



TÜV NORD 客户指南文件

TÜV NORD Guidance Documentation for Customer

风力发电机组认证实施规则

Certification Rules for Wind Turbine generator systems

编制人:

Edited by:

Jane Hu

审核人:

Reviewed by:

Hepei

批准人:

Approved by:

Ryan Xie

杭州汉德质量认证服务有限公司

TÜV NORD (Hangzhou) Co., Ltd.

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前言:

Foreword:

RW TÜV 集团, TÜV 汉诺威/萨克森-安哈尔特集团与 TÜV NORD 集团, 这几家著名的德国检验和认证机构已于 2004 年 9 月 1 日通过合并计划。新合并的集团源用“TÜV NORD”的名称, 以突显新集团的区域性。TÜV NORD 集团在 2014 年拥有高达 10.89 亿欧元的销售额, 现在它在全世界 70 多个国家拥有超过 11000 名员工, 而且人数还在不断的增长中。

TÜV NORD was established from TÜV NORD e.V., TÜV Hannover/Sachsen-Anhalt and Parts of RW RWTÜV e.V. on September 1st 2004, the name of the new groups is “TÜV NORD” to show regional features.

TÜV NORD 集团的服务从蒸汽锅炉检验开始, 经过一百多年的发展, 已发展成为综合性的公司, 包括了汽车、工业、系统安全、新能源和铁路等方面。TÜV NORD 集团现今已成为一家服务范围非常广泛的公司, 长久以来, 在 TÜV NORD 集团的传统服务例如测试和认证中, 已经加入了咨询和培训等服务, 成为了 TÜV NORD 集团和它的分支机构全套服务中的组成部分。通过地区、国家和国际间的运作, TÜV NORD 集团结合了认可的技能、多方面的创新和大量在行业市场领先的公司, 成熟的专业技能和超过 11000 名在世界各地热忱工作的员工, 确保 TÜV NORD 集团成为了安全、质量、技能和信任的标志。

The service starts from the Steam Boiler inspection for TÜV NORD Groups, now it has become a comprehensive company for more than one hundred year development. The service include Vehicle, Industry and Safety for system, Renewables and Railway ect. TÜV NORD Groups also is the company with wide service scopes, expect for the traditional service testing and certification, the consultation, and Training are also its serves. TÜV NORD Groups has more than 11,000 professional employees in specific areas all over the world, and always keep improving the technical skills for certification according to the innovation and the marketing requests to make sure TÜV NORD Groups is the signal of safety, high quality, technology and trust.

自 150 年前成立以来, TÜV NORD 集团一直是全球的安全和信任的代言人。作为一家以知识为基础的公司, TÜV NORD 集团始终坚定地牢记数字化未来。从工程师、IT 安防专业人员到未来移动出行专业人员, 我们利用在 70 多个国家的专业知识确保我们的客户将在互联的世界中更加成功。

Since our foundation 150 years ago, TÜV NORD Groups has been the global byword for security and trust. As a knowledge based company, TÜV NORD Groups has the digital future firmly in mind. With specialists ranging from engineers and IT security professionals to professionals for the mobility of tomorrow, we use our expertise in over 70 countries to ensure that our customers will be even more successful in the networked world.

TÜV NORD 集团作为第三方独立机构, 为客户提供广泛在风能行业提供广泛的服务, 在风力发电机组项目的整个生命周期中, 作为合格的和可靠的合作伙伴陪伴着我们的客户。我们的服务包含型式认证、部件认证、项目认证、海上风电服务、技术检验和监督、技术咨询和技术尽调、风资源预测、可盈利发电量报告、场址适应评估、环境影响分析、地质调查和咨询、电气系统和电网并网。我们可以根据风电行业相关的所有标准和导则, 如 GB、IEC、EN、GL、丹麦批准计划、TAPS 和 BSH 等, 提供以上相关的服务。

As a third part, TÜV NORD Groups offers a wide field of the services in the wind energy that accompany our customer as competent and reliable partner throughout the entire lifecycle of the turbine projects. The services include Type certification, Component certification, Project certification, Offshore Wind Service, Technical Inspection and Surveillance, Technical Advisory Service & Technical Due Diligence, Wind Resource Prognosis, Full Bankable AEP Report, Site-suitability Assessment, Environmental Impact Analysis, Geotechnical Investigation & Consultancy, Electrical System, Grid Connection. All the services can be offered according to the relevant standards, guidelines of wind energy, e.g.: GB, IEC, EN, GL, Danish Energy Authority's Executive Order, TAPS, DIBts ect.

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修订号: Revision No.:	日期 Date	变化 Changes	姓名和头衔 Name & Title	
			起草 Draft	批准 Approve
00	2015.04.02	原始版本 First Revision	Mark Dai / 项目经理 Project Manager	Kevin Zhu / 技术经理 Technical Manager
01	2016.09.13	更新文件名称, 更新 3.4 节内容和增加附录 C Updated the name of this document, Updated some contents of Chapter 3.4 and Added the Annex C	Mark Dai / 项目经理 Project Manager	Kevin Zhu / 技术经理 Technical Manager
02	2018.10.30	更新 GB/T 35792 标准及要求; 修改样机认证的描述; 更新了参考 ISO 9001 标准版本 Updated the standard GB/T 35792 and its requirements; Updated the description of prototype certification; and Updated the latest version of ISO 9001 standard.	Frank Fang/ 工程师 Engineer	Vincent Zhu/ 技术经理 Technical Manager
02.01	2019.02.25	更新了 GB/T 17676、GB/T 25389.1 和 GB/T 25389.2 标准版本及名称 Updated the version and name of the standards GB/T 17676, GB/T 25389.1 and GB/T 25389.2	Frank Fang/ 工程师 Engineer	Vincent Zhu/ 技术经理 Technical Manager
03	2019.12.03	第 3.4 节制造评估: 综述最后一段, 由“所有不同的部件”变更为“所有不同的部件制造商”。 第 3.7 节型式试验: 综述的最后一段更新了 TÜV NORD 对型式测试结果的采信要求。 附录 C 补充了工厂审核实际执行时的变通方案。 The last paragraph in Chapter 3.4 “Manufacturing evaluation: Overview” has modified from “all the different components” to “all the suppliers of different component”. The last paragraph in Chapter 3.7 “Type testing: Overview” has been updated, the content is the requirements of accepting the type testing results. And the flexible method has been given as option during the actual implementation of manufacturing inspection.	Junchao Ping/ 工程师 Engineer	Jane Hu/ 高级项目工程师 Senior Project Engineer

04	2020.04.28	<p>修订该认证实施规则中的一些描述，使认证中的相关要求表达更清晰（修订范围全文），并补充英文对照翻译；增加新的认证方案 IECRE OD-501 及其子标准（等同于认证方案 IEC 61400-22）；增加新的认证方案 DNVGL-SE-0441 及其相关模块的设计标准要求（与 IV-Part 1 / GL 的认证方案上相似性比较高）；新增新的认证导则 IV-Part2/GL（与 IV-Part1/GL 认证导则相似性高）；补充海上风力发电机组的认证实施详情。</p> <p>Modified some descriptions of the certification rules to make the certification requirements more clearer(the modification scope is the whole rule), supplement the translation of the rule ; Added new certification scheme based on standard IECRE OD-501 and sub OD-501s(Identical to standard IEC 61400-22); Added new DNVGL-SE-0441 and its relevant design standards (has high similarity with standard IV-Part1/GL); Added the detailed certification rules for offshore wind turbines,</p>	<p>Jane Hu/ 高级项目工程师 Senior Project Engineer</p>	<p>Ryan Xiao / 技术经理 Technical Manager</p>

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第 1 节 简介

Chapter 1 Introduction

1.1 综述 Overall description

本文件描述适用于风力发电机组设计评估、设计认证、型式认证和全部测试方法的指南和规程，如 IEC 61400-22, GB/Z 25458, GB/T 35792, IV-Part 1 / GL, DNVGL-SE-0441 和 IV-Part2 /GL 标准中所述。

This instruction describe the guidance and procedure for the design evaluation, design certification, type certification and all the requirements of type testing, which are described in standards IEC 61400-22, GB/Z 25458, GB/T 35792, IV-Part1/GL, DNVGL-SE-0441 and IV-Part2 GL.

— 适用于风力发电机组 IEC 61400-22 型式认证的标准应为 IEC 61400-1, IEC 61400-3-1 和 IEC 61400-3-2 (适用于大型风力发电机组扫掠面积 $\geq 200\text{m}^2$)。

The design standard IEC 61400-1, IEC 61400-3-1 and IEC 61400-3-2, which is suitable for sweep square larger than 200 m^2 of wind turbine, outlines design requirements for type certification scheme IEC 61400-22.

— 适用于风力发电机组 IEC 61400-22 型式认证的标准应为 IEC 61400-2 (适用于小型风力发电机组 (扫掠面积 $<200\text{m}^2$))。

The design standard IEC 61400-2, which is suitable for sweep square smaller than 200 m^2 of wind turbine, outlines design requirements for type certification scheme IEC 61400-22.

— 适用于风力发电机组 GB/Z 25458 / GB/T 35792 型式认证的标准应为 GB/T 18451.1 和 GB/T31517-2015 (适用于大型风力发电机组 (扫掠面积 $\geq 200\text{m}^2$))。

The design standard GB/T18451.1 and GB/T 31517-201, which is suitable for sweep square larger than 200 m^2 of wind turbine, outlines design requirements for type certification schemes GB/Z 25458 and GB/T 35792.

— 适用于风力发电机组 GB/Z 25458 / GB/T 35792 型式认证的标准应为 GB/T 17646、GB/T 29494 (适用于小型风力发电机组 (扫掠面积 $<200\text{m}^2$))。

The design standard GB/T 17646 and GB/T 29494, which is suitable for sweep square smaller than 200 m^2 of wind turbine, outlines design requirements for type certification schemes GB/Z 25458 and GB/T 35792.

— 适用于风力发电机组 GL 导则型式认证的标准应为 IV-Part 1 / GL 和 IV-Part2 / GL。

The design standard IV-Part1/GL and IV-Part2/GL outlines design requirements for type certification schemes GL guideline.

设计要求和认证要求是认证过程的重要组成部分，其为被认证风机的设计评估、制造和型式测试提供指南。本文将引用不同的 IEC、GB 和 GL 导则等相关适用标准，明确 TÜV NORD 在风力发电机组认证过程中的要求。

The requirements of design and certification are significant part in the certification procedure, which defines rules and procedures for design assessment, manufacturing and type testing with respect to standards and technical requirements for wind turbines. This instruction will refer to different standards for different application to help the applicant know the requirements in the certification, e.g. IEC, GB and GL Standards or guidelines.

近几十年随着可再生能源行业的发展，国际电工委员会 IEC 为了更好的确保全球可再生能源产业中的设备和服务等在一个相对统一的水平，特别成立了 IECRE 体系。基于该目的，在风能板块，IECRE 体系在 2018 年 6 月发出公告，原来的风力发电机组认证标准 IEC 61400-22 于 2018 年 8 月 31 日作废，并被 IECRE 符合性声明体系所取代。之后，IEC 61400-22 标准被 IECRE OD-501 和 IECRE OD-502 标准取代。但是目前，行业内新旧标准的使用还是同时有效。TÜV NORD 对 IECRE 体系出台的新的风力发电机组相关认证标准 IECRE OD-501、IECRE OD-052 和其子标准的要求与原 IEC 61400-22 标准作了差异性分析，最大差异主要是 IECRE OD-501 和其子标准在风力发电机组的设计评估模块中的要求变得更详细。在第 2 和第 3 章都有相应的详细说明。

As for the decades of renewable development, IECRE System was created to ensure the equipment and services of renewable energy maintaining in the required level in whole global. For the aim, IECRE announced that the certification standard IEC 61400-22 would be withdrawn and be replaced with the IECRE conformity assessment system. After that, IEC 61400-22 was replaced by IECRE OD-501 and IECRE OD-502. But in the wind turbine industry, the old and new standards are still useful for the manufacturers. TÜV NORD has done the certification

requirements deviations analysis between the new IECRE OD-501, IECRE OD-502 and relevant sub-standards and IEC 61400-22 standards, the biggest deviation for the IECRE standards and IEC 61400-22 is the requirements of design evaluation module for wind turbine certification become more clear. The detailed requirements can be found in Chapter 2 and 3.

风力发电机组正在经历快速的发展时期，相关国际和行业标准不断的在基于实践经验优化风力发电机组及其部件的设计、制造和测试的要求，以进一步确保风力发电机组及部件的安全性。风力发电机组整体和关键部件的设计、制造和型式测试是行业内关注的重中之重；风力发电机组整机制造商和部件供应商的设计、测试和制造参考使用除了原有的标准 IEC 61400-22/IEC 61400-1、GL2010，近几年行业内又推出了新的标准，比如 DNVGL-SE-0441、DNVGL-ST-0376、DNVGL-ST-0361、DNVGL-ST-0437、DNVGL-ST-0438；这些标准为整机和部件的设计、制造和测试也提供了具体的方法。TÜV NORD 通过对比分析标准 IEC 61400 系列、GL2010 与 DNVGL 相关标准的差异，明确了 DNVGL 标准对整机和叶片设计、制造和测试的要求；并补充在该导则相应的模块中。

Under the rapid development period of wind turbines, requirements of design, manufacture, test of wind turbines and the sub-components in relevant international and industrial standards are being optimized based on the actual wind turbine operation experiences to further ensure the safety of wind turbines and sub-components. Wind turbines and the main components are paid close attention by wind turbine manufacturers and component manufactures. In addition to the standard IEC 61400-22, IEC 61400-1 and GL2010, now new standards, e.g.: DNVGL-SE-0441, DNVGL-ST-0376, DNVGL-ST-0361, DNVGL-ST-0437, DNVGL-ST-0438, which provide more detailed requirements for the turbine designing, manufacturing and testing, are also followed by wind turbine manufacturers and component manufactures. According to the deviation analysis among IEC 61400 series, GL2010 and DNVGL standards, TÜV NORD has identified the requirements of wind turbine designing, manufacturing and type testing from DNVGL standards. The detailed requirements can be found in the next chapters.

外部验证用于确认测试风机的设计和操作安全性。本章节所讨论的标准给出的是设计要求概述，风力发电机组部件和子系统的型式认证程序。

The external verification is used to test the design and safety operation of wind turbine. The standards listed above are the general design requirements for the certification schemes of wind turbine, components and sub-systems.

TÜV NORD 可以提供基于 IECRE OD-501 及其子标准, IECRE OD-502, IEC 61400-22, GB/Z25458, GB/T 35792, IV-Part 1 / GL, IV-Part2 / GL 和 DNVGL-SE-0441 标准的认证，认证申请人负责决定遵循哪一标准。The certification which applies on standards IECRE OD-501& Sub OD-501s, IECRE OD-052, IEC 61400-22, GB/Z 25458, GB/T 35792, IV-Part1/GL, IV-Part2 / GL and DNVGL-SE-0441 by the applicant can be offered by TÜV NORD.

1.2 风力发电机组认证：综述 **Certification of wind turbine: General**

认证是一种复杂的技术过程。第三方机构根据产品相关标准和其他技术要求来评估产品的设计、安全性、性能、测试和操作。

Certification is a complex technological process. The certification procedures constitute a complete third party conformity evaluation of wind turbine, with respect to specific standards and other technical requirement, relating to design, safety, reliability, testing and performance.

评估程序基于既定的工程和科学实践，可被分类为多个技术文件，被人们称为各类产品的认证标准。上述第三方机构被称为认可机构所认可的认证机构，用于对申请认证的制造商所设计和生产的产品进行认证。

Based on the engineering and science practice, the assessment procedure, which can be separated to multiply technical documentation, was called certification standards for products. The above third party, attestation related to products, processes, systems or persons, shall be the certification body that has been accredited by accreditation body.

对于风力发电机组，大部分重要的技术标准均由国际电工委员会 (IEC) 编写。

For wind turbine, most of the technical standards are edited by International Electro-technical Commission (IEC).

除 IEC 之外，德国劳埃德船级社 (GL) (现在更为 DNVGL, 2013 年挪威船级社 DNV 与德国劳埃德船级社 GL 合并)、全国风力机械标准化技术委员会 (中国) 等组织根据国家差异从 IEC 标准中衍生出他们自己的标准。

And other standards are derived from IEC standards by Germanischer Lloyd Industrial Services GmbH (GL) (Now it is DNVGL after the merger of DNV and GL in 2013) or China National Technical Committee for wind energy Machinery Standardization (SAC/TC 50) or other national standards association.

如 IV-Part1/GL 标准中所述, 由于特定国家或地区的管理机构所规定的国家要求不同, 各国的认证范围也可能有所不同。建议用于认证的标准参见表 1.1。

As for the statement in standard IV-Part1/GL, the scope of certification might be different according to the different national requirements in specific nation or area. The recommended standards of certification are listed in table1.1.

表 1.1: 风力发电机组相关标准
Table1.1 Related standards for wind energy generator system

标准 Standard	说明 Designation
IEC WT 01	风力发电机组 合格认证规则及程序 IEC system for Conformity Testing and Certification of Wind Turbines Rules and procedures
IEC 61400-1	风力发电机组 第 1 部分: 设计要求 Wind turbines-Part1: Design requirements
IEC 61400-2	风力发电机组 第 2 部分: 小型风力发电机组 Wind turbines-Part2: Small wind turbines
IEC 61400-3	风力发电机组 第 3 部分: 海上风力发电机组设计要求 Wind turbines-Part3: Design requirements for offshore wind turbines
IEC 61400-3-1	风力发电机组 第 3-1 部分: 固定式海上风力发电机组设计要求 Wind energy generation system -Part3-1: Design requirements for fixed offshore wind turbines
IEC TS 61400-3-2	风力发电机组 第 3-2 部分: 漂浮式海上风力发电机组设计要求 Wind energy generation system -Part3-2: Design requirements for floating offshore wind turbines
IEC 61400-4	风力发电机组 第 4 部分: 风力发电机组用齿轮箱的设计要求 Wind turbines-Part4: Design requirements for wind turbine gearboxes
IEC 61400-11	风力发电机组 第 11 部分: 噪声测量 Wind turbines-Part11: Acoustic noise measurements techniques
IEC 61400-12-1	风力发电机组 第 12-1 部分: 风力发电机组功率特性试验 Wind turbines-Part12-1: Power performance measurement of electricity producing wind turbines
IEC 61400-12-2	风力发电机组 第 12-2 部分: 基于机舱风速计的风电机组功率特性测试 Wind turbines-Part 12-2: Power performance of electricity producing wind turbines based on nacelle anemometry
IEC 61400-13	风力发电机组 第 13 部分: 机械载荷测量 Wind turbines-Part13: Measurement of mechanical loads
IEC 61400-14	风力发电机组 第 14 部分: 视在声功率级和音值声明 Wind turbines-Part14: Declaration of apparent sound power level and tonality values
IEC 61400-21	风力发电机组 第 21 部分: 并网运行的风力发电机组电能质量测量和评估 Wind turbines-Part21: Measurement and assessment of power quality characteristics of grid connected wind turbines
IEC 61400-22	风力发电机组 第 22 部分: 合格试验和认证 Wind turbines- Part22: Conformity testing and certification
IECRE OD-501	IECRE 操作文档 型式和部件认证方案 IECRE Operational Document Type and Component Certification Scheme
IECRE OD-501-1	IECRE 操作文档 RE 认证机构的叶片合格评定及认证 IECRE Operational Document Conformity assessment and certification of Blade by RECB

IECRE OD-501-2	IECRE 操作文档 RE 认证机构的风力发电机齿轮箱合格评定及认证 IECRE Operational Document Conformity assessment and certification of wind turbine gearboxes by RECB
IECRE OD-501-3	IECRE 操作文档 RE 认证机构的塔筒合格评定及认证 IECRE Operational Document Conformity assessment and certification of tower by RECB
IECRE OD-501-4	IECRE 操作文档 RE 认证机构的载荷合格评定及认证 IECRE Operational Document Conformity assessment and certification of Loads by RECB
IECRE OD-501-5	IECRE 操作文档 RE 认证机构的控制与保护系统合格评定及认证 IECRE Operational Document Conformity assessment and certification of Control and Protection System by RECB
IECRE OD-501-7	IECRE 操作文档 RE 认证机构的主要电器部件合格评定及认证 IECRE Operational Document Conformity assessment and certification of Main Electrical Components by RECB
IECRE OD-502	IECRE 操作文档 项目认证方案 IECRE Operational Document Project Certification Scheme
IEC 61400-23	风力发电机组 第 23 部分：风轮叶片全尺寸结构试验 Wind turbines-Part23: Full-scale structural testing of rotor blades
IEC 61400-24	风力发电机组 第 24 部分：雷电防护 Wind turbines-Part24: Lightning protection
IEC 61400-25-1	风力发电机组 第 25-1 部分：风电场监控系统通信标准- 原则与模型概述 Wind turbines-Part25-1: Communications for monitoring and control of wind power plants-Overall description of principles and models
IEC 61400-25-2	风力发电机组 第 25-2 部分：风电场监控系统通信标准- 信息模型 Wind turbines-Part25-2: Communications for monitoring and control of wind power plants-Information models
IEC 61400-25-3	风力发电机组 第 25-3 部分：风电场监控系统通信标准- 信息交换模型 Wind turbines-Part25-3: Communications for monitoring and control of wind power plants-Information exchange models
IEC 61400-25-4	风力发电机组 第 25-4 部分：风电场监控系统通信标准- 通信协议栈映射 Wind turbines-Part25-4: Communications for monitoring and control of wind power plants-Mapping to communication profile
IEC 61400-25-5	风力发电机组 第 25-5 部分：风电场监控系统通信标准- 一致性测试 Wind turbines-Part25-5: Communications for monitoring and control of wind power plants-Conformance testing
IEC 61400-25-6	风力发电机组 第 25-6 部分：风电场监控系统通信标准- 逻辑节点类和数据类状态监测 Wind turbines-Part25-6: Communications for monitoring and control of wind power plants-Logical node classes and data classes for condition monitoring
IEC 61400-26-1	风能发电系统 第 26-1 部分：风能发电系统的可利用率 Wind energy generation systems-Part 26-1: Availability for wind energy generation systems
IEC 61400-27-1	风力发电机组 第 27-1 部分：电气仿真模型—风力发电机 Wind turbines-Part27-1: Electrical simulation modules-Wind turbines
IEC 60034-1	旋转电机 第 1 部分：定额和性能 Rotating electrical machines-Part1:Rating and performance
IEC 60034-5	旋转电机 第 5 部分：旋转电机整体结构防护等级（IP 代码）--分类 Rotating electrical machines-Part5:Degrees of protection provided by the integral design of rotating electrical machines(IP code) -Classification
IEC 60034-6	旋转电机 第 6 部分：冷却方法

