸应为 63

Special bearings for DE and NDE shall be bearing size 63.

5. 应提供一个符合 DIN 71412-A 标准的 M8 x 1 锥形润滑接头的回转装置，并配有阀盖。

A regreasing device with M8 x 1 conical lubricating nipple to DIN 71412-A complete with cap shall be provided.

4. 1. 5 结构 **Enclosures**

电动机和其他电气设备的结构应如下：

The construction of motors and other electrical equipment shall be as follows:

电机采用全封闭风扇冷却。

The motor should adopt the TEFC structure.

爆炸危险区电机应选用隔爆型并符合 IEC60079 的要求，外壳防护等级不低于 IP55。

Hazardous area: the motor should be of Ex d type and should comply with IEC 60079 and The enclosure protection level is not less than IP55.

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非爆炸危险环境防护等级不低于 IP55

No hazardous area:the motor should be not less than IP55.

电机机架尺寸和法兰尺寸按下表:

Motor frame size and flange size shall be in accordance with the following table:

FRAME SIZE	RATED OUTPUT (kW)	FLANGE SIZE (Free Holes)
132 mm	≤ 7,5 kW	FF 265
180 mm	> 7,5 kW – 22 kW	FF 300
225 mm	> 22 kW – 45 kW	FF 400
280 mm	> 45 kW – 90 kW	FF 500
315 mm	> 90 kW – <200 kW	FF 600

注: 额定 220v 的分马力电机可以是 TENV (全封闭非通风)

Note: Fractional horsepower motors rated 220 V may be TENV (Totally Enclosed Non Ventilated).

4. 1. 6 空间加热器 Space Heaters

1. 放置在高湿地区的电机, 或 75kw 及以上的电机, 以及通常用于备用机组的电机应配备 220vac 空间加热器。

Motors placed in a high humid area, or motor sized 75 kW and above, and motors normally used for standby unit shall be provided with 220 VAC space heaters.

2. 空间加热器应该连接到一个单独的出线接线盒上, 当电机不工作时, 空间加热器应该自动“打开”。
The space heaters shall be wired to a separate outgoing terminal box and the space heater should be “on” automatically when the motor is not in operation.

3. 当电机位于危险区域时, 应指定温度限制。

Temperature limitation shall be specified when the motor is to be located in a hazardous area.

4. 应提供接线图, 显示所有连接, 每个加热器的电压和额定瓦数, 以及整个加热器电路的施加电压和功率。

A wiring diagram shall be provided showing all connections, the voltage and wattage rating of each heater, and the applied voltage and resultant wattage of the complete heater circuit.

4. 1. 7 接线盒 Terminal Box

1. 所有电机都应配备带螺纹 (公制尺寸) 入口的接线盒。这应包括所有辅助设备的接线盒。

All motors shall be provided with terminal boxes which have threaded (metric size) entrances. This shall include terminal boxes for all auxiliary devices.

2. 接线盒的尺寸应是适用于具体框架尺寸的最大接线盒。接线盒应放在顶部。

Terminal box size shall be the largest terminal box available for the specific frame size. The terminal box shall be positioned on the top.

3. 定子线圈的 6 个绕组端均应连接到接线盒中的端子上。

All six winding ends of the stator coils shall be connected to terminals in the terminal box.

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4. 绕组连接为 380V 三角或 660V 绕线

Winding connection shall be 380V delta or 660V wye.

5. 应在接线盒内另外考虑端子，用于连接接地导体。

An additional terminal shall be provided in the terminal box for connection of the grounding conductor.

6. 接线盒应具有最大的孔和螺纹，并且必须能够旋转 90°、180° 和 270°。电缆接头将由承包商提供。

The terminal box shall have the largest possible bore and thread for that box and must be able to be rotated by 90° , 180° and 270° . Cable glands will be supplied by Contractor.

7. 应在接线盒内提供一个标签，该标签应表明用于拧紧端子的最大扭矩。

A label shall be provided inside the termination box which shall indicate the maximum torque to be applied for tightening terminations.

应在端屏蔽上设置带螺纹塞的冷凝排水孔。

Condensation drainage hole complete with thread plug in end shield shall be provided.

8. 电缆入口应安装密封塞。

Cable entries shall be fitted with sealing plugs.

9. 所有电气附件的接线应连接到接线盒的端子上。

All wirings of electrical accessories shall be wired to terminals in terminal boxes.

4. 1. 8 其他 **Miscellaneous**

1. 冷却风扇应由无火花材料制成，并应适合在任何方向上旋转。在标准风扇发出的噪音令人反感的条件下，大型电机可配备单向风扇。单向风机仅可根据具体要求提供。

Cooling fans shall be made of non-sparking material and shall be suitable for rotation in either direction. Uni-directional fans may be provided in large motors where the noise from a standard fan would become objectionable. Uni-directional fans may be provided only with the specific requirement.