	Rotating electrical machines-Part6:Methods of cooling (IC code)
IEC 60034-7	旋转电机 第 7 部分: 结构型式、安装型式及接线盒位置的分类 (IM 代码) Rotating electrical machines-Part7:Classification of types of constructions and mounting arrangements(IM Code)
IEC 60034-9	旋转电机 第 9 部分: 噪声限值 Rotating electrical machines-Part9:Noise limits
IEC 61800-5-1	调速电气传动系统-第 5-1 部分: 安全要求-电、热和能量 Adjustable speed electrical power drive systems-Part5-1:Safety requirements-Electrical, thermal and energy
IEC 62477-1	电力电子变流器系统及设备安全要求- 第 1 部分 基本要求 Safety requirements for power electronic converter systems and equipment - Part 1: General
IEC 61000-6-1	电磁兼容 第 6-1 部分:通用标准—住宅、商业和轻工业环境的抗扰度 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity standard for residential, commercial and light-industrial environments
IEC 61000-6-2	电磁兼容 第 6-2 部分:通用标准—工业环境的抗扰度 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
IEC 61000-6-5	电磁兼容 第 6-5 部分:通用标准—用于发电站和变电站环境设备的抗扰度 Electromagnetic compatibility (EMC) - Part 6-5: Generic standards - Immunity for equipment used in power station and substation environment
IEC 61000-6-7	电磁兼容性 (EMC) 测试 Electromagnetic compatibility (EMC) - Part 6-7: Generic standards - Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations
IEC 60204-1	机械安全 机器的电气设备 第 1 部分: 一般要求 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 2394	结构可靠性一般原则 General principles on reliability for structures
ISO 9001	质量管理体系 Quality management systems
ISO/IEC 17020	检验方各类型操作一般准则 Conformity assessment –Requirements for the operation of various types of bodies performing inspection
ISO/IEC 17025	测试和检验实验室资格 General requirements for the competence of testing and calibration laboratories
ISO 4354	风力对结构的作用 Wind actions on structures
ISO 76	滚动轴承 额定静载荷 Rolling bearings-static load ratings
ISO 281	滚动轴承 额定动载荷和额定寿命 Rolling bearings-Dynamic load ratings and rating life
EN 50308	风机—保护测试—设计、操作和维护要求 Wind turbines-Protective measures-Requirements for design, operations and maintenance
IV-Part 1/GL 2010	风力发电机组认证导则 Rules and Guidelines Industrial Services-Guideline for the certification of wind turbines
IV-Part 2/GL 2012	海上风力发电机组认证导则

	Rules and Guidelines Industrial Services-Guideline for the certification of offshore wind turbines
DNVGL-SE-0441	风力发电机组的型式和部件认证 Type and component certification for wind turbines
DNVGL-RP-0363	风力发电机组的极端温度条件 Extreme temperature conditions for wind turbines
DNVGL-ST-0361	风力发电机组的机械部件 Machinery for wind turbines
DNVGL-ST-0376	风力发电机组 风轮叶片 Rotor blades for wind turbines
DNVGL-ST-0437	风力发电机组的载荷和场址条件 Loads and Site conditions for wind turbines
DNVGL-ST-0438	风力发电机组的控住与保护系统 Control and protection systems for wind turbines
DNVGL-ST-0076	风力发电机组的电气设备设计 Design of electrical installations for wind turbines
GB/Z 25458	风力发电机组 合格认证规则及程序 Rules and procedures for conformity testing and certification of wind turbine generator system
GB/T 18451.1	风力发电机组 设计要求 Wind turbine generator systems-Design requirement
GB/T 17646	小型风力发电机组 Small wind turbines
GB/T 29494	小型垂直轴风力发电机组 Small vertical axis wind turbines
GB/T 18451.2	风力发电机组 功率特性试验 Power performance measurements of electricity producing wind turbines
GB/Z 25426	风力发电机组 机械载荷测量 Wind turbine generator systems measurement of mechanical loads
GB/T 22516	风力发电机组 噪声测量方法 Acoustic noise measurement techniques of wind turbine generators systems
GB/Z 25425	风力发电机组 公称视在声功率级和音值 Declaration of apparent sound power level and tonality values for the wind turbine
GB/T 20320	风力发电机组 电能质量测量和评估方法 Measurement and assessment of power quality characteristics of wind turbine generator systems
GB/T 25383	风力发电机组 风轮叶片 Wind turbine generator system--Rotor blades
GB/T 25384	风力发电机组 风轮叶片全尺寸结构试验 Turbine blade of wind turbine generator systems—Full-scale structural testing of rotor blades
GB/T 19073	风力发电机组 齿轮箱 Gearbox of wind turbine generator system
GB/T 4662	滚动轴承 额定静载荷 Rolling bearings—Static load ratings
GB/T 6391	滚动轴承 额定动载荷和额定寿命 Rolling bearings—Dynamic load ratings and rating life
GB/T 29717	滚动轴承 风力发电机组偏航、变桨轴承 Rolling bearings-Wind power generators yaw and pitch bearings

GB/T 29718	滚动轴承 风力发电机组主轴轴承 Rolling bearings—Wind power generators main bearings
JB/T 10705	滚动轴承 风力发电机轴承 Rolling bearings—Wind power generator bearings
GB/T 23479.1	风力发电机组 双馈异步发电机-第 1 部分：技术条件 Wind turbine—Double-fed asynchronous generator-Part1: Technical specification
GB/T 23479.2	风力发电机组 双馈异步发电机-第 2 部分：试验方法 Wind turbine—Double-fed asynchronous generator-Part2:Testing methods
GB/T 25389.1	风力发电机组 低速永磁：同步发电机-第 1 部分：技术条件 Wind turbine low-speed permanent magnet synchronous generator-Part1:Technical conditions
GB/T 25389.2	风力发电机组 低速永磁：同步发电机-第 2 部分：试验方法 Wind turbine low-speed permanent magnet synchronous generator-Part2:Testing methods
GB 755	旋转电机 定额和性能 Rotating electrical machines-Rating and performance
GB/T 4942.1	旋转电机整体结构防护等级（IP 代码） 分类 Degrees of protecting provided by the integral design of rotating electrical machined(IP code)-Classification
GB/T 1993	旋转电机 冷却方法 Cooling methods for rotating electrical machines
GB/T 19069	失速型风力发电机组 控制系统 技术条件 Stall regulation with wind turbines-Control system-Technical condition
GB/T 19070	失速型风力发电机组 控制系统 试验方法 Stall regulation wind turbines - Control system - Test method
GB/T 19071.1	风力发电机组 异步发电机 第 1 部分：技术条件 Wind turbines-Asynchronous generator-Part1:Technical conditions
GB/T 19071.2	风力发电机组 异步发电机 第 2 部分：试验方法 Wind turbines-Asynchronous generator-Part2:Testing methods
GB/T 18710	风电场 风能资源评估方法 Methodology of wind energy resource assessment for wind farm
GB/T 18709	风电场 风能资源测量方法 Methodology of wind energy resource measurement for wind farm
GB/T 25387.1	风力发电机组 全功率变流器 第 1 部分：技术条件 Full power converter of wind turbine generator systems-Part1: Technical condition
GB/T 25387.2	风力发电机组 全功率变流器 第 2 部分：试验方法 Full power converter of wind turbine generator systems-Part1: Test method
GB/T 25388.1	风力发电机组 双馈式变流器 第 1 部分 技术条件 Double-fed converter of wind turbine generator system-Part1:Technical condition
GB/T 25388.2	风力发电机组 双馈式变流器 第 2 部分 试验方法 Double-fed converter of wind turbine generator system-Part2:Test method
GB/T 25385	风力发电机组 运行及维护要求 Operation and maintenance requirement for wind turbines
GB/T 50571	海上风力发电工程施工规范 The code for constructions of offshore wind power project
GB/T 20319	风力发电机组 验收规范

	Wind turbine generator systems—Specification for acceptance
GB/T 997	旋转电机 结构型式、安装型式及接线盒位置的分类 (IM 代码) Rotating electrical machines-Classification of types of constructions, mounting arrangements and terminal box position for(IM Code)
GB 10069.3	旋转电机噪声测定方法及限值 第 3 部分: 噪声限值 Measurement of the airborne noise emitted by rotating electrical machines and the noise limits-Part1: Method for the measurement of airborne noise emitted by rotating electrical machines
GB/T 19072	风力发电机组 塔架 Tower of wind turbine generator system
GB 5226.1	机械电气安全 机械电气设备 第 1 部分: 通用技术条件 Electrical safety of machinery-Electrical equipment of machines-Part1: General requirements
GB/T 25386.1	风力发电机组 变速恒频控制系统 第 1 部分: 技术条件 Wind turbine generator system variable speed constant frequency control
GB/T 25386.2	风力发电机组 变速恒频控制系统 第 2 部分: 试验方法 Wind turbine generator system variable speed constant frequency control system-Part2:Test method
GB/T 19960.1	风力发电机组 第 1 部分 通用技术条件 Wind turbine generator system-Part 1:General technical specification
GB/T 19960.2	风力发电机组 第 2 部分 通用试验方法 Wind turbine generator system-Part2: General test method
GB/T 21407	双馈式变速恒频风力发电机组 Doubly fed variable speed constant frequency wind turbine
GB/T 29543	低温型风力发电机组 Wind turbine generator systems for cold environments
GB/T 21150	失速型风力发电机组 Stall regulation wind turbines generator system
NB/T 31041	海上双馈风力发电机变流器 Converter of offshore doubly-fed wind turbine generator
NB/T 31042	海上永磁风力发电机变流器 Converter of offshore Permanent Magnet Wind Turbine Generator wind turbine generator
NB/T 31012	永磁风力发电机制造技术规范 Manufactural and technical specification for permanent magnet type wind turbine generator
NB/T 31013	双馈风力发电机制造技术规范 Manufactural and technical specification for double fed wind turbine generator
NB/T 31014	双馈风力发电机变流器制造技术规范 Manufactural and technical specification for converter of double fed wind turbine generator
NB/T 31015	永磁风力发电机变流器制造技术规范 Manufactured technical specification for converter of permanent magnet wind turbine generator
NB/T 31017	双馈风力发电机组主控制系统技术规范 Technical specification for main control system of doubly fed wind turbine generator system
NB/T 31018	风力发电机组电动变桨控制系统技术规范 Wind turbine generator system technical specification of electric pitch system
NB/T 31043	海上风力发电机组主控制系统技术规范

	Technical specification for main control system of offshore wind turbine generator system
JB/T 10425.1	风力发电机组 偏航系统 第 1 部分：技术条件 Yaw system of wind turbine generator systems-Part1: Technology condition
JB/T 10425.2	风力发电机组 偏航系统 第 2 部分：试验方法 Yaw system of wind turbine generator systems-Part2: Test method
JB/T 10426.1	风力发电机组 制动系统 第 1 部分：技术条件 Braking system of wind turbine generator systems-Part1: Technical condition
JB/T 10426.2	风力发电机组 制动系统 第 2 部分：试验方法 Braking system of wind turbine generator systems-Part2: Test method
JB/T 6939.1	离网型风力发电机组用控制器 第 1 部分：技术条件 Controller of off-grid wind turbine generator system-Part1:Technical condition
JB/T 6939.2	离网型风力发电机组用控制器 第 2 部分：试验方法 Controller of off-grid wind turbine generator system-Part2: Test method
GB/T 10760.1	小型风力发电机组用发电机 第 1 部分：技术条件 Generator of small wind turbines -Part1: Technical condition
GB/T 10760.2	小型风力发电机组用发电机 第 1 部分：技术条件 Generator of small wind turbines –Part2: Testing methods
GB/T 20321.1	离网型风能、太阳能发电系统用逆变器 第 1 部分:技术条件 Inverter of wind and solar energy supply of off-grid wind turbine generator system-Part1: Technical specification
GB/T 20321.2	离网型风能、太阳能发电系统用逆变器 第 2 部分:试验方法 Inverter of wind and solar energy supply of off-grid wind turbine generator system-Part1: Test method
JB/T 10401.1	离网型风力发电机组 制动系统 第 1 部分：技术条件 Braking system of off-grid wind turbine generator system-Part1:Technical condition
JB/T 10401.2	离网型风力发电机组 制动系统 第 2 部分：试验方法 Braking system of off-grid wind turbine generator system-Part2:Test method
JB/T 10427	风力发电机组一般液压系统 General hydraulic system of wind turbine generator systems
GB/T 19068.1	小型风力发电机组 第 1 部分：技术条件 Small wind turbines-Part1:Technical condition
GB/T 14039	液压传动 油液 固体颗粒污染等级代号 Hydraulic fluid power-Fluids-Method for coding the level of contamination by solid particles
GB/T 6404.1	齿轮装置的验收规范 第 1 部分：空气传播噪声的试验规范 Acceptance code for gear units-Part1:Test code for airborne sound
GB/T 6404.2	齿轮装置的验收规范 第 2 部分：验收试验中齿轮装置机械振动的测定 Acceptance code for gear units-Part2: Determination of mechanical vibrations of gear units during acceptance testing
GB/T 31517	海上风力发电机组 设计要求 Design requirements for offshore wind turbines
GB/T 35792	风力发电机组 合格测试及认证 Wind turbines-Conformity testing and certification
VDI 3834	陆上带齿轮箱风力发电机组及其组件机械振动测量与评估 Measurement and evaluation of the mechanical vibration of wind turbines and their components -wind turbines with gearbox

还有未列出其他相关的 IEC、DNV-GL、GB 标准也适用于指导风力发电机组的设计、测试、制造等过程。以上标准列出标准号的只有这一版适用于本实施规则，未列出版本号的标准，则是最新版本的标准（含修订版）适用于本实施规则。

Some other related standards of IEC, DNV-GL, GB which are not listed in above table also apply to guide the procedures of the design, testing and manufacturing of wind turbines. The above standards which are dated references, only the edition cited apply. The standards which are undated references, the latest edition of the referenced document (including any amendments) apply.

1.3 文件功能 Function

本文件详细说明了 TÜV NORD 所提供的风力发电机组型式认证服务。本文件提供：

The guidance describes the certification services which TÜV NORD can offer to the customer. The guidance provide:

- 一个说明风力发电机组型式认证的认证活动范围和内容的通用平台；
A General platform that instructs the scope of wind turbine certification and content;
- 一份用于定义符合适用认证体系要求的工作范围的参考文件。
A reference documentation which define the work scope of certification schemes.

这里的所提供认证服务是基于标准 IEC 61400-22、IECRE OD-501、IECRE OD-502、IV - Part 1/GL 2010、IV - Part 2/GL 2012、DNVGL-SE-0441、GB/Z 25458、GB/T 35792 的，认证服务评估的详细方案需要与这些一起阅读，以获得对本文件中描述的服务的完整的概述。

Therein the certification service is based on the standards of IEC 61400-22, IECRE OD-501, IECRE OD-502, IV-Part 1/GL 2010, IV-Part 2/GL 2012, DNVGL-SE-0441, GB/Z 25458, GB/T 35792. The completeness description of the detailed certification service in this guidance shall be combined with these standards.

对于每个将进行的型式认证，其先决条件是，用于 TÜV NORD 型式认证服务工作的详细的工作范围将制定且包括在风机制造商和 TÜV NORD 的型式认证合同之中。

Prior to implementing the certification service, the certification service shall be defined clearly in the contract or service agreement between the manufacturers and TÜV NORD.

1.4 目的 Purpose

本文件有双重目的：在签订合同之前，它将作为用于 TÜV NORD 风力发电机组型式认证服务的公开说明发布，风机制造商和 TÜV NORD 的型式认证合同将把它作为合同文件的参考。

Two purposes are shown for this guidance: it will be used as a public illustration of the type certification service of TÜV NORD and used as a reference of the certification service contract between wind turbine manufacturer and TÜV NORD.

本文件规定认证申请人或认证证书持有人（通常是风力发电机组制造商）在其风力发电机组认证的义务。本文件还规定 TÜV NORD 的义务和进行型式认证的工作内容。

The guidance defines the obligation of applicant in the wind turbine certification. The guidance also defines the obligation of TÜV NORD and the work scope of type certification.

本文件不宜作为单独的风力发电机组认证标准。在使用 IEC、GB 和 GL 风力发电机组等标准时，它是 TÜV NORD 的流程和解释指南。

The guidance shall not be as an independent certification standard, it is work procedure and guidance for TÜV NORD certification wind turbine in conjunction with standards IEC, GB, GL.

1.5 适用范围 Scope

本规范适用于根据 IECRE OD-501、IEC 61400-22、GB/Z 25458、GB/T 35792 或者 IV - Part 1 / GL2010（简称 GL2010）、IV - Part 2 / GL2012（简称 GL2012）、DNVGL-SE-0441 进行的风力发电机组型式认证。

The guidance apply for wind turbine type certification in combination with standard IECRE OD-501, IEC 61400-22, GB/Z25458, GB/T 35792 or IV-Part1/GL2010(short for GL2010), IV-Part2/GL(short for GL2012), DNVGL-SE-0441.

1.6 文件结构 Document structural

本文件包括四个章节。

Four chapters are included in the guidance.

- 第 1 节：提供一般信息和必要的先决条件。

Chapter 1: Provides general information and mandatory requirements.

- 第 2 节：提供风力发电机组型式认证服务的概述。
- Chapter 2: Provides Outline of wind turbine certification service.

- 第 3 节：提供详细的服务说明。
- Chapter 3: Provides detailed description of services.

- 第 4 节：提供所需文件的简要技术说明。
- Chapter 4: Provides the technical description of required documentations.

1.7 定义：言语表达形式 Terms

术语“将”、“能”和“可能”用于描述 TÜV NORD 的行动和活动；然而“应”和“应当”用于描述其他相关方的动作和活动。

Term “will”, “can” and “may” are used to describe the action and activities of TÜV NORD; whereas “shall” and “should” are used to describe the action and activities of other relevant parties.

应：表明严格遵循符合该提供认证服务的要求，不允许偏差。

Shall: indicates requirements strictly to be followed in order to conform to the document.

应当：表明在几种可能性中，因特别适用而建议使用其中一种，不提及或排除其他可能，或是说某一行动方案是优先的但不一定是必需的。其他可能性的应用以协议为准。

Should: indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

将：表明 TÜV NORD 进行的一种强制性的行动或活动（与其他相关方使用的“应”对比）。

Will: indicates the mandatory action or activities are executed by TÜV NORD (compared to the “shall” of relevant parties).

能：表示 TÜV NORD 并不必要进行的一种动作或活动，除非认证申请人有特别要求（与其他相关各方使用的“应当”对比）。可能还表明即使没有客户的特别要求，TÜV NORD 也希望进行的某种行动或活动。

Can: indicates the unnecessary action or activities of TÜV NORD, unless specifically requested by the applicant (compared to the “should” of relevant parties).

可能：该言语表达形式用于表明所提供认证服务范围内容许的行动方案。

May: indicates the action plan permitted in the certification work scope.

1.8 定义 Definition

认证：第三方对其产品、过程或服务符合指定要求而出具书面证明的程序，属于合格评估的一种。

Certification: procedure by which a third party gives written assurance that a product, process or service confirms to specified requirements, also known as conformity assessment.

认证系统：具备实施认证的程序和管理规则的规定。

Certification system: system that has specific rules for procedure and management to carry out certification of conformity.

认证申请人：申请认证的实体。

Certification Applicant: entity applying for certification.

部件认证：特定风机部件，如齿轮箱、机舱和转子机舱组件的型式认证。部件认证包含相关模块认证，其范围取决于讨论中的部件的类型。

Component certification: procedure by which a certification body gives written assurance that specified component of wind turbine type conforms to specified requirements, e.g. gearboxes, rotor and nacelle assembly.

最终评估报告: 包含与设计认证或型式认证相关的合格评估的结论的报告，它是决定签发设计认证证书或型式认证证书的基础。

Final evaluation report: report containing the results of conformity evaluations relating to type certification. The basis of the decision to issue the design certificate or type certificate.

制造商: 从事风力发电机组制造或风力发电机组主要零部件制造的实体。
Manufacturer: entity manufacturing the wind turbine or, where relevant, main components of the wind turbine.

建议: 非强制性意见。
Suggestion: Non-mandatory opinions.

型式证书: 成功地完成了型式认证后签发的证书。
Type certificate: document issued upon the successful completion of type certification.

风力发电机组: 将风能转化为电能的系统，简称风机。
Wind turbine: System that convert the wind energy to electricity, short for WT.

1.9 首字母缩略词和参考文献 Abbreviated terms and Normative references

首字母缩略词 全称
Abbreviated terms Full name

• IEC	国际电工委员会 International Electrotechnical Commission
• ISO	国际标准化组织 International Organization for standardization
• GB	中国国家标准 Chinese National Standards
• EN	欧洲标准 European Standards
• TR	技术报告 Technical Report
• TS	技术规范 Technical Specification

参考文献: 本文件参照的是相关标准、国际法规和标准以及其他国际出版物。除非认证协议或该所提供认证服务另有说明，认证将应用每个参考文件的最新有效版本。
Reference: This guidance refers to relevant standards and international rules and standards, as well as other international publications. The latest valid edition of reference documentations will be applied for the certification unless other specified request supplemented in the certification agreement or provided certification services.

1.10 其他标准参考出版物 Other reference standards

该服务规范参考的国际标准和其他相关出版物如下，见表 1. 2：
The referred international standards and relevant publications apply in this guidance are listed bellowing, see table 1.2:

表 1. 2 参考的国际标准和其他相关出版物
Table1.2 Referred international standards and other relevant pulications

标准 Standard	说明 Designation
IEC WT 01	风力发电机组 合格认证规则及程序 IEC system for Conformity Testing and Certification of Wind Turbines Rules and procedures
IEC 61400-1	风力发电机组 第 1 部分：设计要求 Wind turbines-Part1: Design requirements
IEC 61400-2	风力发电机组 第 2 部分：小型风力发电机组 Wind turbines-Part2: Small wind turbines
IEC 61400-3	风力发电机组 第 3 部分：海上风力发电机组设计要求 Wind turbines-Part3: Design requirements for offshore wind turbines
IEC 61400-3-1	风力发电机组 第 3-1 部分：固定式海上风力发电机组设计要求

	Wind energy generation system -Part3-1: Design requirements for fixed offshore wind turbines
IEC TS 61400-3-2	风力发电机组 第 3-2 部分: 漂浮式海上风力发电机组设计要求 Wind energy generation system -Part3-2: Design requirements for floating offshore wind turbines
IEC 61400-4	风力发电机组 第 4 部分: 风力发电机组用齿轮箱的设计要求 Wind turbines-Part4: Design requirements for wind turbine gearboxes
IEC 61400-11	风力发电机组 第 11 部分: 噪声测量 Wind turbines-Part11: Acoustic noise measurements techniques
IEC 61400-12-1	风力发电机组 第 12-1 部分: 风力发电机组功率特性试验 Wind turbines-Part12-1: Power performance measurement of electricity producing wind turbines
IEC 61400-12-2	风力发电机组 第 12-2 部分: 基于机舱风速计的风电机组功率特性测试 Wind turbines-Part 12-2: Power performance of electricity producing wind turbines based on nacelle anemometry
IEC 61400-13	风力发电机组 第 13 部分: 机械载荷测量 Wind turbines-Part13: Measurement of mechanical loads
IEC 61400-14	风力发电机组 第 14 部分: 视在声功率级和音值声明 Wind turbines-Part14: Declaration of apparent sound power level and tonality values
IEC 61400-21	风力发电机组 第 21 部分: 并网运行的风力发电机组电能质量测量和评估 Wind turbines-Part21: Measurement and assessment of power quality characteristics of grid connected wind turbines
IEC 61400-22	风力发电机组 第 22 部分: 合格试验和认证 Wind turbines- Part22: Conformity testing and certification
IECRE OD-501	IECRE 操作文档 型式和部件认证方案 IECRE Operational Document Type and Component Certification Scheme
IECRE OD-501-1	IECRE 操作文档 RE 认证机构的叶片合格评定及认证 IECRE Operational Document Conformity assessment and certification of Blade by RECB
IECRE OD-501-2	IECRE 操作文档 RE 认证机构的风力发电机齿轮箱合格评定及认证 IECRE Operational Document Conformity assessment and certification of wind turbine gearboxes by RECB
IECRE OD-501-3	IECRE 操作文档 RE 认证机构的塔筒合格评定及认证 IECRE Operational Document Conformity assessment and certification of tower by RECB
IECRE OD-501-4	IECRE 操作文档 RE 认证机构的载荷合格评定及认证 IECRE Operational Document Conformity assessment and certification of Loads by RECB
IECRE OD-501-5	IECRE 操作文档 RE 认证机构的控制与保护系统合格评定及认证 IECRE Operational Document Conformity assessment and certification of Control and Protection System by RECB
IECRE OD-501-7	IECRE 操作文档 RE 认证机构的主要电器部件合格评定及认证 IECRE Operational Document Conformity assessment and certification of Main Electrical Components by RECB
IECRE OD-502	IECRE 操作文档 项目认证方案 IECRE Operational Document Project Certification Scheme
IEC 61400-23	风力发电机组 第 23 部分: 风轮叶片全尺寸结构试验 Wind turbines-Part23: Full-scale structural testing of rotor blades
IEC 61400-24	风力发电机组 第 24 部分: 雷电防护 Wind turbines-Part24: Lightning protection
IEC 61400-25-1	风力发电机组 第 25-1 部分: 风电场监控系统通信标准- 原则与模型概述

	Wind turbines-Part25-1: Communications for monitoring and control of wind power plants-Overall description of principles and models
IEC 61400-25-2	风力发电机组 第 25-2 部分: 风电场监控系统通信标准- 信息模型 Wind turbines-Part25-2: Communications for monitoring and control of wind power plants-Information models
IEC 61400-25-3	风力发电机组 第 25-3 部分: 风电场监控系统通信标准- 信息交换模型 Wind turbines-Part25-3: Communications for monitoring and control of wind power plants-Information exchange models
IEC 61400-25-4	风力发电机组 第 25-4 部分: 风电场监控系统通信标准- 通信协议栈映射 Wind turbines-Part25-4: Communications for monitoring and control of wind power plants-Mapping to communication profile
IEC 61400-25-5	风力发电机组 第 25-5 部分: 风电场监控系统通信标准- 一致性测试 Wind turbines-Part25-5: Communications for monitoring and control of wind power plants-Conformance testing
IEC 61400-25-6	风力发电机组 第 25-6 部分: 风电场监控系统通信标准- 逻辑节点类和数据类状态监测 Wind turbines-Part25-6: Communications for monitoring and control of wind power plants-Logical node classes and data classes for condition monitoring
IEC 61400-26-1	风能发电系统 第 26-1 部分: 风能发电系统的可利用率 Wind energy generation systems-Part 26-1: Availability for wind energy generation systems
IEC 61400-27-1	风力发电机组 第 27-1 部分: 电气仿真模型—风力发电机 Wind turbines-Part27-1: Electrical simulation modules-Wind turbines
IEC 60034-1	旋转电机 第 1 部分: 定额和性能 Rotating electrical machines-Part1:Rating and performance
IEC 60034-5	旋转电机 第 5 部分: 旋转电机整体结构防护等级 (IP 代码) --分类 Rotating electrical machines-Part5:Degrees of protection provided by the integral design of rotating electrical machines(IP code) -Classification
IEC 60034-6	旋转电机 第 6 部分: 冷却方法 Rotating electrical machines-Part6:Methods of cooling (IC code)
IEC 60034-7	旋转电机 第 7 部分: 结构型式、安装型式及接线盒位置的分类 (IM 代码) Rotating electrical machines-Part7:Classification of types of constructions and mounting arrangements(IM Code)
IEC 60034-9	旋转电机 第 9 部分: 噪声限值 Rotating electrical machines-Part9:Noise limits
IEC 61800-5-1	调速电气传动系统-第 5-1 部分: 安全要求-电、热和能量 Adjustable speed electrical power drive systems-Part5-1:Safety requirements-Electrical, thermal and energy
IEC 62477-1	电力电子变流器系统及设备安全要求- 第 1 部分 基本要求 Safety requirements for power electronic converter systems and equipment - Part 1: General
IEC 61000-6-1	电磁兼容 第 6-1 部分:通用标准—住宅、商业和轻工业环境的抗扰度 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity standard for residential, commercial and light-industrial environments
IEC 61000-6-2	电磁兼容 第 6-2 部分:通用标准—工业环境的抗扰度 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
IEC 61000-6-5	电磁兼容 第 6-5 部分:通用标准—用于发电站和变电站环境设备的抗扰度 Electromagnetic compatibility (EMC) - Part 6-5: Generic standards - Immunity for equipment used in power station and substation environment

IEC 61000-6-7	电磁兼容性 (EMC) 测试 Electromagnetic compatibility (EMC) - Part 6-7: Generic standards - Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations
IEC 60204-1	机械安全 机器的电气设备 第 1 部分：一般要求 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 2394	结构可靠性一般原则 General principles on reliability for structures
ISO 9001	质量管理体系 Quality management systems
ISO/IEC 17020	检验方各类型操作用一般准则 Conformity assessment –Requirements for the operation of various types of bodies performing inspection
ISO/IEC 17025	测试和检验实验室资格 General requirements for the competence of testing and calibration laboratories
ISO 4354	风力对结构的作用 Wind actions on structures
ISO 76	滚动轴承 额定静载荷 Rolling bearings-static load ratings
ISO 281	滚动轴承 额定动载荷和额定寿命 Rolling bearings-Dynamic load ratings and rating life
EN 50308	风机—保护测试—设计、操作和维护要求 Wind turbines-Protective measures-Requirements for design, operations and maintenance
IV-Part 1/GL 2010	风力发电机组认证导则 Rules and Guidelines Industrial Services-Guideline for the certification of wind turbines
IV-Part 2/GL 2012	海上风力发电机组认证导则 Rules and Guidelines Industrial Services-Guideline for the certification of offshore wind turbines
DNVGL-SE-0441	风力发电机组的型式和部件认证 Type and component certification for wind turbines
DNVGL-RP-0363	风力发电机组的极端温度条件 Extreme temperature conditions for wind turbines
DNVGL-ST-0361	风力发电机组的机械部件 Machinery for wind turbines
DNVGL-ST-0376	风力发电机组 风轮叶片 Rotor blades for wind turbines
DNVGL-ST-0437	风力发电机组的载荷和场址条件 Loads and Site conditions for wind turbines
DNVGL-ST-0438	风力发电机组的控住与保护系统 Control and protection systems for wind turbines
DNVGL-ST-0076	风力发电机组的电气设备设计 Design of electrical installations for wind turbines
GB/Z 25458	风力发电机组 合格认证规则及程序 Rules and procedures for conformity testing and certification of wind turbine generator system
GB/T 18451.1	风力发电机组 设计要求 Wind turbine generator systems-Design requirement
GB/T 17646	小型风力发电机组

	Small wind turbines
GB/T 29494	小型垂直轴风力发电机组 Small vertical axis wind turbines
GB/T 18451.2	风力发电机组 功率特性试验 Power performance measurements of electricity producing wind turbines
GB/Z 25426	风力发电机组 机械载荷测量 Wind turbine generator systems measurement of mechanical loads
GB/T 22516	风力发电机组 噪声测量方法 Acoustic noise measurement techniques of wind turbine generators systems
GB/Z 25425	风力发电机组 公称视在声功率级和音值 Declaration of apparent sound power level and tonality values for the wind turbine
GB/T 20320	风力发电机组 电能质量测量和评估方法 Measurement and assessment of power quality characteristics of wind turbine generator systems
GB/T 25383	风力发电机组 风轮叶片 Wind turbine generator system--Rotor blades
GB/T 25384	风力发电机组 风轮叶片全尺寸结构试验 Turbine blade of wind turbine generator systems—Full-scale structural testing of rotor blades
GB/T 19073	风力发电机组 齿轮箱 Gearbox of wind turbine generator system
GB/T 4662	滚动轴承 额定静载荷 Rolling bearings—Static load ratings
GB/T 6391	滚动轴承 额定动载荷和额定寿命 Rolling bearings—Dynamic load ratings and rating life
GB/T 29717	滚动轴承 风力发电机组偏航、变桨轴承 Rolling bearings-Wind power generators yaw and pitch bearings
GB/T 29718	滚动轴承 风力发电机组主轴轴承 Rolling bearings—Wind power generators main bearings
JB/T 10705	滚动轴承 风力发电机轴承 Rolling bearings—Wind power generator bearings
GB/T 23479.1	风力发电机组 双馈异步发电机-第 1 部分：技术条件 Wind turbine—Double-fed asynchronous generator-Part1: Technical specification
GB/T 23479.2	风力发电机组 双馈异步发电机-第 2 部分：试验方法 Wind turbine—Double-fed asynchronous generator-Part2:Testing methods
GB/T 25389.1	风力发电机组 低速永磁：同步发电机-第 1 部分：技术条件 Wind turbine low-speed permanent magnet synchronous generator-Part1:Technical conditions
GB/T 25389.2	风力发电机组 低速永磁：同步发电机-第 2 部分：试验方法 Wind turbine low-speed permanent magnet synchronous generator-Part2:Testing methods
GB 755	旋转电机 定额和性能 Rotating electrical machines-Rating and performance
GB/T 4942.1	旋转电机整体结构防护等级（IP 代码）分类 Degrees of protecting provided by the integral design of rotating electrical machined(IP code)-Classification
GB/T 1993	旋转电机 冷却方法 Cooling methods for rotating electrical machines

GB/T 19069	失速型风力发电机组 控制系统 技术条件 Stall regulation with wind turbines-Control system-Technical condition
GB/T 19070	失速型风力发电机组 控制系统 试验方法 Stall regulation wind turbines - Control system - Test method
GB/T 19071.1	风力发电机组 异步发电机 第 1 部分：技术条件 Wind turbines-Asynchronous generator-Part1:Technical conditions
GB/T 19071.2	风力发电机组 异步发电机 第 2 部分：试验方法 Wind turbines-Asynchronous generator-Part2:Testing methods
GB/T 18710	风电场 风能资源评估方法 Methodology of wind energy resource assessment for wind farm
GB/T 18709	风电场 风能资源测量方法 Methodology of wind energy resource measurement for wind farm
GB/T 25387.1	风力发电机组 全功率变流器 第 1 部分：技术条件 Full power converter of wind turbine generator systems-Part1: Technical condition
GB/T 25387.2	风力发电机组 全功率变流器 第 2 部分：试验方法 Full power converter of wind turbine generator systems-Part1: Test method
GB/T 25388.1	风力发电机组 双馈式变流器 第 1 部分 技术条件 Double-fed converter of wind turbine generator system-Part1:Technical condition
GB/T 25388.2	风力发电机组 双馈式变流器 第 2 部分 试验方法 Double-fed converter of wind turbine generator system-Part2:Test method
GB/T 25385	风力发电机组 运行及维护要求 Operation and maintenance requirement for wind turbines
GB/T 50571	海上风力发电工程施工规范 The code for constructions of offshore wind power project
GB/T 20319	风力发电机组 验收规范 Wind turbine generator systems—Specification for acceptance
GB/T 997	旋转电机 结构型式、安装型式及接线盒位置的分类（IM 代码） Rotating electrical machines-Classification of types of constructions, mounting arrangements and terminal box position for(IM Code)
GB 10069.3	旋转电机噪声测定方法及限值 第 3 部分：噪声限值 Measurement of the airborne noise emitted by rotating electrical machines and the noise limits-Part1: Method for the measurement of airborne noise emitted by rotating electrical machines
GB/T 19072	风力发电机组 塔架 Tower of wind turbine generator system
GB 5226.1	机械电气安全 机械电气设备 第 1 部分：通用技术条件 Electrical safety of machinery-Electrical equipment of machines-Part1: General requirements
GB/T 25386.1	风力发电机组 变速恒频控制系统 第 1 部分：技术条件 Wind turbine generator system variable speed constant frequency control
GB/T 25386.2	风力发电机组 变速恒频控制系统 第 2 部分：试验方法 Wind turbine generator system variable speed constant frequency control system-Part2:Test method
GB/T 19960.1	风力发电机组 第 1 部分 通用技术条件 Wind turbine generator system-Part 1:General technical specification
GB/T 19960.2	风力发电机组 第 2 部分 通用试验方法 Wind turbine generator system-Part2: General test method
GB/T 21407	双馈式变速恒频风力发电机组

	Doubly fed variable speed constant frequency wind turbine
GB/T 29543	低温型风力发电机组 Wind turbine generator systems for cold environments
GB/T 21150	失速型风力发电机组 Stall regulation wind turbines generator system
NB/T 31041	海上双馈风力发电机变流器 Converter of offshore doubly-fed wind turbine generator
NB/T 31042	海上永磁风力发电机变流器 Converter of offshore Permanent Magnet Wind Turbine Generator wind turbine generator
NB/T 31012	永磁风力发电机制造技术规范 Manufactural and technical specification for permanent magnet type wind turbine generator
NB/T 31013	双馈风力发电机制造技术规范 Manufactural and technical specification for double fed wind turbine generator
NB/T 31014	双馈风力发电机变流器制造技术规范 Manufactural and technical specification for converter of double fed wind turbine generator
NB/T 31015	永磁风力发电机变流器制造技术规范 Manufactured technical specification for converter of permanent magnet wind turbine generator
NB/T 31017	双馈风力发电机组主控制系统技术规范 Technical specification for main control system of doubly fed wind turbine generator system
NB/T 31018	风力发电机组电动变桨控制系统技术规范 Wind turbine generator system technical specification of electric pitch system
NB/T 31043	海上风力发电机组主控制系统技术规范 Technical specification for main control system of offshore wind turbine generator system
JB/T 10425.1	风力发电机组 偏航系统 第 1 部分：技术条件 Yaw system of wind turbine generator systems-Part1: Technology condition
JB/T 10425.2	风力发电机组 偏航系统 第 2 部分：试验方法 Yaw system of wind turbine generator systems-Part2: Test method
JB/T 10426.1	风力发电机组 制动系统 第 1 部分：技术条件 Braking system of wind turbine generator systems-Part1: Technical condition
JB/T 10426.2	风力发电机组 制动系统 第 2 部分：试验方法 Braking system of wind turbine generator systems-Part2: Test method
JB/T 6939.1	离网型风力发电机组用控制器 第 1 部分：技术条件 Controller of off-grid wind turbine generator system-Part1:Technical condition
JB/T 6939.2	离网型风力发电机组用控制器 第 2 部分：试验方法 Controller of off-grid wind turbine generator system-Part2: Test method
GB/T 10760.1	小型风力发电机组用发电机 第 1 部分：技术条件 Generator of small wind turbines -Part1: Technical condition
GB/T 10760.2	小型风力发电机组用发电机 第 1 部分：技术条件 Generator of small wind turbines –Part2: Testing methods
GB/T 20321.1	离网型风能、太阳能发电系统用逆变器 第 1 部分:技术条件

	Inverter of wind and solar energy supply of off-grid wind turbine generator system-Part1: Technical specification
GB/T 20321.2	离网型风能、太阳能发电系统用逆变器 第 2 部分:试验方法 Inverter of wind and solar energy supply of off-grid wind turbine generator system-Part1: Test method
JB/T 10401.1	离网型风力发电机组 制动系统 第 1 部分: 技术条件 Braking system of off-grid wind turbine generator system-Part1:Technical condition
JB/T 10401.2	离网型风力发电机组 制动系统 第 2 部分: 试验方法 Braking system of off-grid wind turbine generator system-Part2:Test method
JB/T 10427	风力发电机组一般液压系统 General hydraulic system of wind turbine generator systems
GB/T 19068.1	小型风力发电机组 第 1 部分: 技术条件 Small wind turbines-Part1:Technical condition
GB/T 14039	液压传动 油液 固体颗粒污染等级代号 Hydraulic fluid power-Fluids-Method for coding the level of contamination by solid particles
GB/T 6404.1	齿轮装置的验收规范 第 1 部分: 空气传播噪声的试验规范 Acceptance code for gear units-Part1:Test code for airborne sound
GB/T 6404.2	齿轮装置的验收规范 第 2 部分: 验收试验中齿轮装置机械振动的测定 Acceptance code for gear units-Part2: Determination of mechanical vibrations of gear units during acceptance testing
GB/T 31517	海上风力发电机组 设计要求 Design requirements for offshore wind turbines
GB/T 35792	风力发电机组 合格测试及认证 Wind turbines-Conformity testing and certification
VDI 3834	陆上带齿轮箱风力发电机组及其组件机械振动测量与评估 Measurement and evaluation of the mechanical vibration of wind turbines and their components -wind turbines with gearbox

第 2 节 认证综述

Chapter 2 Certificate overview

2.1 所提供服务概述：综述 Provided Service: Overview

本节是提供与风机型式认证相关的认证活动的概述。

This chapter gives a general overview for certification activities connected with wind turbine type certification.

2.2 认证系统的选择 Certification Schemes Option

应用的型式认证系统应在制造商和 TÜV NORD 的合同中约定。

Type certification system applied shall be specified in TÜV NORD contract with manufacturer.

将根据确定的型式认证过程进行风机型式认证。

Wind turbine type certification will be carried out according to determined type certification process.

以下是经 TÜV NORD 认可的可用型式认证系统：

Type certification schemes which are available for TÜV NORD are listed as below:

- | | |
|-------------------------|--|
| • IECRE OD-501 型式认证系统 | IECRE OD-501 type certification scheme |
| • IEC 61400-22 型式认证系统 | IEC 61400-22 type certification scheme |
| • GB/T 35792 型式认证系统 | GB/T 35792 type certification scheme |
| • IV-Part 1 / GL 型式认证系统 | IV-Part 1 / GL type certification scheme |
| • IV-Part 2 / GL 型式认证系统 | IV-Part 2 / GL type certification scheme |
| • DNVGL-SE-0441 型式认证系统 | DNVGL-SE-0441 type certification scheme |
| • GB/Z 25458 型式认证系统 | GB/Z 25458 type certification scheme |

关于型式认证系统的详细信息，见第 2.3 节。

Detailed information for different type certification schemes refers to chapter 2.3.

2.3 风机型式认证：认证模块 Wind turbine type certification module

TÜV NORD 风力发电机组型式认证过程基于 IECRE OD-501、IEC 61400-22、GB/T 35792、GB/Z 25458 或 GL2010、GL2012、DNVGL-SE-0441 中规定的型式认证方法。

Wind turbine type certification for TÜV NORD is based on the procedures specified in standards IECRE OD-501, IEC 61400-22, GB/T 35792, GB/Z 25458 or GL2010, GL201, DNVGL-SE-0441.

- IECRE OD-501、IEC 61400-22 型式认证系统
IECRE OD-501 / IEC 61400-22 type certification scheme

IECRE OD-501 与 IEC 61400-22 标准在型式认证系统包含一系列五个强制模块和三个可选模块，这两个标准的强制模块和可选模块完全相同。不同的是 IECRE OD-501 标准对于强制模块中的设计部分要求更加具体。这些具体的要求是在 IECRE OD-501 的子标准 OD-501-1、OD-501-2、OD-501-3、...、OD-501-7 中呈现，第 3、4 章将会详细展开。

Five mandatory modules and three optional modules are included in the standards IECRE OD-501 and IEC 61400-22, these mandatory modules and optional modules are the same in the two standards. The differences between the two standards are the detailed requirements in the mandatory modules, IECRE OD-501 gives more clear requirements for the turbine designing. The detailed clear requirements has been described in the sub OD-501 standards, e.g.: OD-501-1, OD-501-2, OD-501-3, ..., OD-501-7, these requirements will be shown in Chapter 3 and 4.

五个强制模块是指风机设计、制造和测试过程中的五大任务。三个可选模块是指风机用基础设计和制造，以及整机型式特征测试。参考图 2.1。

Five mandatory modules are the requirements of wind turbine design, manufacturing and type testing. Three operational modules are the requirements for foundation design, manufacturing of wind turbine and type characteristics testing of wind turbine. Please see the figure 2.1.

五个强制模块：Five mandatory modules:

- 设计基础评估； design basis evaluation;
- 风力发电机组设计评估； wind turbine design evaluation;
- 型式测试； type testing;
- 制造评估；和 manufacturing evaluation; and
- 最终评估； final evaluation;

三个可选模块：And three optional modules:

- 基础设计评估； foundation design evaluation;
- 基础制造评估；和 foundation manufacturing evaluation; and
- 型式特性测试。 type characteristic measurements.

相关模块见图 2.1。

The modules are illustrated in figure 2.1.