2. 应在可能聚集湿气的外壳内设置排水管。带有空气到水冷却系统的电动机的底板上也应该有排水孔，并且底板应该倾斜以保证足够的排水。

Drains shall be provided in enclosures where moisture may collect . Drain holes shall also be provided in the base plate of motors with air to water cooling systems and the base plate shall be sloped to ensure adequate drainage.

3. 底板应适合用水泥灌浆安装。如果需要特殊灌浆，则应提供这种材料。

Base plates shall be suitable for installation with cement grout. If special grout is required such material shall be furnished.

4. 所有电机都应配备不锈钢铭牌。

All motors shall be provided with stainless steel name plates.

5. 单向电机的旋转方向应在电机的非驱动端屏蔽上用箭头明确标明。

The direction of rotation of unidirectional motors shall be clearly indicated by means of an arrow located on the non driving end shield of the motor.

6. 大型电机的接线盒应有可拆卸的底压盖板，便于维护。

Terminal boxes of large motor shall be provided removable bottom gland plate for maintenance purpose.

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7. 接线盒格兰（黄铜镀镍双密封格兰）由厂家提供，格兰数量和规格根据买方后期提供的电缆外径确定。

The cable gland (copper-nickel plated double-sealed gland) is provided by the vendor. The gland number and size will be determined based on the outer diameter of the cable provided by the buyer later.

8. 每台电机应在电机机架上设置一个外部接地端子，在主接线盒内设置一个内部接地端子。这些接地端子应清晰而永久地加以标识。

Each motor shall be provided with an external grounding terminal on the motor frame and an internal grounding terminal in the main terminal box. These grounding terminals shall be clearly and permanently identified.

5 备件 SPARE PARTS

制造商应根据需要提供所有推荐的施工备件。

制造商应单独向买方提交一份推荐的备件清单，包括其互换性和两年运行的单价。

Manufacturer shall provide all recommended construction spare parts as necessary.

Manufacturer shall separately submit to the purchaser a recommended spare parts list including their interchangeability and their unit prices for two years operation.

6 铭牌 NAME PLATES

6.1 低压电机 LV Motor

1. 每台电机都应配备一个铭牌。铭牌应由不锈钢制成，并牢固地固定在框架的不可移动部分。如果在可移动部件上安装了额外的铭牌，则应在这些额定铭牌上重复序列号和电机标签编号。

Every motor shall be provided with a rating plate or plates. Nameplates shall be made of stainless steel and securely fixed to a non-removable part of the frame. If additional nameplates are mounted on removable parts, the serial number and motor tag number shall be repeated on these rating plates.

2. 额定极板应符合 IEC 标准，但爆炸性环境中电动机的额定极板应符合适用标准。

Rating plate shall be in accordance with IEC except that rating plates for motors in explosive atmospheres shall be in accordance with the applicable standard.

3. 还应提供下列数据牌：

The following data plates shall also be provided:

- Made in country
- Rated power, rated FLA, frequency, poles, rated voltage, winding connection, frame size
- Motor item no. as specified in data sheet
- Direction of rotation
- Instructions for lubrication with bearing No.
- End play mark for horizontal sleeve bearing
- Other plates, where necessary
- Net weight

4. 铭牌应为黑字白底，机器雕刻，用锥形不锈钢螺丝固定。用胶水粘上的铭牌是不可接受的。

Name plates shall have black letters with white background and shall be machine-engraved fastened with tapered stainless-steel screws. Glued-on name plates are not acceptable.

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5. 变频驱动控制的电机，电机铭牌上应注明为变频占空电机。

For motor controlled by Variable Speed Drive, the motor nameplate shall identify it is an inverter duty motor.

7 涂漆 PAINTING

1. 根据 ISO 12944 的要求，所有的电机都应进行 C5I 级的油漆和涂层处理，特别是暴露于海水雾中的电机应进行 C5M 级的油漆和涂层处理，以保护电机免受腐蚀性大气的影响。

All motors shall be painting and coating finish with C5I category and specially motors which expose seawater mist shall be painted and coating finish with C5M category to protect motors against corrosive atmosphere as per ISO 12944.

2. 暴露海水雾的电机的风扇和接线盒应采用非腐蚀性材料。

Cover fan and terminal box of motors which expose seawater mist shall be non-corrosive material.

3. 漆面颜色应在泵/电机数据表或涂装规范中注明。

Finish color shall be as indicated in pump/motor data sheet or painting specification.

8 安装、储存、搬运 INSTALLATION, STORAGE & HANDLING

1. 运输、处理和储存要求应由供应商说明。

Shipping, handling and storage requirements shall be stated by vendor.