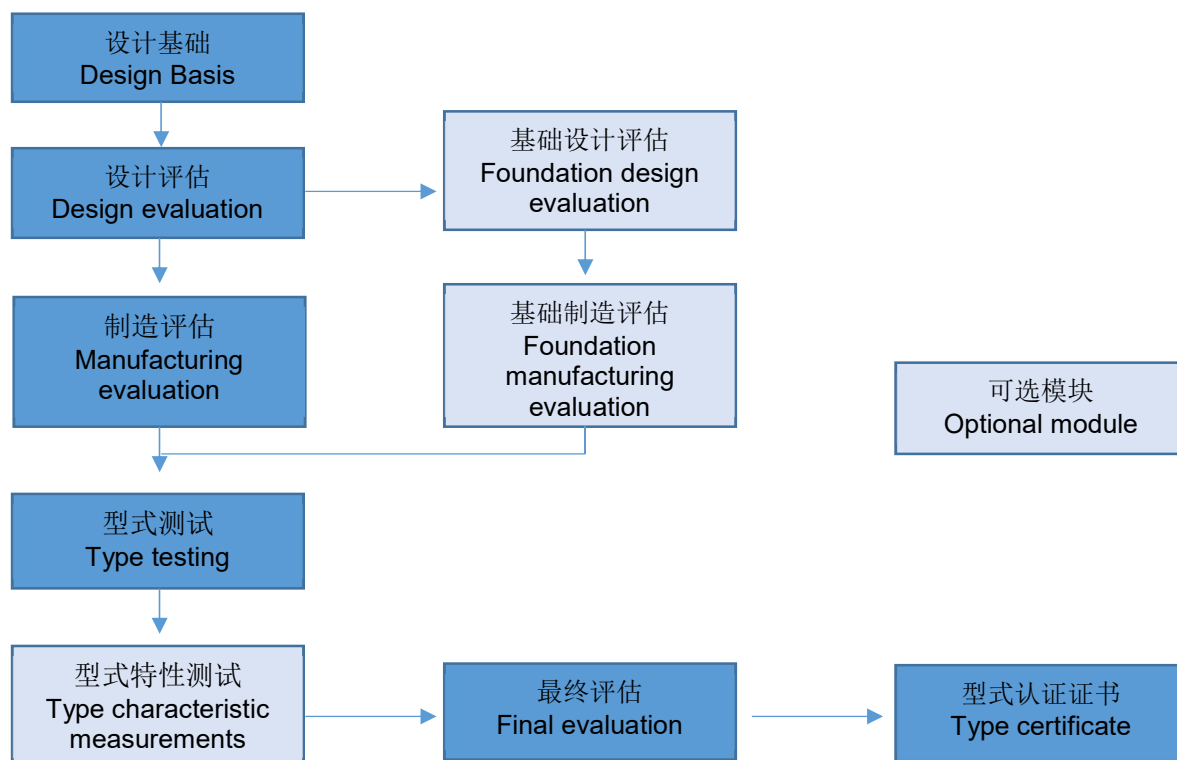


图 2.1 标准 IECRE OD-501/ IEC 61400-22 的认证系统模块

Figure 2.1 Modules of type certification for Standards IECRE OD-501/ IEC 61400-22

认证模块“设计基础评估”和“设计评估”属于实现风机最终设计认证所需的步骤。该验证包括对设计基础的评估和设计本身的评估。这两个模块是强制性的。设计评估模块不包括基础，因此可能要通过可选模块“基础设计评估”加以补充，参见图 2.1。

The modules design basis evaluation and wind turbine design evaluation belongs to the entire procedure for final design certification, which aims at evaluating the design basis and design of wind turbines. Otherwise, the two modules design basis and design are mandatory for the type certification. Foundation design will just be optional modules for wind turbine design evaluation, this module can be added into certification scheme if needs. Figure 2.1 shows the details.

认证模块中的“制造评估”是强制性的。制造评估模块不包括基础，因此要通过可选模块“基础制造评估”加以补充，参见图 2.1。

Manufacturing evaluation is also mandatory in certification process, meanwhile the foundation manufacturing evaluation is optional module which can be added in the certification scheme according to the request of applicant. Figure 2.1 shows the details.

认证模块中的“型式试验”是强制性的。型式试验模块可能要通过“性能测试”用可选模块加以补充，参见图 2.1。

Type testing in certification scheme is also mandatory, but type characteristics measurements are optional modules. Figure 2.1 shows the details.

认证模块中的“最终评估”是强制性的。

Ultimately, the final evaluation is mandatory after all the other mandatory modules and optional modules (if applicable) are assessed.

IEC 标准的型式认证中，图 2 所列各阶段性评估完成后，可颁发阶段性符合性声明证书。具体的要求可参见标准 IECRE OD-501 的第 6.4 节和 IEC 61400-22 的第 7.2 节。

Type certification based on IEC standards, a conformity statement for each module can be issued, the detailed requirements can be found in section 6.4 of standard IECRE OD-501 and section 7.2 of IEC 61400-22.

IEC 标准的认证模式中，除了上述主要描述的风力发电机组的型式认证外，风力发电机组的部件根据相关的认证流程，可以颁发相应的部件认证证书；请见标准 IECRE OD-501 的第 6.2 节和 IEC 61400-22 的第 7.4 节。以及，根据风力发电机组在型式认证过程中的相关认证模块和情况，可以颁发机组的样机认证证书、临时型式认证证书；请见标准 IECRE OD-501 的第 6.3 节和 5.4.4 节，IEC 61400-22 的第 6.3 节和第 7.5 节。

Except the above described type certification of wind turbines, the components used in wind turbines can also be certificated and relevant component certificates can be issued according relevant procedures according to IEC standards, the detailed requirements can be found in section 6.2 of standards IECRE OD-501 and in section 7.4 of standard IEC 61400-22. As well as the prototype certificate, provisional type certificate can be issued according to the relevant certification module and situation in the type certification of wind turbines, the detailed requirements please see section 6.3 and section 5.4.4 of standard IECRE OD-501, and section 6.3 and section 7.5 of standard IEC 61400-22.

IEC 认证系统相关的风机标准包括但不限于：IECRE OD-501 及其子标准、IEC 61400-22（合格试验和认证）、IEC 61400-1（陆上大型风电机组）、IEC 61400-2（小型风电机组）、IEC 61400-3 & IEC 61400-3-1 & IEC 61400-3-2（海上风电机组）、IEC 61400-12-1（风电机组功率特性测试）、IEC 61400-13（风电机组载荷、安全与功能测量）。

Relevant standards for IEC certification Scheme include but not limit to: IEC 61400-22(conformity testing and certification), IEC 61400-1(wind turbine design requirements), or IEC 61400-2(design requirements for small wind turbine), IEC 61400-3 & IEC 61400-3-1 & IEC 61400-3-2 (design requirements for offshore wind turbine), IEC 61400-12-1(Power performance measurement for wind turbine), IEC 61400-13(Loads measurement, Safety & Function tests).

- **GB/T 35792 型式认证系统**

- GB/T 35792 Type Certification Scheme**

标准 GB/T35792 与 IEC 61400-22 之间的关系为等同采用，其拥有相同的认证体系，即为包含一系列五个强制模块和三个可选模块。五个强制模块是指风机设计、制造和测试过程中的五大任务。三个可选模块是指风机用基础设计和制造以及性能测试。同样参考图 2.1。

Standard GB/T 35792 is identical to IEC 61400-22, thus they have the same certification scheme, which includes a series of five mandatory modules and three optional modules. The five mandatory modules means the specified five certification procedures during the wind turbine design, manufacturing and testing. Besides, three optional modules are foundation design, foundation manufacturing and type characteristics testing. The modules can also follow the Figure 2.1.

机组的型式认证，标准 GB/T 35792 的强制模块和可选模块的要求与标准 IEC 61400-22 相同。机组的相关部件的认证证书、机组的样机认证证书和临时认证证书的认证模块与流程，标准 GB/T 35792 与标准 IEC 61400-22 的要求也相同。

For type certification of wind turbines, the requirements for the mandatory modules and optional modules in standard GB/T 35792 are the same with standard IEC 61400-22. The certification modules and procedures of

relevant components certificate in wind turbines, prototype turbine certificate and provisional certificate in standard GB/ T 35792 are also the same with standard IEC 61400-22.

- **GB/Z 25458 型式认证系统**
GB/Z 25458 Type certification Scheme

标准 GB/T 25458 包含风力发电机组的设计认证和型式认证设计认证。
Design certification and type certification are included in the standard GB/Z 25458.

➤ **设计认证 Design Certification**

由以下强制模块组成：设计基础评估，设计评估，安全及功能试验，制造能力评估，最终评估，设计认证，获证后监督检查，参考图 2. 2。
Design certification consists of the bellowing mandatory modules: design basis evaluation, design evaluation, safety and function testing, manufacturing evaluation, final evaluation, design certificate and certificate surveillance, referring to figure 2.2.

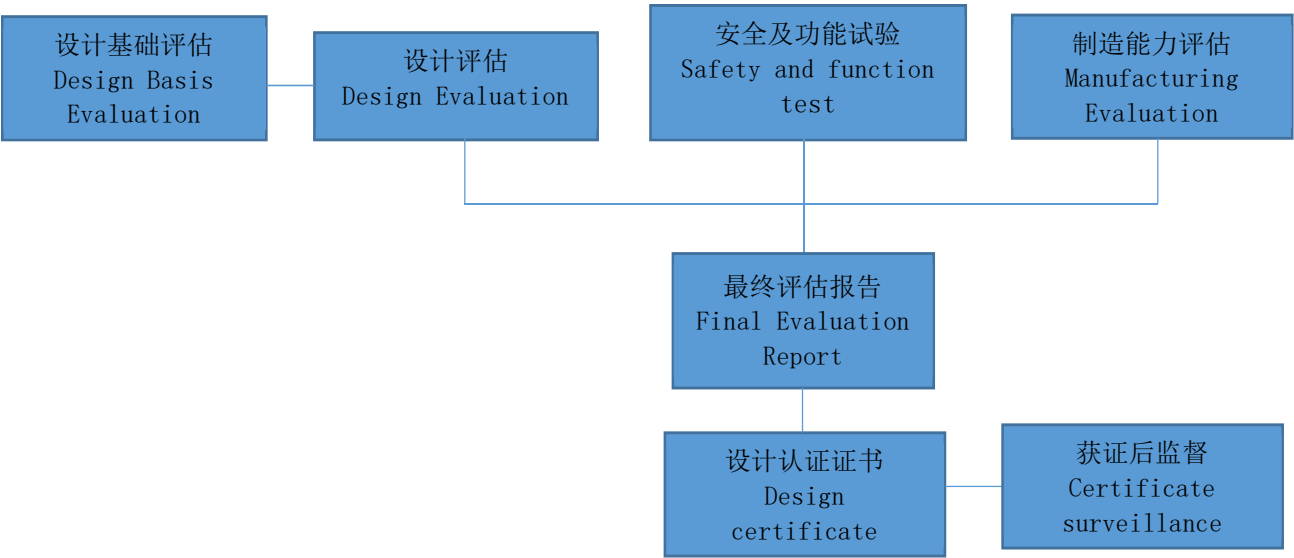


图 2.2 GB/Z 25458 设计认证模块图
Figure 2.2 Modules of design certification in GB/Z 25458

➤ **型式认证 Type Certification**

获得设计认证证书是型式认证的基础，对获得设计认证证书的风力发电机组，型式认证由以下必选模块和可选模块组成：

Obtaining design certificate is the basis prerequisites of type certification. For the turbines which has obtained the design certificate, the type certification must contain the bellowing mandatory modules and optional modules.

必选模块：型式试验；最终评估；获证后监督。
Mandatory modules: type testing, final evaluation and certificate surveillance.

可选模块：塔基设计评估；性能测试。参考图 2. 3
Optional modules: foundation design evaluation and type characteristics. Referring to figure 2.3.

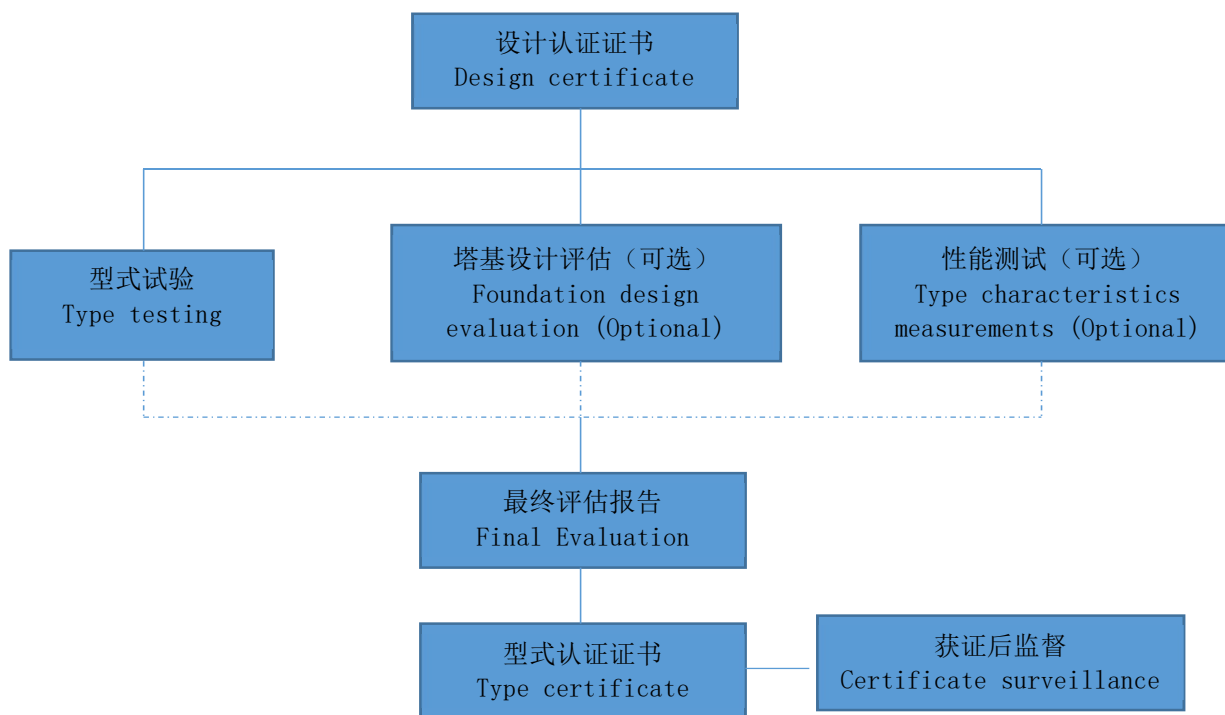


图 2.3 GB/Z 25458 型式认证模块图

Figure 2.3 Modules of type certification in GB/Z 25458

标准 GB/Z 25458 可根据客户的认证需求，执行风力发电机组的部件认证；相关的认证模块请见该标准第 7.5 节。

According to the request of customers, the component certification of wind turbines can also be performed with standard GB/Z 25458, the detailed certification modules can be found in section 7.5.

GB 认证系统相关的风机标准包括但不限于：GB/Z 25458（合格试验和认证）、GB/T35792（合格测试及认证）、GB/T 18451.1（陆上大型风电机组）、GB/T 18451.2（风力发电机组 功率特性测试）或 GB/T 17646（小型风电机组）、或 GB/T 29494（小型垂直轴风电机组）、IEC 61400-3（海上风电机组）、GB/T 18451.2（风电机组功率特性测试）、GB/T 25426（风电机组载荷测量）。

Relevant standards for GB certification scheme including but not limited to: GB/Z 25458 (conformity testing and certification), GB/T35792(conformity testing and certification), GB 18451.1 (wind turbine design requirements), GB/T 17646 (design requirements for small wind turbine), GB/T 29494(Small vertical axis wind turbine) or IEC 61400-3 (Offshore wind turbine), GB/T 18451.2(Power performance measurements of wind turbine), GB/T25246(mechanical loads measurements of wind turbines).

- **GL 导则型式认证系统**
GL Guideline Type Certification scheme

- **IV-Part 1 / GL (GL2010) 导则**

IV - Part 1 / GL 导则主要是针对陆上风力发电机组的型式认证，其中的评估模块(见图 2.4)有：

Guideline IV-Part 1 / GL is mainly for the type certification of onshore wind turbines, the type certification consists of following evaluation modules (see Figure2.4):

- 设计评估 Design evaluation
- 制造评估 Implementation of the design-related requirements in Production and Erection
- 质量管理体系 Quality management system
- 型式试验 Type testing
- 最终评估 Final evaluation
- 型式证书 Type certificate

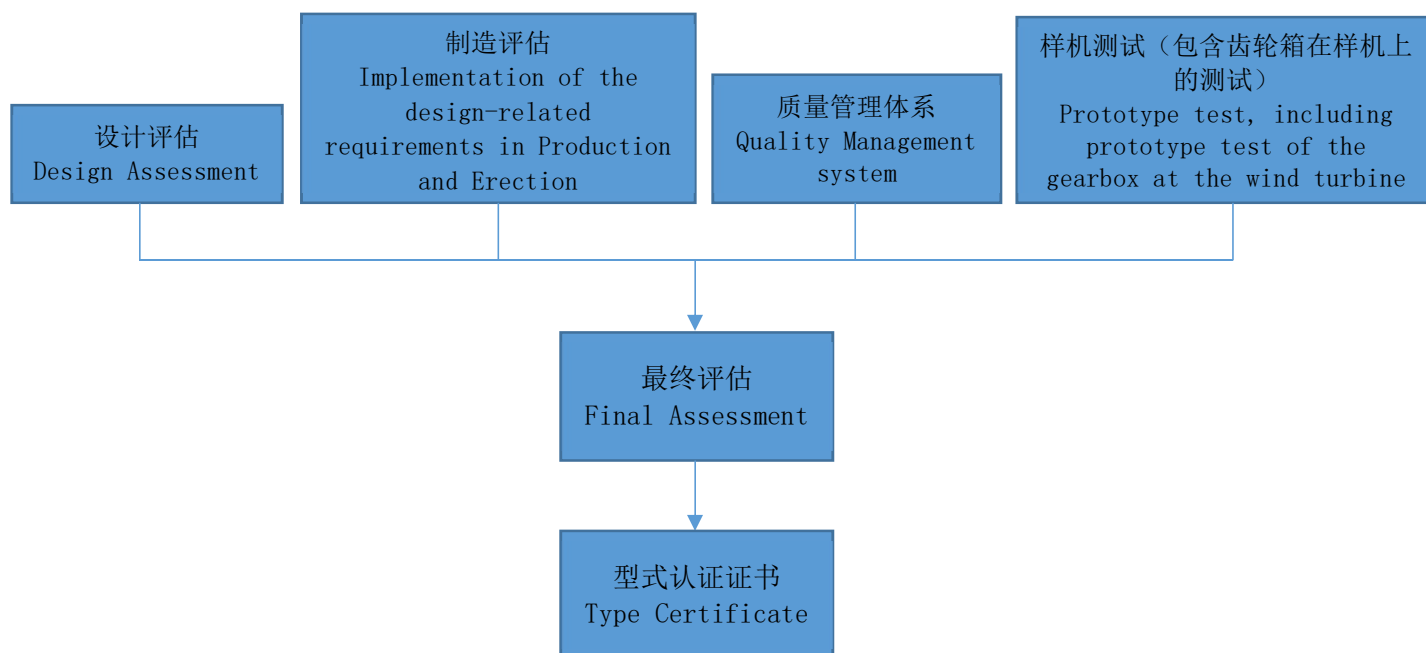


图 2.4 IV-Part 1 / GL (GL2010) 型式认证模块图
Figure 2.4 IV-Part 1 / GL (GL2010) modules of type certification

就 IV-Part 1 / GL 而言，整机型式认证中，有些模块完成后可颁发阶段符合性证书：
In terms of IV-Part 1 / GL, the stage statement of compliance can be issued after the module has been assessed in type certification of wind turbine:

- 设计评估：C 类、D 类设计评估（参考 IV-Part 1 / GL 第 1.2.2.3 条）；A 类、B 类设计评估（参考 IV-Part 1 / GL 第 1.2.2.4 条）和 IV-Part 1 / GL 第 1.3 条；
Design evaluation: C- or D-Design assessment (see section 1.2.2.3 in IV-Part 1 / GL); A- or B-Design assessment (see section 1.2.2.4 in IV-Part 1 / GL) and section 1.3 in IV-Part 1 / GL.
- A 类型式认证（型式认证），参见 IV-Part 1 / GL 第 1.2.2.2 节。
A type certification, see section 1.2.2.2 in IV-Part 1 / GL.
- B 类型式认证（临时型式认证），参见 IV-Part 1 / GL 第 1.2.2.2 节。
B type certification (provisional type certification), see section 1.2.2.2 in IV-Part 1 / GL.

➤ IV-Part2 / GL(GL2012)导则

IV-Part 2/ GL 导则主要是针对海上风力发电机组的型式认证，型式认证中的评估模块与 IV-Part1/GL 导则一致，可同样参考图 2.4。同样地，按照 IV-Part 2/ GL 导则进行型式认证，各个评估模块完成后，可以颁发相应的阶段性评估符合性声明。

Guideline IV-Part2 / GL is mainly for the type certification of offshore wind turbines. The evaluation module of IV-Part2/ GL for type certification is the same with IV-Part1/GL, the Figure 2.4 can also be referred to. Also, the type certification based on guideline IV-Part2/ GL can issue the stage statement of compliance after the module has been assessed.

GL 认证系统相关的风机标准包括但不限于：IV-Part 1 / GL 2003+2004 补充条款版本、或 IV-Part 1 / GL 2010 版本、或 IV-Part 2 / GL 2005 版本（海上风电机组）、IV-Part 2 / GL 2012 版本（海上风电机组）。

Relevant standards for GL certification scheme include but not limited to: IV-Part 1 / GL edition 2003 with supplement 2004, or IV-Part 1 / GL 2010 edition, or IV-Part 2 / GL 2005 edition (offshore wind turbine), IV-Part2 / GL2012 (offshore wind turbine).

- **DNVGL-SE-0441 型式认证系统**
DNVGL-SE-0441 Guideline Type Certification scheme

DNVGL-SE-0441 导则是参考了 IEC 61400-22、IV - Part 1/ GL 和 IV - Part 2/ GL 导则的认证模块衍生的机组认证导则。该导则适用于陆上、海上风力发电机组的型式认证和部件认证。

The guideline DNVGL-SE-0441 is refers to standard IEC 61400-22, guidelines IV-Part 1/ GL and IV-Part 2/ GL to be applicable for wind turbine certification, the guideline also refer to the standard IEC 61400-22. This guideline is applicable for type and component certification of on-shore and offshore wind turbines.

该导则的型式认证模块，又称为 A 类型式认证；主要有：

- 设计评估；Design Evaluation
- 测试评估；Test Evaluation
- 制造评估；Manufacturing Evaluation

A 类型式认证，同样有可选模块，如下：

- 基础/支撑结构设计评估；Foundation and/ or substructure design evaluation
- 特征测试评估：Type characteristics test evaluation
- 基础和/或支撑结构的制造评估；Foundation and/ or substructure manufacturing evaluation

相关认证模块的流程，见图 2.5。

Please see the Figure2.5 for the procedure of certification modules.

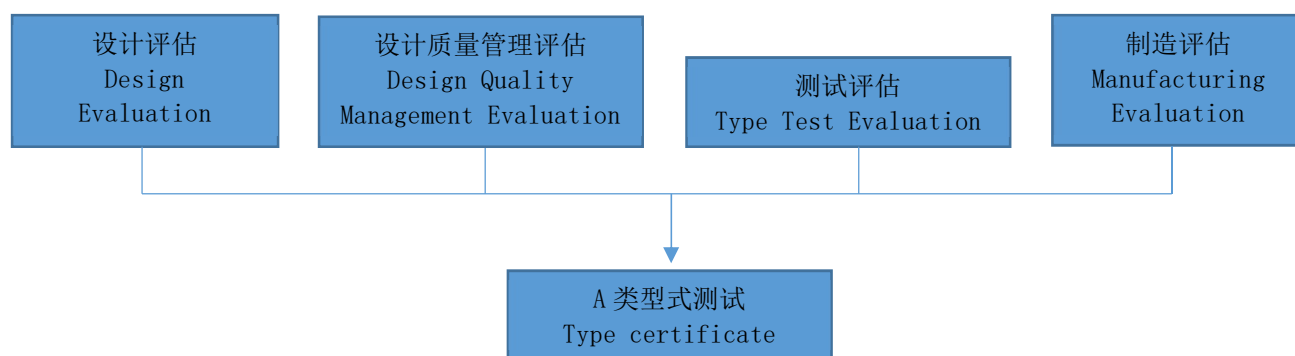


图 2.5 DNVGL-SE-0441 的认证模块的流程

Figure 2.5 Procedure of certification modules for DNVGL-SE-0441

DNVGL-SE-0441 导则中除了包含 A 类型式认证方案，也可根据客户的认证需求执行 D 类符合性声明评估（机组认证方法评估）、C 类样机认证、B 类临时型式认证以及特定场址型式认证。这些评估或认证的详细要求，可参见 DNVGL-SE-0441 导则第 2 章。

Except the A Type certification, DNVGL-SE-0441 guideline can be scheme for D statement of feasibility (Methodologies and technology used in turbine certification), C prototype certification, B provisional type certification and site specification type certification.

2.4 可交付证书 Deliverable Certificate

IECRE OD-501 和 IEC 61400-22 型式认证系统：

IECRE OD-501 and IEC 61400-22 type certification scheme

- 设计评估符合证明 design evaluation conformity statement
- 型式试验符合证明 type testing conformity statement
- 制造能力评估符合证明 manufacturing evaluation conformity statement
- 性能测试符合证明 type characteristics testing conformity statement
- 基础设计符合证明 foundation design conformity statement
- 基础制造符合证明 foundation manufacturing conformity statement
- 型式证书 type certificate

- 部件型式证书 component type certificate
- 样机认证证书 prototype type certificate
- 临时型式证书 provisional type certificate

GB/T 35792 型式认证系统

GB/T 35792 type certification scheme

- 设计评估符合证明 design evaluation conformity statement
- 型式试验符合证明 type testing conformity statement
- 制造能力评估符合证明 manufacturing evaluation conformity statement
- 性能测试符合证明 type characteristics testing conformity statement
- 基础设计符合证明 foundation design conformity statement
- 基础制造符合证明 foundation manufacturing conformity statement
- 型式证书 type certificate
- 部件型式证书 component type certificate
- 样机认证证书 prototype type certificate
- 临时型式证书 provisional type certificate

GB/Z 25458 型式认证系统

GB/ Z 25458 type certification scheme

- 设计评估符合证明 design evaluation conformity statement
- 型式试验符合证明 type testing conformity statement
- 制造能力评估符合证明 manufacturing evaluation conformity statement
- 性能测试符合证明 type characteristics testing conformity statement
- 基础设计符合证明 foundation design conformity statement
- 基础制造符合证明 foundation manufacturing conformity statement
- 设计证书 design certificate
- 型式证书 type certificate
- 部件型式证书 component type certificate

IV – Part 1 / GL 和 IV-Part 2 / GL 型式认证系统

IV-Part 1 / GL and IV-Part 2 / GL type certification scheme

- A 型符合证明 A statement of compliance

- B 型符合证明 B statement of compliance
- C 型符合证明 C statement of compliance
- D 型符合证明 D statement of compliance
- A 型式证书 A type certificate
- B 型式证书 B type certificate

DNVGL-SE-0441 型式认证系统

DNVGL-SE-0441 type certification scheme

- D 可行性声明, 缩写: SoF D
- D Statement of Feasibility, abbreviation: SoF D
- C /B / A/ 特定场址类设计符合性声明 缩写: SoC C/B/A – Design
- Statement of compliance C/B/A – Design, abbreviation: SoC C/B/A – Design
- C/ B/ A/ 特定场址类测试符合性声明 缩写: SoC C/B/A – Test
- Statement of compliance C/B/A – Test, abbreviation: SoC C/B/A – Test
- C/ B/ A/ 特定场址类制造符合性声明 缩写: SoC C/B/A – Manufacturing
- Statement of compliance C/B/A – Manufacturing, abbreviation: SoC C/B/A – Manufacturing
- C/ B/ A/ 特定场址类型式认证证书 缩写: PTC C; TC B/ A/ Site
- C/ B/ A/ Site Specific Type certificate, abbreviation: PTC C; TC B/ A/ Site

根据以上认证标准, 型式认证的目的是确保风力发电机组型式的设计、记录和制造与设计假定、特定标准和其他技术要求的一致性。认证机构还应确认机组制造过程、组件规范、检验和测试程序, 以及包含的部件的相关文件应与设计文件一致。证书和证明将类似于附件 A 所示格式。

According to the above certification standards, type certification is to confirm that the wind turbine type is designed, documented and manufactured in conformity with the design assumptions, specific standards and other technical requirements. The manufacturing process, component specifications, inspection and test procedures and corresponding documentation of the components for wind turbines shall be conformed with the design documentation by certification body. Certificates and conformity statements sample are showed in annex A.

2.5 证书有效性和维护 certificate validity and maintenance

根据上述中第 2.3 章提到的所有型式认证系统, 所颁发的证书的有效期、维护和监督的要求基本一致; 详情请见下方。若上述认证体系对于证书有效期、维护和监督的要求有差异的部分, 将会单独补充说明。

According to all the certification schemes mentioned in chapter 2.3, the requirements of validity, maintenance and surveillance for certificates are almost the same, the detailed requirements are listed in next parts. If there are some differences on the validity, maintenance and surveillance of certificates, the supplement description will be listed.

型式证书有效期为 5 年。

The period of validity for type certificates shall not exceed 5 years.

样机认证证书有效期通常为 3 年。在完成机组型式认证最终审核后, 风机设计的变化可能会导致发布新版本的证书。新版本证书与原证书到期日应相同。

The period of validity of a Prototype certificate shall not exceed 3 years. After the final certification has been assessed, any change of wind turbine design will result in issuing an updated certificate, which shall have the same validity deadline with the original certificate.

在有重大变化的情况下，在重新进行型式认证审核后，一个新证书的有效期将为 5 年。

When significant changes happen in one type of wind turbine, a new certificate with 5 year validity will be issued after finishing verification of renewal type certification.

型式认证过程中，若与机组安全性不相关的开口项暂未关闭；TÜV NORD 可酌情颁发临时型式认证证书或临时符合性声明 (IEC 标准)；B 类型式认证证书或 B 类符合性声明 (GL/ DNVGL 标准) 给客户。该临时型式认证证书或 B 类型式认证证书的有效期为 1 年，且 1 年内必须关闭遗留测开口项。

During the type certification, in case of some outstanding issues of no importance to the primary safety of the certified wind turbines, a provisional certificate or provisional conformity statement (IEC standards), B Type certificate or B Statement of Compliance (GL/ DNVGL standards) will be issued to customers by TÜV NORD appropriately. The validity of provisional certificate or B Type certificate shall not be exceed 1 year, and the outstanding issues shall be verified within the validity period.

型式证书的维护条件为：

Maintenance of type certificate:

- 证书申请人提交的年度报告包含所有已安装的经过型式认证的风机，且包括相关信息：

The applicant shall prepare an annual report for the certified wind turbine to be sent to the certification body for review. The report shall include relevant information:

- 异常或不正常的操作经验或操作故障。

Abnormal operating experience or failures known to the certificate holder

- 细微修改。

Any minor modifications

- 客户即刻报告计划的重大修改，把充分的修改时间考虑在内。

The applicant shall report major modifications to the certified product to the certification body without delay, and take the sufficient modification time into account.

- TÜV NORD 在实施之前进行评估，且能够更新型式证书

TÜV NORD shall proceed on the assessment before performing, and be able to update the type certificate.

- TÜV NORD 在证书有效期内进行定期审核，至少每 2½ 年一次（标准 IV-Part1/GL 和 IV-Part1/GL 为每 4 年一次），也可根据机组安装的条件协商定期审核时间（适用所有认证体系），检查以确认已经安装的风机及其部件与经过型式认证的风机相符。定期审核的方式：对近期安装的机组进行检验或者对部件进行制造审核（部件认证）。

TÜV NORD shall perform periodic surveillance or monitoring with the purpose to check that installed the wind turbine and its components correspond to the type-certified turbines. The period shall in general not exceed 2.5 years (4 years is an interval for GL standard), the interval may be varied depending on the condition of wind turbine installation for all the certification schemes. The methodology of periodic surveillance or monitoring can be that such inspection is on a recently installed wind turbine or in the workshop for component certificates.

2.6 部件证书 Component certificates

部件证书是指发布用于特定部件的型式证书，如叶片、齿轮箱、发电机和转子机舱组件。部件认证包含相关模块认证，其范围取决于风力发电机组的部件的类型。关于部件认证，其要求接口应具有明确定义。

Component certificates are issued for a major component of a specific type, such as rotor blade, gearbox, generator and rotor nacelle assembly. Component certification includes several related modules, whose scope depends on the specified components. The requirements of interface definition shall be unambiguous for the component certification.

部件认证与型式认证的评估流程相同。

The procedure for component certification is the same with the type certification procedure.

叶片部件认证的相关设计、型式测试和制造的标准要求包括但不限于：IEC 61400-1、GB/T 18451.1、GB/T 25383、GB/T 25384、IEC 61400-23、IV - Part 1 / GL、IV - Part 2 / GL 和 DNVGL-ST-0376。

Relevant standards requirements of design, type testing and manufacturing for the rotor blade component certification include but not limit to: IEC 61400-1, GB/T 18451.1, GB/T 25383, GB/T 25384, IEC 61400-23, IV-Part 1 / GL Wind, IV-Part 2 / GL Wind and DNVGL-ST-0376.

齿轮箱部件认证的相关设计、型式测试和制造的标准要求包括但不限于：IEC 61400-1、GB/T 18451.1、GB/T 19073、IEC 61400-4、IV-Part 1 / GL、IV-Part 2 / GL 和 DNVGL-ST-0361。

Relevant standards requirements of design, type testing and manufacturing for the gearbox component certification include but not limit to: IEC 61400-1, GB/T 18451.1, GB/T 19073, IEC 61400-4, IV-Part 1 / GL, IV-Part 2 / GL and DNVGL-ST-0361.

发电机部件认证的相关设计、型式测试和制造的标准要求包括但不限于：IEC 61400-1、GB/T 18451.1、GB/T 23479.1、GB/T 23479.2、GB/T 25389.1、GB/T 25389.2、GB 755、GB/T 4942.1、GB/T 1993、GB/T 997、GB 10069.3、IEC 60034-1、IEC 60034-5、IEC 60034-6、IEC 60034-7、IEC 60034-9、IV-Part 1 / GL、IV-Part 2 / GL 和 DNVGL-ST-0076。

Relevant standards requirements of design, type testing and manufacturing for the generator component certification include but not limit to: IEC 61400-1, GB/T 18451.1, GB/T 23479.1, GB/T 23479.2, GB/T 25389.1, GB/T 25389.2, GB 755, GB/T 4942.1, GB/T 1993, GB/T 997, GB 10069.3, IEC 60034-1, IEC 60034-5, IEC 60034-6, IEC 60034-7, IEC 60034-9, IV-Part 1 / GL, IV-Part 2 / GL and DNVGL-ST-0076.

2.7 样机认证证书 **Prototype certificates**

样机认证证书的发布过程与型式证书相同，但在每个定义的模块内其评估范围相对缩小。

The issuing of prototype certificates has the same procedures with type certificates, but the evaluation scope for every specified module is smaller than type certification.

样机认证的模板包含基础设计评估（强制模块：设计基础评估和机组设计评估），样机测试计划评估，以及安全和功能测试。

Prototype certification consists of the following modules: basic design evaluation (mandatory modules: design basis evaluation and wind turbine design evaluation), prototype test plan evaluation, safety and function test.

2.8 认证系统概要 **Certification system overview**

图 2.1-2.5 概述了 TÜV NORD 的型式认证系统。关于这些标准的任何变化与更新将优先适用于于本文件中所显示的变化。

Figure 2.1-2.5 summarizes type certification schemes of TÜV NORD. Any changes and updates in the standards will be prior to the changing of this certification rule.

第 3 节 认证内容

Chapter 3 Certification Content

3.1 具体服务说明：简介 Specific service description: Introduction

TÜV NORD 的认证服务描述主要是基于 IEC、IECRE、GB、GL、DNVGL 标准。以下信息限制为认证申请人必须承认的几项最重要的条款。但是，有关认证范围的非常详细和机密的信息将提供给认证申请人，作为进一步明确之用。

TÜV NORD certification service is mainly based on IEC, IECRE, GB, GL, DNVGL standards. The following information is limited to the most important items that the applicant must acknowledge. However, detailed and confidential information on the scope of the certification will be provided to the certification applicant for further clarification.

本节提供 TÜV NORD 风机的型式认证系统包含的每个模块的认证方法的细节。本节将以标准 IECRE OD-501 和 IEC 61400-22 的型式认证系统为例。对于每个阶段性评估完成，将制定符合 IECRE OD-501 和 IEC 61400-22 标准的符合性声明证书。在开展风机的型式认证时，选择了 2.3 节中其他认证体系作为认证依据，将按照其他认证体系标准的要求执行认证。

This section provides details of each module for wind turbines for TÜV NORD type certification scheme. The certification schemes from standard IECRE OD-501 and IEC 61400-22 are used as examples in this Chapter. The conformity statements of each module will be issued after the assessment of each module is finished. When the other certification schemes in section 2.3 are chosen as the certification scheme, the requirements described in the other certification scheme shall be followed.

标准 IECRE OD-501 和 IEC 61400-22 对风力发电机组型式认证的评估和文档要求是一致的；但是标准 IECRE OD-501 的子标准对风力发电机组的各个部件或功能模块有更多更明确的要求，即 IECRE OD-501-1（叶片的设计、测试、制造的详细的评估和文档要求）、IECRE OD-501-2（齿轮箱的设计、测试、制造的详细的评估和文档要求）、IECRE OD-501-3（塔筒的设计、测试、制造的评估和文档要求）、IECRE OD-501-4（载荷的设计、测试的评估和文档要求）、IECRE OD-501-5（控制与保护系统的设计、测试的评估和文档要求）和 IECRE OD-501-7（电气部件的设计、测试、制造的评估和文档要求）。客户基于 IECRE OD-501 标准申请型式认证时，准备的相关文档资料也应满足这些子标准的要求；TÜV NORD 将按照 IECRE OD-501 和子标准的要求进行评估。

The requirements of documentation and evaluation for wind turbine type certification in standard IECRE OD-501 are identical to the requirements of standard IEC 61400-22. But the sub standards of standard IECRE OD-501 give more specific requirements for the components or functional module of wind turbines, i.e. IECRE OD-501-1 (the requirements of assessment and documentation for rotor blade design ,test and manufacturing), IECRE OD-501-2 (the requirements of assessment and documentation for main gearbox design ,test and manufacturing), IECRE OD-501-3 (the requirements of assessment and documentation for tower design ,test and manufacturing), IECRE OD-501-4 (the requirements of assessment and documentation for load design ,test and manufacturing), IECRE OD-501-5 (the requirements of assessment and documentation for control and protection design ,test) and IECRE OD-501-7 (the requirements of assessment and documentation for main electrical components design ,test and manufacturing). When the type certification based on IECRE OD-501 is applied by customer, the documentation shall also meet the requirements of the sub standards; TÜV NORD will do assessment according to IECRE OD-501 and its sub standards.

关于验证活动，IECRE OD-501 或 IEC 61400-22 中没有指定特定的标准，将根据满足 IECRE OD-501 或 IEC 61400-22 安全水平的标准、规范或指南并在与客户商定后制定符合性认证。

As for the verification activities, no specific standards are specified in IEC 61400-22 or IECRE OD-501. Compliance certification will be established according to the standards, specifications or guidelines that meet the safety level of IEC 61400-22 or IECRE OD-501 and upon agreement with the customer.

3.2 设计基础评估：综述 Design basis evaluation: General

提交用于 TÜV NORD 评估的设计基础文件应确定所有要求、假设和方法，这对设计理念和设计文件至关重要。因此，设计基础应包括对所有规范和标准、设计参数、假设、方法和原则以及其他与制造、运输、安装、调试、操作和维护相关的要求的描述。参见本文件中的附件 A.1。

The design basis document which was submitted to TÜV NORD for evaluation shall identify all requirements, assumptions and methodologies, which are essential for the design and the design documentation. Therefore, the design basis shall include a description of all codes and standards, design parameters, assumptions, methodologies and principles, and other requirements related to manufacture, transportation, installation, commissioning, operation and maintenance. See Annex A.1 of this rule.

设计基础是指 IEC、ISO 标准或目标市场在细节、组件或系统适用时用于所评估风机模型的国家标准。风机叶片的设计、制造和测试应满足上述要求，因此建议使用 IEC 61400-1 和 IEC 61400-23 标准。在人员安全方面，建议使用 EN 50308 标准，但是可能还需要考虑用于目标市场的当地人员安全规程（例如用于美国市场的 OSHA）。

The design basis is the IEC, ISO standards or national standards of the target market that are used to evaluate the wind turbine when details, components or systems are applicable. Wind turbine shall be designed, manufactured and tested to meet the above requirements, and IEC 61400-1 and IEC 61400-23 standards are recommended for rotor blade. In terms of personnel safety, the EN 50308 standard is recommended, but local personnel safety protocols for target markets (such as OSHA for the United States market) may also need to be considered.

TÜV NORD 将根据标准 IECRE OD-501 或 IEC 61400-22 验证设计基础是否正确记录以及风机型式设计是否足够安全。TÜV NORD 将验证所选规范、标准和指南以及参数、假设、方法和其他要求是否符合 IECRE OD-501 或 IEC 61400-22 中的要求。设计基础评估不是对标准要求的设计的评估，而是验证所提供的如上设计信息是否足以执行设计评估。

TÜV NORD will verify whether the design basis is properly documented and whether the wind turbine type design is sufficiently safe in accordance with IEC 61400-22 or IECRE OD-501. TÜV NORD will verify that the selected specifications, standards and guidelines, as well as parameters, assumptions, methodologies and other requirements are appropriate and fulfill the requirements of IEC 61400-22 or IECRE OD-501. The design basis assessment is not an assessment of the design required by the standards, but rather a validation of whether the design information provided is sufficient to perform the design assessment.

按照风力发电机组的组成模块，相比于 IEC 61400-22 对设计基础的要求，IECRE OD-501 及子标准在文档和评估要求方面主体是一致的，只是子标准中再次说明机组各模块的设计基础的要求，详细的要求请见 IECRE OD-501-1 的第 4.2 节、IECRE OD-501-2 的第 3.1 节、IECRE OD-501-3 的第 3.1 节、IECRE OD-501-4 的第 3 章、IECRE OD-501-5 的第 4 章和 IECRE OD-501-7 的第 3.1 节。

According to the component modules of the wind turbine, the main requirements for design basis of standard IECRE OD-501 and its sub-standards are identical compared to the requirements of design basis for standard IEC 61400-22. It is just that the requirements for each component module has been separately described in the sub-standards of IECRE OD-501. The detailed requirements can be found in the section 4.2 of IECRE OD-501-1, section 3.1 of IECRE OD-501-2, section 3.1 of IECRE OD-501-3, section 3 of IECRE OD-501-4, section 4 of IECRE OD-501-5 and section 3.1 of IECRE OD-501-7.

在成功完成设计基础评估后，TÜV NORD 应出具一份设计基础评估总结报告；以及如有必要，也会颁发设计基础评估符合性声明证书。

After successful completion of assessment of the design basis, TÜV NORD shall issue an evaluation report of the design basis, and if applicable, TÜV NORD can issue the conformity statement of design basis.

3.3 设计评估：综述 **Design evaluation: general**

设计评估的目的是检查风力发电机组是否按设计条件、指定标准和其他技术要求，以及设计基础中确定的要求进行设计。

The purpose of design evaluation is to examine whether the wind turbine is designed according to design conditions, specified standards and other technical requirements, as well as the confirmed requirements in design basis.

整机制造商应提供所有必要的设计文件。在标准 IECRE OD-501 或 IEC 61400-22 附件 A 中给出了文件列表指南。

The wind turbine manufacturer shall provide all documentation which are necessary for design evaluation. A list of the documentation is shown in annex A of IECRE OD-501 or IEC 61400-22.

TÜV NORD 将验证最终设计是否符合设计假设、标准和 TÜV NORD 验证和批准的设计基础中指定的其他要求。在成功完成最终设计验证后，TÜV NORD 应出具一份设计评估一致性声明。

TÜV NORD will verify whether the final design fulfill the design assumptions, standards, and other requirements specified in the design basis which has been verified and approved by TÜV NORD. After successful completion of the final design validation, TÜV NORD shall issue a statement of design assessment conformity.

设计评估将针对以下主题:

The design evaluation will address the following topics:

- 设计控制 design control
- 控制和保护系统 control and protection systems
- 载荷和载荷工况 loads and load cases
- 风轮叶片 rotor blades
- 机械部件和结构部件 machinery structures and structural components
- 电气部件 electrical components
- 外壳 housings
- 部件测试 evaluation of component tests
- 基础设计要求 (可选) foundation design requirements(optional)
- 制造过程 manufacturing process
- 运输过程 transportation process
- 安装过程 installation process
- 维护过程 maintenance process
- 人员安全 personnel safety

在以下子章节中给出了关于每个主题评估的细节。

The details of the evaluation on each topic give in the following sections.

3.3.1 设计控制 design control

设计控制程序应符合 ISO 9001 第 8.3.4 条款要求。设计控制程序应包括文件控制, 以保证每个成员都清楚每份文件的修订状态。

Design control procedures shall comply with ISO 9001 clause 8.3.4. The design control procedure shall include a control of documents so that the revision status of every document is clearly to all parties.