2. 在运输、搬运、吊装和安装过程中，每个运输段都应配备合适的钢段和吊装眼形式的支撑，以保持部件的对齐。吊装点的位置应在集装箱和图纸上清楚地标明。每个装运部分的重量和重心应清楚地标明在集装箱上。

Each shipping section shall be provided with supports in the form of suitable steel sections and lifting eyes to maintain alignment of parts during shipping, handling, hoisting and installation.

Location of lifting points shall be clearly marked on shipping containers and on drawings. Each shipping section shall have its weight and center of gravity clearly marked on the container.

3. 为保持装运物品的完好，卖方应提供特殊的储存要求。在储存期间，加热器和除湿器的电线应易于使用。在安装之前，面板应在原始供应商的包装中保存在受保护的安全环境中。在储存过程中应保持密封保护罩的完整性。

Special storage requirements to maintain the fitness of the shipped items shall be provided by the Vendor. Clearly marked space heater and dehumidifier wiring shall be accessible for use during storage. Prior to installation, panels shall be stored in a protected and secure environment in the original Vendor's packaging. The integrity of the sealed protective covers shall be maintained during storage.

4. 供应商应在其安装和操作手册中提供现场设备安装说明。此外，当在申请单和/或采购订单中注明时，供应商服务人员应在现场安装过程中提供安装监督。

Vendor shall provide instructions for installation of equipment in the field in their installation and operating manual. Additionally, when indicated in requisition and/or purchase order, installation supervision shall be provided by vendor serviceman during installation process at site.

9 试验及检验 TEST AND INSPECTION

1. 车间试验应按照适用规范或标准的要求进行。供应商应提交车间测试项目和测试程序。进行的车间试验应至少包括车间检验程序中列出的所有试验。

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Shop test shall be carried out in accordance with the requirements of the applicable codes or standards. Vendor shall submit the shop test items and the test procedure. Shop tests to be performed shall include at least all test listed on the shop inspection procedure.

2. 所有电机应至少接受制造商的常规测试程序，以验证其具有必要的电气强度，并且电气和机械性能令人满意。

All motors shall be subjected to at least the Manufacturer's routine test programme to verify it has the necessary electrical strength and that electrical and mechanical performance are satisfactory.

3. 当在申请和/或采购订单中注明时，在设备通电和/或调试之前，应由供应商维修人员在现场项目中进行现场验收测试。卖方应在报价单上提交在现场进行的测试项目清单，并提交现场验收测试程序供买方审查。

When indicated in requisition and/or purchase order, site acceptance test shall be performed by vendor serviceman at site project prior to energizing the equipment energize and/or commissioning. Vendor shall submit the list of test items to be performed at site on their quotation, and also submit site acceptance test procedure to be reviewed by Purchaser.

10 供应商数据要求 **VENDOR DATA REQUIREMENT**

供应商应为所供应的每台电机提供以下文件和图纸。

Vendor shall provide the following document and drawing for each of supplied motor.

- Dimensioned outline drawing including floor anchoring and foundation template and weights
- Rated kW , full-load amps, rated speed, rated voltage, service factor, number of poles, locked-rotor current (% LRC)
- Percent power factor and efficiency at 50%, 75% and 100% load
- No-load current and power factor
- Stall times (hot and cold) in seconds
- Certified torque-speed curves at 80% and 100% voltage
- Certified current-speed curves at 80% and 100% voltage
- Motor thermal damage curves
- Equipment nameplate
- Shaft power
- Load and motor inertia (GD^2)
- Acceleration time (starting time) at 80% and 100% voltage

11 保修 **WARRANTY**

1. 供应商需对依据本规范所供应的所有设备的设计及性能承担最终及全面的责任。供应商应保证所提供的设备及其性能符合本规范的要求。该保证将涵盖材料供应以及人力投入，以修复任何有缺陷的部件或设备。

Vendor shall have the final and total responsibility for the design and performance of all equipment supplied under this specification. Vendor shall warrant the equipment furnished and the performance of said equipment in accordance with this specification. The warranty shall cover both, the supply of material and manpower to make good any defective components or equipment.

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2. 供应商需自行承担费用，对现场进行必要的修改或增设，以弥补任何存在的缺陷。

The Vendor shall make, at its expense, any required modifications or additions to correct any deficiencies at site.

3. 供应商应保证设备在材料和工艺方面无任何缺陷，并且其尺寸和容量足以满足本协议中规定的设计和运行条件。

The Vendor shall warrant the equipment to be free of defects in material and workmanship, and that it is of adequate size and capacity to fulfill the design and operating conditions specified herein.

4. 如果发现材料或工艺存在缺陷，且此类缺陷导致产品在设计条件下出现故障，那么供应商应免费更换和安装任何相关材料、用品或设备。

The Vendor shall replace and install without cost any materials, supplies or equipment which fails under design conditions due to defects in material or workmanship if the defect is observed and/or such failure occurs.