TÜV NORD 将评估风机制造商使用的质量程序以控制设计过程。若风机制造商的质量体系经过 ISO9001:2015 认证 (其范围包括设计), 可认为其设计控制程序满足要求。如果未经过 ISO9001:2015 认证时, 将结合制造评估进行质量体系评估。

TÜV NORD will evaluate the quality procedures used by the wind turbine manufacturer to control the design process. If the quality system of the wind turbine manufacturer has been certified according to standard ISO9001:2015 (its scope includes design) by certification bodies, the design control procedures can be considered to meet the requirements. If no valid ISO9001:2015 certificate is available, the quality system will be evaluated in combination with the manufacturing evaluations.

以上评估的要求是标准 IECRE OD-501 和 IEC 61400-22 对设计控制模块的要求。

The above requirements are the requirements from standards IECRE OD-501 and IEC 61400-22.

3.3.2 控制和保护系统 control and protection system

TÜV NORD 将评估控制和保护系统文件。评估将包括以下文件:

TÜV NORD will evaluate the documentation of a control and protection of system. Including the following documents:

- 风力发电机组运行模式的描述;
description of wind turbine modes of operation
- 所有模块的设计和性能;
design and functionality of all elements

- 保护系统的失效安全设计;
fail-safe design of the protection system
- 系统逻辑及其硬件实现;
system logic and hardware implementation
- 所有重要安全传感器可靠性的证明;
authentication of reliability of all safety critical sensors
- 刹车系统分析;
braking system analysis
- 状态监控;
condition monitoring
- 核查控制保护系统的试验大纲
test plan for the verification of the control and protection system functions

制造商应充分记录失效模式和影响分析 (FMEA)，以包含风机设计中所使用的所有部件。FMEA 应提供：
The manufacturer shall fully record the failure mode and impact analysis (FMEA), including all components used in the wind turbine design. FMEA shall provide:

- 用于选择具有操作成功和安全高概率的设计的一种记录方法。
a recording method for selecting designs with high probability of operational success and safety
- 用于评估潜在故障机制、故障模式及其对系统运行的影响并根据对系统影响的严重性和发生的可能性排名制作的故障列表的一种统一记录格式。
a uniform record format for evaluating potential failure mechanisms, failure modes, and their impact on system operation, and for generating a failure list based on the severity of the impact on the system and the likelihood of its occurrence
- 对单一故障点 (SFPS) 和系统接口问题的早期识别可能对成功完成任务和/或安全性至关重要。它们还提供了一种验证冗余要素之间的切换不会被假定单一故障损坏的方法。
early identification of single point of failure (SFPS) and system interface issues may be critical to successful completion of tasks and/or security. They also provide a way to verify that switching between redundant elements is not assumed to be broken by a single failure
- 用于评估提议的变化对设计和/或操作程序（关于成功完成任务和安全性）影响的一种有效方法。
an effective way to evaluate the impact of proposed changes on the design and/or operational procedures (regarding successful completion of tasks and security)
- 用于使用中故障诊断程序和用于定位性能监控和故障检测设备的基础。
foundation for in-use fault diagnosis programs and for locating performance monitoring and fault detection equipment
- 用于测试早期规划的标准。
standard for testing early planning

按要求 FMEA 将包括：
FMEA shall include as required:

- **过程：**对制造和组装过程的分析。
process: analysis of manufacturing and assembly processes
- **设计：**对生产前的产品的分析。
design: analysis of pre-production products
- **理念：**在早期设计理念阶段对系统或子系统的分析。
philosophy: analysis of a system or subsystem in the early design philosophy phase
- **设备：**在采购前对机器或设备设计的分析。
equipment: analysis of machine or equipment design prior to purchase
- **服务：**在发布并对客户产生影响之前对服务产业流程的分析。
Service: analysis of service industry processes prior to release and having impact on customer
- **系统：**对系统功能的分析。
system: analysis of system functions
- **软件：**对软件功能的分析。
software: analysis of software functions

以上要求是标准 IECRE OD-501 和 IEC 61400-22 对控制和保护系统的设计评估要求，基于这些主要内容，标准 IECRE OD-501-5 对控制和保护系统列出了更加具体的要求。比如，OD-501-5 中，机组运行模式的描述需要包含风力发电机组描述（设计名称、主要布局、功能方针）、控制系统概念和控制系统的描述（控制系统构架、启停机程序的次序、机组正常运行、检测故障和触发条件声明）；系统逻辑及其硬件实现，需要包含软件逻辑描述、控制系统的测量传感器和传感器的描述（名称、设置值、时间常数）、刹车系统和它们的行为（刹车系统结构、运行模态等）、锁定装置的功能的描述等。更多的详细要求，请见 IECRE OD-501-5 的第 4 章。

The requirements listed above is the design evaluation requirements of standard IECRE OD-501 and IEC 61400-22. Based on the requirements, more detailed requirements are described in IECRE OD-501-5. Such as, the description of wind turbine modes of operation shall contain the description of the wind turbine (Type designation, general layout and functional principles), description of the control system concept and the control system (Structural of the control system, sequences of the start and stop procedures, behavior of the turbine during normal operation and on detection of malfunctions, statement of trigger criteria); the system logic and hardware implementation shall contain the description of software logics, description of the sensors and (if applicable) measuring transducers of the control system (Type designation, setting values, time constants), description of the braking systems and their behavior (Structure of the braking systems, mode of operation,...), functional description of the locking devices ect. More detailed requirements can be found in the section 4 of IECRE OD-501-5.

标准 IECRE OD-501-5 对控制和保护系统的认证要求更明确，便于认证申请人更加明确相关的资料提交要求；但是对于 TÜV NORD 的评估执行并未有影响。

IECRE OD-501-5 gives more detailed certification requirements, it is more clear for the certification applicant to submit the documentations. While, it has no impact on the evaluation for TÜV NORD.

3.3.3 载荷和载荷工况 loads and load cases

制造商应记录载荷分析结果，并提供设计使用的载荷总结。载荷值应与相应的载荷工况的描述、计算模型以及输入的数据（如下列参数）一起提供：

The manufacturer shall record the results of the load analysis and provide a summary of the loads used in the design. The load values submitted shall be accompanied by the load case description, description of calculation models and input data (such as the following parameters):

- 空气动力参数；
Parameter values relating to aerodynamics
- 结构特性参数；
Structural characteristics
- 与控制系统有关的参数。
Parameter values relating to the control system

IEC 61400-1 中定义了所需的载荷工况。在载荷工况的详细设置中应考虑控制和保护系统的设计。

The required load cases are defined in IEC 61400-1. The design of control and protection system should be considered in the detailed setting of load cases.

以下为 IEC 61400-1 中定义的载荷工况所包含的设计情况：

The load cases defined in IEC 61400-1 include the following conditions:

- 发电 Power production
- 发电兼有故障 Power production plus occurrence of fault
- 启动 Start up
- 正常关机 Normal shut down
- 紧急关机 Emergency shut down
- 停机（静止或空转） Parked (standing still or idling)
- 停机兼有故障 Parked and fault conditions
- 运输、组装、维护和维修 Transport, assembly, maintenance and repair

除了 IECRE OD-501 和 IEC 61400-22 中的要求，IECRE OD-501-4 更详细的描述的载荷评估的资料要求。比如机组的概括性描述（关键部件的尺寸、主要图纸、机组等级、功率曲线等）、载荷计算输入的环境条件和仿真软件（风况仿真的软件名称、版本、风种子设置等，海况仿真的软件、版本、破浪设置等）、机组的载荷仿真（软件及版本、关键部件的尺寸、质量、刚度、固有频率等）、载荷工况设计（工况定义、风速考虑、初始条件、仿

真时间等)、载荷后处理(极限载荷、疲劳载荷、外推等)。相比于 IECRE OD-501-4 的要求, TÜV NORD 对载荷评估的要求未有明显的差异, 在该标准发布之前 TÜV NORD 就是按照机组载荷设计中必要的输入执行的评估。
In addition to the requirements of standard IECRE OD-501 and IEC 61400-22, IECRE OD-501-4 gives more detailed requirements of the load evaluation. Such as general turbine description (main components dimensions, general drawings, wind turbine class, power curves, ect.), the environmental conditions for load simulation and simulation software of environmental conditions (software, version, setting of wind seeds for wind conditions or marine condition, waves settings), load simulation (software and version, general components geometry, mass, stiffness, eigenfrequencies, ect.), load cases design (load case definition, wind speeds consideration, initial condition, simulation time, ect.), loads post-processing(extreme loads, fatigue loads, extrapolation, ect.). Compared to the requirements of IECRE OD-501-4, it has no big deviations on the requirements of load evaluation for TÜV NORD, TÜV NORD also do the load evaluation according to the necessary inputs of load design.

TÜV NORD 将验证载荷和载荷工况。验证范围将取决于风机设计理念和风机容量。
TÜV NORD will verify the loads and load cases. The scope of validation will depend on the wind turbine design concept and capacity.

作为载荷和载荷工况验证的一部分, 载荷评估的重点是疲劳载荷和关键极限载荷工况。
As a part of loads and load cases verification, the emphasis of load evaluation is fatigue load and critical ultimate loads condition.

独立载荷分析是指, 在定义域与运动方程式解决方案结合时, 使用专用气动弹性规范进行的气动弹性载荷模拟。
Independent load analysis refers to aeroelastic load simulation using specific aeroelastic specifications when the domain is combined with the motion equation solution.

载荷分析将作为对应用输入的独立检查, 并对重要载荷工况和载荷组合进行确认。它还将验证:
The load analysis will be used as an independent check on the application inputs and to confirm important load cases and load combinations. It will also verify:

- 制造商计算载荷水平 the manufacturer calculates the load level
- 动态行为 dynamic behavior
- 任何不稳定性存在 the existence of any instability

3.3.4 部件 components

TÜV NORD 将评估结构、机械、电气组件的设计是否符合适用的认证标准 IECRE OD-501、IEC 61400-22, 设计标准 IEC 61400-1 或 IEC 61400-2 或 IEC 61400-3-1 或 IEC 61400-3-2 以及商定的附加规范和标准的要求。
TÜV NORD will evaluate whether the design of the structural, mechanical, and electrical components fulfill the requirements of applicable certification standards IECRE OD-501, IEC 61400-22, and design standards IEC 61400-1, or IEC 61400-2 or IEC 61400-3-1 or IEC 61400-3-2, as well as the requirements of agreed additional specifications and standards.

涉及部件的设计文件通常包括规格、说明书、示意图和设计计算, 它还可能与测量报告、测试报告、图纸和零件列表相结合。TÜV NORD 要求该文件明确地标识设计的基准(即规范和标准)以及载荷和相关外部情况。
Design documentation of components usually includes specifications, diagrams, and design calculations. It may also can combine with measurement reports, test reports, drawings, and a list of parts. TÜV NORD requires that the design base (i.e., specifications and standards) as well as the load and associated external conditions (interfaces with other components) are well described in these documentation.

TÜV NORD 对部件的评定包含文件审核和独立分析。
The evaluation of components done by TÜV NORD includes documentation review and independent analysis.

关于其设计文件包括高级分析的部件, 如高度利用部件的 FEM 分析, TÜV NORD 可能进行独立分析以用于设计的验证。
With respect to the components whose design documentation includes advanced analysis, such as FEM analysis with high utilization of components, TÜV NORD may perform independent analysis to verify the component design.

关于受制于部件测试的组件, 组件测试结果可能将用作结构容量的全部或部分文件。在这种情况下, 测试计划以 TÜV NORD 批准为准。
With respect to components subject to component testing, the results files of component testing may be used as all or part of the structural capacity. In this case, the test plan shall be subject to the approval of TÜV NORD.

以上这些要求与 IECRE OD-501 和 IEC 61400-22 的要求相同，而 IECRE OD-501 与部件相关的子标准更详细的陈述了设计评估要求。比如 IECRE OD-501-1 标准说明了叶片部件设计文档需要包含材料特性（包含材料测试报告）、叶片说明书（质量、刚度分布、频率、重心位置）、有限元模型 FEA、叶片图纸、气动特性数据、型式测试大纲等等。IECRE OD-501-2 标准说明了主齿轮箱设计文档需要包含主图纸、子部件的清单和图纸、静力和疲劳的齿轮额定值计算、主轴及其与轮毂的连接部分的极限和疲劳的强度计算等等。额外地，IECRE OD-501-3 标准是说明塔筒设计的详细评估要求；IECRE OD-501-7 标准是说明主要电气部件设计的评估要求。认证申请人可以参考这些子标准的详细的要求准备设计评估的资料。TÜV NORD 对部件的设计评估的要求未有明显的差异。

The above requirements are identical to the requirements of IECRE OD-501 and IEC 61400-22, while the detailed requirements for design evaluation of the components are described in relevant sub-standards. For example, IECRE OD-501-1 describes the design documentation of rotor blade should contain the material properties (including material test reports), blade specification (mass, stiffness distribution, natural frequencies, blade mass and center of gravity), Finite Element model (FEA), blade drawings, aerodynamic data, type testing specification, ect. IECRE OD-501-2 describes the design documentation of main gearbox should contain main drawings, list of parts and their drawings, gear rating calculations for static and fatigue strength, shaft and the connection between shaft & hub strength calculations for fatigue and ultimate, ect. Additionally, IECRE OD-501-3 describes the detailed requirements for tower design evaluation; IECRE OD-501-7 describes the detailed requirements of main electrical components design evaluation. The certification applicant can refer these sub-standards to prepare the design evaluation documentation. The evaluation of all the components for TÜV NORD has no big deviations.

3.3.5 基础设计要求 foundation design requirements

基础设计评估不是用于型式认证的一个强制性模块。但是，TÜV NORD 将评定用于基础的设计要求。将对特性载荷和设计载荷进行评定，还将对基础-塔架接口处的基础弹性容许范围进行评定。将通过设计文件审核进行评定。

Foundation design evaluation is not a mandatory module for type certification. However, TÜV NORD will evaluate the design requirements of the foundation. The characteristic and design loads will be evaluated, as well as the allowable range of foundation elasticity which is the interface with the base-tower. The design document will be reviewed for evaluation.

当机组的基础部分被包含在机组的型式认证范围内，则 TÜV NORD 将根据客户所选的认证系统评估机组的基础设计部分。在此基于标准 IECRE OD-501 和 IEC 61400-22 对基础的设计要求进行说明。根据认证标准 IEC 61400-22 的要求，机组的基础设计需要满足相关的 IEC 设计标准 IEC 61400-1、IEC 61400-2、IEC 61400-3 中的要求，其中 IEC 61400-1 为陆上风力发电机组的设计标准，IEC 61400-2 为小型风力发电机组的设计标准，IEC 61400-3 为旧版本的海上机组认证标准（目前也可作为设计标准被选用）。认证标准 IECRE OD-501 中要求，机组的基础设计同样需要满足相关的 IEC 设计标准（IEC 61400-1，IEC 61400-2，IEC 61400-3，IEC 61400-3-1，IEC 61400-3-2）的要求；标准 IEC 61400-3-1 和 IEC 61400-3-2 为新版的海上风力发电机组设计标准（从旧版本的标准 IEC 61400-3 升版而来），分别区分了固定式支撑结构基础和漂浮式支撑结构基础。

When the foundation of turbine has been considered in the type certification scope, the foundation design will be assessed by TÜV NORD according to the certification scheme chosen by the customer. Here, the design evaluation of foundation will be described according to the requirements of standard IECRE OD-501 and IEC 61400-22. According to the requirements of IEC 61400-22, the foundation design need to meet the design requirements of design standard IEC 61400-1, IEC 61400-2, IEC 61400-3. IEC 61400-1 is the standard for onshore wind turbine design, IEC 61400-2 is the standard for small wind turbine design, IEC 61400-3 (It can still be chosen as design standard) is the old standard for offshore wind turbine design. According to the requirements of standard IECRE OD-501, the foundation design of turbine also need to satisfy the requirements of relevant IEC standards (IEC 61400-1, IEC 61400-2, IEC 61400-3, IEC 61400-3-1, IEC 61400-3-2). The standards IEC 61400-3-1 and IEC 61400-3-2 is new version standards for offshore wind turbines, which are revised from the old version IEC 61400-3, the two standards are separately for the fixed offshore wind turbine and floating wind turbines.

基础设计通常需要考虑地质等因数，设计岩土工程和结构元素有利于使用设计规范。有几个不同的规范能够使用，每个国家通常都有自己的规范或标准。除了地质需要考虑之外，载荷、地震等因素对基础的影响。中国相关标准有：比如，风电场风电机组塔架地基基础设计 FD 003-2007(试行)、建筑地基基础设计规范 GB50007、岩土工程勘察规范 GB50021 等。

The geologic factor normally need to be considered for the foundation design, the design of geotechnical engineering and structural elements facilitates the use of design specifications. Several different specifications are available, and each country usually has its own specification or standards. There are some relevant standards in China, such as the design regulations on subgrade and foundation for Wind turbine generator system FD 003-

2007 (trial implementation), Code for design of building foundation GB50007-2011, Code for investigation of geotechnical engineering GB50021, ect.

欧洲的标准称为欧洲规范(Eurocodes), 除此规范外, 每个国家都有自己的国家附录, 其中包含适用于每个国家的具体参数值。

The European standards are known as Eurocodes. In addition to these codes, each country has its own national annex, which contains specific parameter values applicable to each country.

欧洲规范示例为:

Eurocodes as follows:

- Eurocode 0 — 结构设计基础 basis of structural design
- Eurocode 1 — 动作对结构的影响 influence of movement on structure influence of movement on structure
- Eurocode 2 — 混凝土结构设计 concrete structure design
- Eurocode 3 — 钢结构设计 steel structure design
- Eurocode 7 — 岩土工程设计 geotechnical engineering design
- Eurocode 8 — 抗震结构设计 seismic structural design

关于涉及欧洲规范的完整的 EN 和 BSEN 出版物, 参阅下列网址:

For complete EN and BSEN publications involving Eurocodes, see the following web sites:

http://www.eurocodes.co.uk/Complete_publication_schedule.aspx

另外, 关于海上机组的固定式基础设计, 标准 IEC 61400-3 和 IEC 61400-3-1、IEC 61400-3-2 中也给出了明确要求, 规定海上机组的基础应满足相关的 ISO 标准, 比如:

In addition, for the foundation design of fixed offshore wind turbine, the standards IEC 61400-3, IEC 61400-3-1, IEC 61400-3-2 give detailed requirements that the design requirements of relevant ISO standards shall be considered. For example,

- ISO 19900 石油和天然气工业--海上结构的一般要求 Petroleum and natural gas industries – General requirements for offshore structures
- ISO 19901-1 石油和天然气工业—海洋结构的特殊要求-第 1 部分: 海洋气象设计和操作条件 Petroleum and natural gas industries – Specific requirements for offshore structures – Part 1: Metocean design and operating conditions
- ISO 19901-4 石油和天然气工业—海洋结构的特殊要求-第 4 部分: 岩土工程和基础设计考虑 Petroleum and natural gas industries – Specific requirements for offshore structures – Part 4: Geotechnical and foundation design considerations
- ISO 19902 石油和天然气工业-海上固定钢结构 Petroleum and natural gas industries – Fixed steel offshore structures
- ISO 19903 时候和天然气工业-固定混凝土海上结构 Petroleum and natural gas industries – Fixed concrete offshore structures

关于海上机组的漂浮式基础设计, 在 IEC 61400-3-1 中列出的相关标准(以上标准)不适用, 不过标准 ISO 19901-4 和 ISO 19901-7 给出了相关锚定位置的保持系统的锚设计、场址、土壤和岩石特性的要求。在 IEC 61400-3-2 标准的附录 E 中, 明确了漂浮式风力发电机组的锚栓基础的设计的进一步特定指导要求。

For the foundation design of floating offshore wind turbine, the relevant standards which are listed in IEC 61400-3-1(above) are not applied. But Requirements related to anchor design and site, soil and rock characterization for the anchor locations of station-keeping systems are given in ISO 19901-4 and ISO 19901-7. And the annex E of IEC 61400-3-2 identifies sources of further specific guidance relating to the design of anchor foundation.

3.3.6 制造、运输、安装和维护 manufacturing, transportation, installation and maintenance

这一部分的设计验证的目的是验证可以根据设计文件中确定的任何要求制造、运输、安装和维护风机。

The purpose of this section of design verification is to verify the wind turbines can be manufactured, transported, installed and maintained according to requirements identified in the design document.

TÜV NORD 评定包含文件审核。所审核的文件包括规格、说明、手册和 TÜV NORD 可能要求的其他文件。

The evaluation of TÜV NORD contains documation evaluation. The documentation should include specifications, instructions, manuals and other documents that TÜV NORD may require.

最终手册将作为终极评估的一部分进行审核。

The final manual will be assessed as part of the final evaluation.

3.3.7 人员安全 personnel safety

TÜV NORD 将评估设计文件中的人员安全方面。评估将包含符合设计基础的文件中的如下方面，(参考 EN50308 构造、操作和维护用风机安全性要求)：

TÜV NORD will evaluate the personnel safety aspects in the design documentation. The evaluation will include the following aspects of the documentation that meet the design basis (refer to EN50308 as safety requirements of construction, operation and maintenance for wind turbines):

- 安全指南 Safety instructions
- 攀爬设施 climbing facilities
- 进出通道和通路 access ways and passages
- 站立区、平台和地板 standing places, platforms and floors
- 扶手和定点 hand rails and fixing points
- 照明 lighting
- 设备和照明系统 electrical and earthing system
- 耐火性 fire resistance
- 紧急停止按钮 emergency stop buttons
- 备选逃生通道的准备 provision of alternative escape routes
- 海上机组紧急停留一周时间的准备 provision for emergency stay in an offshore wind turbine for one week
- 海上风力发电机组的海上专用安全设备 offshore-specific safety equipment for an offshore wind turbine

TÜV NORD 评定包含文件审核。所审核文件通常包括规范、说明书和手册。最终手册将作为终极评估的一部分进行审核。

The evaluation of TÜV NORD contains documation evaluation. The documentation should include specifications, instructions and manuals. The final manual will be assessed as a part of the final evaluation.

3.4 制造评估：综述 manufacturing evaluation: General

制造评估的目的是确认风力发电机组设计评估中关键部件和关键生产工艺的要求在制造和组装过程中得到了实施。

The purpose of manufacturing evaluation is to confirm that the requirements of key components and key production processes for wind turbine in design evaluation are implemented during production and assembly.

根据标准 IECRE OD-501 和 IEC 61400-22 对风力发电机组的制造评估的要求，制造评估包括以下两个元素：

According to the requirements of manufacturing in standard IECRE OD-501 and IEC 61400-22, The manufacturing evaluation shall include the following two elements:

- 质量体系评估 Quality system evaluation
- 制造检查 Manufacturing inspection

制造商若获得 ISO9001:2015 质量管理体系认证证书可视为已通过质量管理体系评估，颁发该认证证书的机构须通过了权威认可机构的认可。若制造商的质量体系未经过所指定的 ISO9001:2015 认证，TÜV NORD 将根据 ISO9001:2015 对制造商的质量管理体系进行审核。主要的评估内容，可以参见标准 IECRE OD-501 的第 7.7.2 节和标准 IEC 61400-22 的第 8.7.2 节。

If the manufacturer obtains the ISO9001:2015 quality management system certification, it can be deemed that it has passed the quality management system assessment, and the organization that issues the certification must have the approval of the authoritative recognized institution. If the manufacturer's quality system has not been certified by the specified ISO9001:2015, TÜV NORD will assess manufacturer's quality system according to the ISO9001:2015. The main contents of the evaluation can be referred to section 7.7.2 of standard IECRE OD-501 and section 8.7.2 of standard IEC 61400-22.

TÜV NORD 将通过检验验证至少有一个有代表性的样品（风力发电机组关键部件）是根据已经认证过的设计而制造的，即其符合经过验证的设计图纸和设计规范。

TÜV NORD shall verify by inspection that at least one representative specimen (key components of wind turbines) is manufactured according to the design under certification, i.e. the manufacturing complies with the assessed design drawings and design specifications.

在对生产和组装中观测和实施的关键部件和关键制造过程进行评估时，TÜV NORD 将对所指定的要求进行验证。

TÜV NORD will validate the specified requirements during the inspection of key components and critical manufacturing processes observed and implemented during production and assembly.

根据标准 IECRE OD-501 和 IEC 61400-22 的要求，制造检验将包括但不限于以下：

According to the requirements of standards IECRE OD-501 and IEC 61400-22, manufacturing inspection will include but not be limited to:

- 核查详细的设计细节在车间得到了恰当的执行；
Verification that design specifications are properly implemented in workshop
- 车间说明书、采购规范、安装说明书；
Workshop instructions, purchase specifications and installation instructions
- 对相关制造车间进行评估；
Evaluation of manufacturer's workshop
- 确认组装方法、工艺及人员资格；
Verification of fabrication methods, procedures and qualifications of personnel
- 复核材质证书；
Review of material certificates
- 抽查采购的零部件，确认采购程序能有效实施；
Random checks on effectiveness of procedures for acceptance of purchased components
- 抽查组装工艺。Random checks of fabrication process

一般关键的零部件列出如下：

In general, the following components shall be considered for inspection:

- 风轮叶片；rotor blades
- 轮毂；rotor hub
- 主轴；rotor shaft
- 主轴轴承、变桨和偏航轴承（变桨和偏航驱动）；main, pitch and yaw bearings(pitch and yaw drives)
- 主轴承座；main bearing housings
- 齿轮箱；gear box
- 锁紧装置和机械刹车；locking devices and mechanical brake
- 发电机、变压器；generator, transformer
- 机舱底座、发电机底座；main frame, generator frame
- 塔架；tower
- 螺栓连接；bolted connections
- 轮毂与机舱装配。Hub and nacelle assembly

制造能力评估还应满足附录 C “工厂质量保证能力要求”，以进行工厂质量保证能力审查。

The manufacturing capability assessment shall also meet the requirements of annex C "factory quality assurance capability requirements" to conduct inspections of factory quality assurance capability.

如果一个关键部件是由多个部件制造商制造的，而且部件在规范或制造工艺方面有显著差异，应当考虑对所有不同的部件制造商进行检验。

If a critical component made by more than one component manufacturer, and the specifications and manufacturing processes of different component manufacturers have significant differences, the inspections for all the different component manufacturers should be considered.

3.6 制造用可选模块：基础制造评估 foundation manufacturing evaluation (optional)

当机组的基础部分被包含在机组的型式认证范围内，则 TÜV NORD 将对机组基础的设计、制造进行评估。根据标准 IECRE OD-501 和 IEC 6140-22，机组基础的制造评估的目的是评估是否特定机组的基础类型的制造与设计评估阶段验证的设计文档一致。该评估同样必须包含两个元素，与第 3.4 节要求相同。

When the foundation is included in a wind turbine type certification, the designing and manufacturing of foundation shall be assessed by TÜV NORD. According the standard IECRE OD-501 and IEC 61400-22, the purpose of manufacturing evaluation is to assess if a specific wind turbine foundation type is manufactured in conformity with the documentation design verified during the design evaluation. The evaluation also shall include two elements which has the same requirements with section 3.4.

假定机组基础的制造评估是建立在机组基础的制造商按照质量体系进行管理。该制造评估至少应对制造在该认证范围内的特定型号的代表性样品进行检验。详细的基础制造检验的要求，请参见标准 IECRE OD-501 的第 7.7.3 节和标准 IEC 61400-22 的第 8.7.3 节。

The manufacturing evaluation presupposes that the manufacturer of the foundation operates a quality system. It requires manufacturing of at least one representative specimen of the type under certification. The detailed foundation manufacturing inspection requirements which listed in section 7.7.3 of IECRE OD-501 and section 8.7.3 of IEC 61400-22 shall be considered.

对于海上风力发电机组，基础制造评估将包含基础与塔筒链接的支撑结构的制造评估。

For an offshore wind turbine, the foundation manufacturing evaluation shall include manufacturing evaluation of the sub-structure connecting the foundation to the tower.

3.7 型式试验：综述 Type testing: General

型式试验的目的是证明与电力生产相关的风力发电机性能，以及验证载荷计算和叶片设计。

The purpose of the type test is to demonstrate the performance of the wind turbine in relation to power generation, as well as to verify the load calculation and blade design.

根据标准 IECRE OD-501 和 IEC 6140-22，型式试验模块包含以下元素：

According to standard IECRE OD-501 and IEC 61400-22, the type test module contains the following elements:

- 安全及功能试验 Safety and function tests
- 功率特性测试 Load measurements
- 载荷测试 Power performance measurements
- 叶片测试 Blade tests
- 包括齿轮箱现场测试在内的其他测试(若机组有主齿轮箱) other tests including main gearbox field tests(if the main gearbox is part of wind turbine)

以上这些测试项的相关评估要求，请参见 IECRE OD-501 的第 7.4.2 节至第 7.4.7 节和 IEC 61400-22 的第 8.4.2 节至 8.4.6 节。以及，根据这两个标准的要求，相关测试应满足特定的测试标准。叶片测试应满足 IEC 61400-23 的测试要求；安全与功能试验和载荷测试应满足 IEC 61400-13 的有测试要求；功率特性测试应满足 IEC 61400-12-1 的要求；齿轮箱在样机上的测试应满足 IEC 61400-4 中列出的测试要求。

The detailed evaluation requirements for the above tests shall be implemented according to section 7.4.2 ~ section 7.4.7 of IECRE OD-501 and section 8.4.2~8.4.6 of IEC 61400-22. And the specific tests standards shall be followed for the relevant test according to the two standards. The IEC 61400-23 shall be considered for rotor blade tests, the IEC 61400-13 shall be considered for safety and function tests and load measurements, the IEC 61400-12-1 shall be considered for power performance measurements, and the requirements of gear box field tests listed in IEC 61400-4 shall be considered.

型式试验原则上应当由认可的测试机构承担，在实际的认证项目中，TÜV NORD 应对测试实验室按照内部的程序文件《HZ-WI-WE-001 风力发电机组及关键部件 外部实验室型式测试结果采信规定》进行评估，确保测试机构有能力满足认证产品的测试要求后，对测试机构的测试结果进行采信。

The type test shall be carried out by a testing laboratory which has been accredited by accreditation bodies in principle, whileas in the actual type certification project, TÜV NORD shall assess the test laboratory according to the internal procedure “HZ-WI-WE-001 The acceptance rules of type testing results from external type testing labs for wind turbines and main components” to verify the capability of test laboratory, which can meet the measurement requirements of the certification products, and then the test report and results can be accepted.

3.8 性能测试(可选): 综述 Type characteristics measurements(optional): general

性能测试组成了型式认证系统中的一个可选模块。

The performance test constitutes an optional module in the type certification scheme.

根据标准 IECRE OD-501 和 IEC 6140-22, 性能测试包含下列元素:

The performance test contains the following elements:

- 电能质量测试 Power quality test
- 低电压穿越 Low voltage ride through tests
- 噪声测试 Acoustic noise measurement

性能测试应当由认可的测试机构承担。TÜV NORD 将应对测试实验室按照内部的程序文件《HZ-WI-WE-001 风力发电机组及关键部件 外部实验室型式测试结果采信规定》进行评估, 确保测试机构有能力满足认证产品的测试要求后, 对测试机构的测试结果进行采信。

The type characteristics measurements shall be carried out by an accredited testing institution. TÜV NORD shall assess the test laboratory according to the internal procedure “HZ-WI-WE-001 The acceptance rules of type testing results from external type testing labs for wind turbines and main components” to verify the capability of test laboratory, which can meet the measurement requirements of the certification products, and then the test report and results can be accepted.

根据 IECRE OD-501 和 IEC 61400-22 对性能测试的要求, 这些性能测试应考虑相关的 IEC 61400 系列的测试要求, 以及该机组能满足安装的地区的相关法律法规要求。电能质量测试和低电压穿越能考虑 IEC 61400-21 的测试要求; 噪声测试能考虑 IEC 61400-11 的测量要求。

According to the requirements of type characteristics in IECRE OD-501 and IEC 61400-22, these tests may also follow relevant IEC 61400 series standards and the local guideline and regulations which the turbines will be installed. The IEC 61400-21 may be considered for power quality tests and low voltage ride through tests, the IEC 61400-21 shall be considered for acoustic noise measurement.

3.9 型式证书最终评估和发布: 综述 Final evaluation and release of type certificate: General

最终评估的目的是为型式认证涉及的各项内容做出结论的书面证据。

The purpose of the final evaluation is to provide written evidence for the conclusion of the type certification.

最终评估模块对强制性模块和所选可选模块进行概述。它还将解决设计文件是否完整以及型式试验结果是否符合相关设计假设的问题。还将对包括图纸、规范和手册在内的最终风机文件进行审核, 以确定其是否符合制造评估和设计计算及假设。

The final evaluation module provides an overview of mandatory and optional modules. It will also identify whether the design documentation is complete and whether the type test results meet the relevant design assumptions. The final wind turbine documentation, including drawings, specifications and manuals, will also be reviewed to determine whether it conforms to the manufacturing evaluation and design calculations and assumptions.

若已实现满意的评估结果, 将发布最终评估报告。

If satisfactory evaluation results have been achieved, a final evaluation report will be issued.

最终评估报告将包含所有辅助性产品文件的参考文献列表。它将包含一份关于详细文件是否完整的评估。它还将包含关于型式试验结果是否与设计文件中所有相关要求一致的评估。

The final evaluation report will contain a list of references for all supporting product documentation. It will contain an assessment of the completeness of the detailed documentation. It will also include an assessment of whether the type test results are consistent with all relevant requirements in the design document.

型式证书的发布基于满意的最终评估。将按照选定用于认证的型式认证系统发布型式证书, 证书有效期为 5 年(除非另有规定), 且适用于已完成模块用一致性声明证书:

The issuance of the type certificate is based on a satisfactory final assessment. A type certificate will be issued in accordance with the selected type certification scheme for certification with a validity period of 5 years (unless otherwise specified) and applicable to issue the conformity statements of the completed modules:

- 设计基础评估 Design basis evaluation
- 设计评估 Design evaluation

- 制造评估 Manufacturing evaluation
- 型式试验 Type testing
- 性能测试（可选） Type characteristics measurements(optional)
- 基础设计评估（可选） Foundation design evaluation(optional)
- 基础制造评估（可选） Foundation manufacturing evaluation(optional)

3.10 型式证书的维护：有效期 **Type certificate maintenance: period of validity**

风机型式证书的有效期通常为 5 年，除非规范或当局另有规定。

The period of validity of the type certificate is usually 5 years, unless otherwise specified by the specification or the authority.

对于制造商/认证申请人的义务，认证申请人应根据 ISO 9001:2015 认证体系的要求采取合适的措施，解决申诉以及妨碍符合型式认证要求的缺陷。认证申请人应记录与风机符合型式认证所使用的标准和要求有关的所有申诉。TÜV NORD 和根据 ISO 9001:2015 对制造商的质量体系进行认证的认证机构应可以使用这些记录以及采取的行动记录。

For the manufacturer/certification applicant's obligations, the certification applicant shall take appropriate action in accordance with the requirements of the ISO 9001:2015 certification system to address complaints and defects that prevent compliance with the type certification requirements. The applicant shall record all complaints relating to the wind turbine's compliance with the standards and requirements used for type approval. These records and records of actions taken shall be available to TÜV NORD and certification bodies certifying the manufacturer's quality system under ISO 9001:2015.

这些记录和所采取措施的报告以及对设计进行细微修改的报告应提交至 TÜV NORD，每年至少提交一次。

These records and reports of measures taken and minor modifications to the design shall be submitted to TÜV NORD at least once a year.

关于对设计、程序、规范和其他文件进行重大修改的提议应立即连同这些修改所影响的所有文件一起进行报告，从而维持和扩展型式证书。在型式证书有效期内对从每种型号的风机中随机选出的样本进行研究，目的在于验证制造商设计程序、与设计程序相关的维护和实施，以及最初由 TÜV NORD 批准的设计参数。对于选出进行检查的风机，证书申请人应提供使用途径。

Proposals for significant changes to the design, procedures, specifications and other documents should be reported immediately together with all documents affected by these changes in order to maintain and extend the type certificate. A random sample of each type of wind turbine is studied during the validity period of the type certificate to validate the manufacturer's design program, the maintenance and implementation associated with the design program, and the design parameters initially approved by TÜV NORD. The applicant for the certificate shall provide access to the wind turbine selected for inspection.

一旦证书持有者获知安装的已经型式认证的风机发生任何安全相关事故或故障，其应将事故或故障呈报给 TÜV NORD。对于此种重大事故或故障，TÜV NORD 可能会要求证书持有者对事故或故障进行根源分析并采取纠正措施；TÜV NORD 会对证书持证人提交的根源分析和纠正措施进行评估以确保型式证书可以维持其有效性。

Once the certificate holder is informed of any safety-related accident or failure of the installed type certified wind turbine, the certificate holder shall report the accident or failure, root-cause analyse and correction actions to TÜV NORD; TÜV NORD shall do the evaluation for the root-cause analysis and correction actions to verify the validity of type certificate can be maintained.

根据事故或故障评估，以及纠正措施的评估（如相关），TÜV NORD 将决定是否暂停型式证书，直到实施了满意的纠正措施。暂停代表风机不得按照被暂停的型式证书发布广告、销售、制造或安装。型式证书暂停的最大期限为一年，只要证书申请人的纠正措施计划得到 TÜV NORD 的批准。

TÜV NORD will decide whether to suspend the type certificate until satisfactory corrective action has been taken based on the accident or failure assessment and the assessment of corrective action (if relevant). The suspended representative shall not advertise, sell, manufacture or install the fan according to the suspended type certificate. The maximum period for type certificate suspension is one year, as long as the certificate applicant's corrective action plan is approved by TÜV NORD.

如果未能采取满意的纠正措施，所涉及的型式证书将被撤回，签发该型式证书的认证机构也将随后得到通知。

If no satisfactory corrective action is taken, the type certificate concerned will be withdrawn and the certification authority issuing the type certificate will be subsequently notified.

在撤回或暂停的情况下，由 TÜV NORD 签发的认证文件须应要求归还 TÜV NORD。

In the event of revocation or suspension, the certification document issued by TÜV NORD shall be returned to TÜV NORD upon request.

3.11 修改和重新认证 Modification and recertification

在对签发了型式证书的风机进行修改的情况下，只有当修改完全不改变或影响主要特性，或者修改对主要特性的改变或影响处于适用的设计规范或标准允许的范围内，才允许对风机进行修改。当机型的变更在这些允许的范围内，整机厂商还是需要报备更换证书。

In the case of modification to a wind turbine for which a type certificate has been issued, modification to the wind turbine shall be permitted only if the modification does not change or affect the main characteristics at all, or if the modification is within the scope permitted by the applicable design specification or standard. When the change of model is within the allowed range, the manufacturer of the wind turbine manufacture still needs to report the replacement certificate.

根据上述内容，以下任何修改需要对机组进行新的补充设计评估，可能还需要进行新的型式测试，并更新新的型式证书。若修改未超过如下范围可以不重新进行型式测试，但是需要更新的型式证书：

According to the above, any modification listed in the bellowing is exceeded, a new supplement design evaluation and type testing shall be done for the turbine type certification, and the type certificate will be revised. If the modification in the bellowing is not exceeded, the new type testing can be omitted, but the revised type certificate is required:

- 转子直径的变化大于 2% a change in rotor diameter of more than 2%
- 转子转速的变化大于 2% a change in rotor rotational speed of more than 2%
- 安全系统的设计不同 a different design of the safety system
- 限制功率输出的方式不同 a different way of limiting the power output
- 改变了叶片翼型 modified blade profiles
- 修改导致载荷谱大幅增加 modifications which lead to a significant increase in the load spectrum
- 功率输出的增加超过 5% increase of the power output by more than 5%
- 对风机设计进行了重大变更 major changes to the wind turbine design.

在适用标准要求或 TÜV NORD 认为有必要的情况下，重大变更可能会导致需要重新认证。

Significant changes may result in the need for recertification if applicable standard requirements or if TÜV NORD deems necessary.

在证书的有效期内，如果国家当局或适用的设计规范或标准设置了有关型式证书的其他要求，TÜV NORD 可以要求重新认证。

Within the validity period of the certificate, if the national authority or the applicable design specification or standard sets other requirements for the type certificate, TÜV NORD can request recertification.

如果未能遵守型式证书条件，TÜV NORD 将要求证书持有者在规定的时间内采取措施纠正不符合的情况。

If the type certificate condition is not complied with by the certification holder, TÜV NORD will require the certificate holder to take actions to rectify the non-conformity within the specified time.

如果未能采取满意的纠正措施，所涉及的型式证书将被撤回，签发该型式证书的认证机构也将随后得到通知。

If no satisfactory corrective action is taken, the type certificate concerned will be withdrawn and the certification authority issuing the type certificate will be subsequently notified.

在撤回或暂停的情况下，由 TÜV NORD 签发的认证文件须按照 TÜV NORD 要求进行归还。

In the event of revocation or suspension, the certification document issued by TÜV NORD shall be returned upon TÜV NORD's request.

在型式证书有效期内，对一项参考标准以及其他新兴产业知识的重大修改将需要由 TÜV NORD 进行评估。如果经判断一项修订对于经过认证的风机完整性和完全性有影响，为保持其证书类型，将不得不对风机进行修改和/或重新评估。TÜV NORD 将为每种单独的情况确定用于实施新版本的过渡期和指导。

Significant changes to a reference standard and other emerging industry knowledge will be assessed by TÜV NORD during the validity period of the type certificate. If it is judged that a revision has an impact on the integrity

and completeness of a certified wind turbine, the wind turbine will have to be modified and/or reassessed in order to maintain its certificate type. TÜV NORD will determine the transition period and guidance for implementing the new version for each individual case.

3.12 使用型式证书的原则：综述 Principle of using type certificate: general

型式证书的使用不得给 TÜV NORD 带来不良名声。此外，不允许出现有关型式证书的误导性或未经授权的声明。

The use of type certificates should not bring TÜV NORD a bad reputation. In addition, misleading or unauthorized statements regarding type certificates are not allowed.

型式证书在 TÜV NORD 认证规程附录 A 中有所确定，或是在 TÜV NORD 条款和条件中有所确定，只有用于经过型式认证的产品或作为其参考。型式认证的使用不得带来误导，或是给人留下一一种型式证书包含的不是经过型式认证的产品而是其他产品的印象。

Type certificates are identified in annex A of the TÜV NORD certification procedures or in the TÜV NORD terms and conditions and are used only for type certified products or for reference. The use of type certification should not mislead or give the impression that a type certificate contains not a type certified product but other products.

当型式证书用于宣传册、信件和其他印刷材料时，必须声明经过型式认证的产品所引用的明确的参考文件。When the type certificate is used in brochures, letters and other printed materials, it must state the specific reference document cited by the type certified product.

附录 A：设计文档要求

Annex A: design documentation requirements

这部分内容是基于认证标准 IECRE OD-501 或 IEC 61400-22 进行设计评估时，认证申请人需要准备的风力发电机组的相关设计文档及其要求。

This part is about the requirements and documentations for wind turbine design which the certification applicant need to prepare for the certification scheme of IECRE OD-501 or IEC 61400-22.

A.1. 设计基础文档 design basis documentation

设计基础需要确定所有的要求、假定和方法，这些对于设计和设计文档而言是至关重要的，至少应包括：

A design basis shall identify all requirements, assumptions, and methodologies that are essential to the design and design documentation, including:

- 规范和标准；
codes and standards;
- 设计参数，假定，方法和原理，以及；
design parameters, assumptions, methods and principles, and
- 其他要求，例如：制造、运输、安装和试运行，以及操作和维修；
other requirements, such as: manufacture, transportation, installation and commissioning, as well as operation and maintenance.

与设计有关的一些方案、补充信息和差异，应清晰地设计基础中，予以说明，例如：

The choices, supplementary information and deviations relating to the design issues shall be clearly stated in the design basis, e.g. for:

- 外部设计参数；
external design parameters
- 设计载荷工况；
design load cases
- 载荷因数以及载荷降低因数；
load factor and load reduction factor
- 载荷、材料的局部安全系数；
local safety factor applied on loads and material
- 耐久性仿真说明以及数量；
durability of simulation as well as number of simulations
- 极限和疲劳设计载荷/响应分析的方法；
ultimate and fatigue design load/response analysis methods
- 安装有关的环境条件；
environmental conditions related to installation
- 检查范围和频率；
inspection scope and frequency;

- 部件、系统和结构的预期寿命，以及
target lifetime of components, systems and structures, and
- 环境监控系统的要求。
requirements for condition monitoring systems.

■ 需要提交的设计文档、资料

Design documents and materials shall be submitted

	尺寸图纸 Drawings geometric data	描述 Description	规格说明 Specifications	图表 Schematics
风机的特性，配置和布局 General turbine characteristics, configurations and layout		√		√
风机的描述和总体规格 Turbine description and general specifications	√	√	√	
主要部件的重量和重心位置 Major component weights and centres of gravity			√	
运行的限制值 Operational limits			√	
电气功率系统 Electrical power system		√		√
外部条件 and 设计等级 External conditions and design class		√		
所采用的规范和标准 Codes and standards		√		
选用的坐标轴系 Co-ordinate systems	√	√		

A.2. 设计控制审核 Design control evaluation

审核控制设计流程的质量管理程序。设计控制体系应该要求：

Review the quality management procedures of the control design process. The design control system shall require:

- 遵循 ISO 9001；comply with ISO 9001
- 包括文件控制，以便让所有方面都清楚每份文件的修订状态。
include control of documents such that the revision status of every document is clear to all parties.

■ 需要提交的设计文档、资料

Required Design documents and materials

	尺寸图纸 Drawings geometric data	描述 Description	规格说明 Specifications	图表 Schematics
符合 ISO 9001 的文档描述和组织说明 Document description and organization in compliance with ISO 9001		√		

A.3. 设计文档 design documentations

设计文档主要包括：

HZ-WI-215(R04)

The design documentation mainly includes:

- 1) 控制及保护系统; control and protection system
- 2) 载荷及载荷工况; loads and load cases
- 3) 风轮叶片; rotor blades
- 4) 机械及结构部件; machinery structures and structural components
- 5) 电气部件; electrical components
- 6) 外罩; housings
- 7) 基础设计要求 (可选); foundation design requirements(optional)
- 8) 制造步骤; manufacturing process
- 9) 运输步骤; transportation process
- 10) 安装步骤; installation process
- 11) 运行及维护步骤; maintenance process
- 12) 人员安全。 personnel safety

所需要提供的资料请见下面章节 (注: 不适用的可不填)

The required documentation is shown in the next sections (note: if the item is not applicable the information may not be filled in)

A.3.1. 控制和保护系统评估 control and protection systems

需要提供: 控制和安全保护系统的功能描述, 安装, 操作和维护说明书; 电控系统的主电路图和控制系统电路图, 以供评估。需提交的资料请见下方表格所勾选项:

Need to provide for evaluation: control and safety protection system function description, installation, operation and maintenance manual; Main circuit diagram and control circuit diagram of electronic control system. The required documentation which has been marked with tick can be found in bellowing table.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specificati ons	数据表格 Data sheet	图表 Schematic s
详细的控制逻辑流程表 Detailed control logic flow chart						√
控制和保护原理 Control and protection philosophy			√			
运行模式 Modes of operation			√			
控制系统软件 Control system software			√	√		√
软件的发行和版本控制 Software release and version control			√			
设置点清单 Set point list				√		
	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specificati ons	数据表格 Data sheet	图表 Schematic s
远程控制和监控 Remote contol/monitoring			√	√		√

保护系统的逻辑 Protection system logic				√		√
电气控制系统（结构，启动和停机程序） Electrical control system(structure, starting and stopping procedures)			√			√
失效分析 Fault analysis		√	√			
保护系统的结构 Structure of protection system	√		√			√
安全设计理念描述，零部件的规格说明，包括各互感器和传感器（设定，时间常数，...） Description of safety concept and component specifications including transducers and sensors(settings, time constants...)			√	√		
制动系统（结构，时间常数，制动扭力曲线） Braking system(structure, time constants, characteristics, braking torque curve...)	√	√	√	√		√
制动系统（结构，时间常数，制动扭力曲线） Braking system(structure, time constants, characteristics, braking torque curve...)	√	√	√	√		√
电气图和液压图 Electrical and hydraulic circuit diagrams			√			√
环境监控 Condition monitoring			√	√	√	√
安全手册 Safety instructions			√			
超速监测 Overspeed sensing				√		√
过载/过电流监测 Overpower/current sensing				√		√
振动监测 Vibration sensing				√		√
紧急停车 Emergency stop button			√			√
风场控制系统的监控（功率输出的远程控制，变桨/偏航控制参数） Supervisory wind farm control system(remote control of power output, pitch/yaw control parameters...)			√			
测试计划 Test plan			√			

A.3.2. 载荷和载荷工况 loads and load cases

载荷描述必须按照能够让认证机构进行独立分析的格式提供。提交载荷描述时，还必须提交载荷工况的描述，计算模型的描述，以及输入数据，比如：

Description of loads shall be provided in a format that enables the certification body to carry out independent analysis. The load values submitted shall be accompanied by the load case description, description of calculation models and input data such as:

– 气动相关的参数值

Parameter values relating to aerodynamics

– 结构特征值

Structural characteristics

– 控制系统相关的参数值

Parameter values relating to the control system

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics	测试数据 Test data
一般要求 general							
风场配置表 Wind farm configuration chart	√					√	
场地数据（例如：环境，动态粘度，空气密度，土壤等） Site data(e.g. enbironmental and marine conditions, dynamic viscosity, air density, salinity, soil...)		√	√				
所有结构部件的质量分布，刚度，固有频率和阻尼系数（例如：转子，叶片，传动链，支撑结构,...） Mass distribution, stiffness natural frequencies and damping factors for all structural components(rotor, blade, drive train, support structure...)		√		√			
切入 / 切出 / 额定风速 Cut in/cut off/rated wind speed				√			
转子 / 发电机转速 Rotor/generator speeds				√			
机械 / 电气损耗 Mechanical/electrical losses				√			
发电机数据（额定功率，同步转速，相关时间常数等） Generator data(rated power, synchronous speed, nominal/maximum slip, relevant time constants)					√		
机舱 / 叶片数据（质量，尺寸，重心等） Nacelle/rotor data(mass, dimensions, centre of gravity, etc.)	√	√		√			

总体分析方法（例如，采用的坐标系） General analysis approach(e.g. co-ordinate system used)	√	√	√				
系统动态模型描述 System dynamics model description							
自由度 Degrees of freedom			√			√	
质量和刚度分布 Mass and stiffness distributions				√			
气动特性数据（翼型，叶片几何形状，升力系数，阻力系数，...） Aerodynamic inputs(airfoil tables, blade geometry, lift and drag coefficients...)		√		√		√	
局部安全系数 Partial safety factors		√		√			
	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematic s	测试数据 Test data
计算模型的验证 Validation of calculation models							
分析 Analytical		√					
同测量数据比较 Comparison with test data		√					√
系统和各主要部件的动态响应 Dynamic behaviour of the system and of individual major components							
Campbell 图 Campbell diagrams		√				√	
频谱 / 频率图 Spectral/frequency plots		√					√
模态振型和频率 Mode shapes and frequencies		√					
预测和测量的比较 Comparisons between predictions and measurements		√					√
载荷工况 Load cases							
不同截面的疲劳载荷（塔架截面，主轴/轮毂，叶片根部，叶片截面） Fatigue loads for several turbine sections(tower sections, main shaft/hub, blade root, blade sections)		√					
不同截面的极限载荷（塔架截面，主轴/轮毂，叶片根部，叶片截面） Ultimate loads for several turbine sections(tower		√					

sections, main shaft/hub, blade root, blade sections)							
传动链和叶片截面载荷的马尔可夫矩阵 Markov matrices for drive train and blade section loads		√					
传动链和变桨轴承载荷的载荷分布谱(LDD) Load duration distribution spectra(LDD) for drive train and pitch bearing loads		√					
塔底载荷 Tower bottom loads		√					
最大叶片挠度分析 Maximum blade deflection analysis		√					
临界挠度（叶片/塔架间） Critical deflection (blade/tower)		√					
失效模式 Failure modes		√					
风机控制器（例如：电路原理框图，输入和输出信号，等） Turbine controller(e.g. block circuit diagram, input and output signals, etc.)			√			√	

A.3.3. 风轮叶片评估 rotor blades

风轮叶片的设计文档正常情况下由说明书、描述、图纸和设计计算组成，其中还可以包含测量/试验报告，图表和部件清单。文档必须清楚地指明设计基准并确认设计的依据。

The design documentation for a rotor blade normally consists of specifications, description, drawings and design calculations. It may also contain measurement/test reports, diagrams and parts lists. The documentation shall clearly identify the design baseline and confirm the basis for the design.

文档需要包含足够的信息，用以设计评估，例如：

The design documentation shall contain sufficient information for the evaluation, such as:

- 规范、标准和参考资料； Codes, standards and references
- 设计载荷和相应的外部条件； Design loads and relevant external conditions
- 静力系统和边界条件； Influence of adjacent structures and components
- 邻近结构和部件的影响； Influence of adjacent structures and components
- 材料和许用应力； Influence of adjacent structures and components
- 材料和子部件的测试程序； Influence of adjacent structures and components
- 全尺寸叶片测试流程； Influence of adjacent structures and components
- 制造流程； Materials and permissible stresses
- 公差对设计的影响； 以及 Tolerances influencing the design; and
- 质量控制程序和级别。 Quality control procedures and levels

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	测试数据 Test data
结构图 Structure	√		√	√	
叶片连接 Blade connection		√		√	
所用材料的数据（纤维，树脂，泡沫塑料） Data of materials used (fibres, resins, foam, etc.)				√	
几何数据 Geometric data	√			√	√
极端应力分析 Extreme stress analysis		√			
疲劳应力分析 Fatigue stress analysis		√			
模态分析 Modal analysis		√			
稳定性应力分析 Stability stress analysis		√			
生产程序 Production sequence	√			√	
叶片根部 Root	√	√			
叶片/轮毂连接 Blade/hub connection	√	√			
气动制动器 Aerodynamic brake mechanism	√	√		√	
材料和叶片测试 Material and blade tests		√			√

A.3.4. 机械和结构部件评估 Machine and structural components

审核所有承载机械结构和部件的设计，例如：

The certification body shall evaluate the design of all load-bearing machinery structures and components of the wind turbine, such as:

– 铸件（如轮毂）、锻件和焊接结构（如机舱底座）；

Casted, forged or welded structures

– 机舱支架；

Nacelle frame

– 塔架；

Tower

– 变桨和偏航系统；

Pitch and yaw systems

– 轴承和弹性衬套；

Bearings and elastomer bushings

– 齿轮箱；

Gearboxes

- 制动、联轴器和锁定装置；
Brakes, couplings and locking devices
- 连接这些结构和部件的螺栓；
Bolts for connecting these structures and components
- 冷却系统和加热系统；
Cooling and heating systems; and
- 液压系统
Hydraulic systems

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics	测试数据 Test data
一般要求 General							
装配图 Assembly drawings	√		√				
材料数据 Material data		√		√			√
传动装置和传动链 (包括发电机, 制动 和联轴器, 传动比, 惯量) Gearing and drive train(including generator, brake and couplings, ratio, inertia)		√		√			
传动链动态特性 Drive train dynamics	√	√	√	√	√	√	
液压系统 Hydraulic system		√	√	√	√	√	
变桨系统: Pitch system							
驱动 Drive	√	√		√	√	√	
电源 Power supply	√	√		√			
轴承 Bearings	√	√		√			
变桨锁定装置 Pitch lock	√	√		√			
连接处 Connections	√	√		√			
	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics	测试数据 Test data
轮毂: Hub							
结构 Structure	√	√		√			
Teeter 系统 Teeter system	√	√		√			

变桨系统（包括电源） Pitch system(including power supply)	√	√		√	√		
轮毂/低速轴连接 Hub/low speed shaft connection	√	√		√			
低速轴 Low speed shaft							
主轴 Main shaft	√	√		√			
主轴承 Main bearing	√	√		√			
轴承座 Bearing housing	√	√		√			
转子锁定装置 Rotor lock	√	√		√			
低速轴联结装置 Coupling		√		√			
轴承润滑 Bearing lubricants				√	√		
齿轮箱： Gear box							
齿轮箱 Gear box	√	√		√			√
扭矩支撑结构 Torsion support	√	√		√			
与主机架、轴承连接处 Connections to main frame, bearings	√	√		√	√		
冷却系统和加热系统 Cooling and heating systems	√	√		√	√		√
高速轴： High speed shaft							
机械刹车 Mechanical brake	√	√		√			
高速轴联轴器 Coupling	√	√		√			
机架： Frame							
主机架 Main frame	√	√		√			
	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics	测试数据 Test data
发电机机架 Generator frame	√	√		√			
与主机架连接处以及主机架与发电机机架连接处 Connections main frame and main frame to generator frame	√	√		√			

偏航系统: Yaw system							
驱动 Drive		√					
轴承 Bearings	√	√		√			
偏航锁定装置 Yaw lock	√	√		√			
连接处 Connections	√	√		√			
塔架: Tower							
结构 Structure	√	√		√			
连接处 Connections	√	√					
塔架（包括机组） 动力学分析 Dynamic analysis of the tower(with turbine)		√					
地震分析 Earthquake analysis		√					
焊缝以及螺栓连接的 极限分析和疲劳分析 Extreme and fatigue analysis for welded and bolted connections of the tower		√					
门框架和其他开口区 域的有限元分析 Finite-element- analysis of door frame and other openings	√	√					
防腐系统 Corrosion protection system				√			
电缆缠绕 Cable twist			√	√		√	
电缆悬挂 Cable suspension	√			√			
楼梯，平台，电梯 Ladders, platforms, elevators	√	√		√			

A.3.5. 电气部件的评估 electrical components

审核所有电气部件的设计，例如：

The certification body shall evaluate the design of all electrical components of the wind turbines, such as:

- 发电机；Generators
- 变压器；Transformers
- 逆变器；Converters

- 充电设备和储能蓄电池；Charging equipment and storage batteries
- 开关和保护装置；Switchgear and protection equipment
- 电缆和电气安装设备；以及 Cables/bus bars and electrical installation equipment

■ 需要提交的文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics	测试数 据 Test data
一般要求 General							
单线图（带有安全设备的基本电力线路） Single line diagram(basic power circuit with safety devices)						√	
电气部件的技术参数（例如 发电机，...） Character parameters of electrical components(positioning drives, generator...)			√	√			
各种电气部件的功能描述和维护手册 Functional descriptions and maintenance instructions			√				
电力图 Power circuit schematic	√					√	
短路和过电流保护装置的数值 Data of short-circuit and overcurrent protection gear						√	
系统电路图，包括辅助电路 Electrical systems diagrams(incl. auxiliary circuits like cranes, lifts, etc.)	√		√	√		√	
	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics	测试数 据 Test data
零部件清单（包含传感器，开关等重要的电气设备） Part lists(incl. sensors, switches and all important electrical appliances)						√	
应急电源系统、火警系统	√		√			√	

Emergency power system and fire alarm system							
充电设备和储能蓄电池 Charging equipment and storage batteries			√	√	√	√	
电气测量设备的概括 Summary of electrical measuring equipment	√		√			√	
根据 IEC 60034-1 的例行测试纪录 Records of routine test according to IEC 60034-1			√	√			√
逆变器 Power converter	√			√		√	
电缆 High voltage cable	√		√		√		
发电机 Generator			√	√		√	√
电气连接 Connections to generator frame	√	√		√			
发电机轴承 Generator bearings	√	√		√			
冷却系统 Cooling system			√				
电容 Capacitors			√		√		
高电压分断装置 High voltage disconnection device	√		√		√	√	
低电压分断装置 Low voltage disconnection device	√		√		√	√	
中压变压器 Medium voltage transformer	√		√	√		√	
变压器应满足 IEC 60076-1 的型式试验纪录 Type test records of the transformer as per IEC 60076-1			√				√
接地和防雷（包括防雷区，避雷针和导体，接地体，连接到独立建筑等） Earthing and lightning protection(incl. lightning protection zones, lightning rods and conductors, earth electrodes, location of bonding bars, connection to separate buildings)	√		√	√		√	

A.3.6. 外罩的评估 Housings

审核所有外罩的设计，例如：

The certification body shall evaluate the design of all housings, such as:

- 整流罩；和 Spinners, and
- 机舱罩； Nacelle covers

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	规格说明 Specifications	图表 Schematics	测试数据 Test data
整流罩和机舱罩 Spinner and nacelle cover	√	√	√		
外壳（材料，设计细节，总体图） Enclosure(materials, design details, general view, etc.)	√	√	√		√
极端分析（钢结构，螺栓和纤维增强塑料） Extreme analysis(for steel parts, bolts and fibre reinforced plastics, etc.)		√			

A.3.7. 塔基设计要求 foundation

应该依据在适合于基础安装在现场中有代表性的土壤条件来评估基础的抗力和柔性，这些土壤条件应该在基础设计文档中给出。

The resistance and flexibility of the foundation shall be evaluated on the basis of representative soil conditions at the site suitable for foundation installation, which shall be given in the basic design document.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	图表 Schematics
结构 Structure	√			√	
设计参数 Design parameters			√	√	
材料 Materials			√	√	
加强部位设计的详细说明 Derailed presentation of the reinforcement plan	√		√		√
加强（钢的种类，直径，形状，钢筋束的数量和位置） Reinforcement(type of steel: diameter, shape, number and position of bars)	√		√	√	

塔架和基础连接（预埋钢筋或者地脚螺栓） Analysis of tower to foundation joint(embedded steel or anchor bolts)	√				
建造，运输和安装 Construction, transport and installation			√		

A.3.8. 制造步骤 manufacturing process

核实风电机组能够按照设计文档上面的质量要求，被制造出来。与质量相关的制造工艺，需要描述。

Verify that wind turbines can be manufactured according to the quality requirements specified in the design document. Manufacturing processes related to quality need to be described.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics
采购规范 Purchase specifications				√		
制造规范 Manufacturing specifications				√		
工作指导书 Work instructions	√		√			√
质量控制程序 Quality control procedures				√	√	
制造手册 Manufacturing manual	√		√	√	√	√

A.3.9. 运输步骤 transportation process

核实风电机组能够按照设计文档上面的要求，被运输。

Verify that wind turbines can be transported in accordance with the requirements of the design document above.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics
技术规范 Technical specifications				√		
限制环境条件 Limited environmental conditions			√	√		
工作指导书 Work instructions	√		√			√
质量控制程序 Quality control procedures				√	√	

运输手册 Transportation manual	√		√	√	√	√
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A.3.10. 安装工艺 installation process

核实风电机组设计是否周到，考虑到特殊安装程序和试运行。

Verify whether the wind turbine design is thorough, taking into account special installation procedures and commissioning.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics
安装规范 Installation specifications				√		
工作指导书 Work instructions	√		√			√
质量控制程序 Quality control procedures				√	√	
安装手册 Installation manual	√		√	√	√	√

A.3.11. 维护工艺 maintenance process

核实风电机组设计是否周到，考虑到特殊维护程序。

Verify whether the wind turbine design is thorough, taking into account special maintenance procedures.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics
工作指导书 Work instructions	√		√			√
质量控制程序 Quality control procedures				√	√	
维护手册 Maintenance manual	√		√	√	√	√

A.3.12. 人员安全 personnel safety

审核设计文档（图纸，规格和说明）中的人员安全方面，是否符合设计标准及附加的规范和标准。

Review design documents (drawings, specifications and instructions) for personnel safety, compliance with design standards and additional specifications and standards.

■ 需要提交的设计文档、资料

Required Design documents and materials

	图纸 Drawings geometric data	分析计算 Analysis calculations	描述 Description	规格说明 Specifications	数据表格 Data sheet	图表 Schematics
安全手册 Safety instructions			√	√		√
爬塔设施, 进出口, 通道, 平台, 楼层, 扶手, 固定点 Climbing facilities, access ways, passages, platforms, floors, hand rails, fix points	√	√	√	√		
照明 Lighting			√	√	√	
防止火灾 Fire resistance			√	√	√	
紧急撤离路线 Alternative escape routes			√	√		√

附件 B：型式认证证书样本

Annex B: Sample of type certification certificate



型式认证证书

注册号

SHW XXXXXXX-XX-TC-GB, Rev. 0

该符合声明颁发给

公司
街道
邮编
国家

风力发电机组

(风力发电机组名称)

风力发电机组等级

IIA (补充信息, 如风力发电机组设计等级为S)

该证书证实相关的设计、测试和制造与下面引用的标准相符, 该证书是以下面的参考文献为依据:

SHW XXXXXXX-XX-D-GB, Rev. 0

风力发电机组的设计符合声明“风力发电机组制造商和机型名称, 例如, XXX XX120/2500”, TÜV NORD(HANGZHOU), 日期 20yy-mm-ss

SHW XXXXXXX-XX-M-GB, Rev. 5

风力发电机组的制造符合声明“风力发电机组制造商和机型名称” TÜV NORD(HANGZHOU), 日期 20yy-mm-ss

SHW XXXXXXX-XX-T-GB, Rev. 0

风力发电机组的型式测试符合声明“风力发电机组制造商和机型名称” TÜV NORD(HANGZHOU), 日期 20yy-mm-ss

12345677, Rev.0

“部件, 名称”, “部件认证机构”的部件证书, 日期 20yy-mm-dd, 有效期至 20yy-mm-ss

SHW XXXXXXX-XX -20 E, Rev. 0

最终评估报告, TÜV NORD(HANGZHOU), 日期 20yy-mm-ss

标准:

认证计划:

GB/Z25458-2010“风力发电机组 合格认证 规则及程序”, 发布日期: 2010-11-10

以及:

GB/T18451.1-2012“风力发电机组 设计要求”, 发布日期: 2012-05-11

该证书的第1-5页指定了风力发电机组的类型,

设计、生产和安装或者制造商的合格系统都必须由杭州汉德质量认证服务公司认可, 若未被认可, 该证书将无效。

该证书有效期至20XX年XX月XX日。

(根据GB/Z25458-2010第6.5章的要求定期维护)

杭州汉德质量认证服务有限公司
认证中心
风能



中国认可
产品
PRODUCT
CNAS C183-P

杭州, 年-月-日

签证官(签名)

杭州 310019 江平区九环路9号B座502室

型式认证证书
注册号: SHW XXXXXXX-XX-TC-GB, Rev.0

页码 1/1

附件 C：工厂质量保证能力要求

Annex C: Factory quality assurance capability requirement

为保证批量生产的认证产品与已获型式试验合格的样品的一致性，工厂应满足本文件规定的产品质量保证能力要求。当执行工厂审核时，应采用在产或库存的同型号产品为样本，与设计信息进行比对，检查其一致性。然而，鉴于风能产品的同型号产品产量少、生产计划不固定的行业特点，在工厂审核或监督审核期间，若工厂没有在生产同型号产品也没有同型号产品的库存，可以参考相似型号产品的生产过程评估工厂的生产与质控能力，以确保工厂有满足认证标准要求的产品制造能力。

In order to ensure the consistency of the production of certification products with the samples that have passed the type test, the factory shall meet the product quality assurance capability requirements specified in this document. During the manufacturing inspection, the being produced or stocked product which is used for inspection shall be the same type with the certification product to assess the consistency with the design of production. Nevertheless, due to the low yield or irregular production plan of wind turbine industrial characteristics, when the certification product has no production plan or stock during manufacturing inspection or supervision inspection, the similar type of production can be used to inspect the manufacturing progress to assess the capability of production and quality control of the certification product. During the manufacturing inspection, the manufacturing capability of the factory shall be assessed to meet the requirements of the certification standards.

C.1.文件和记录 Documents and records

工厂应建立、保持认证产品的质量计划或类似文件的系统化，以确保产品质量的相关过程有效运作和控制。质量计划应包括产品设计目标、实现过程、检测及有关资源的规定，以及对获认证产品的变更（标准、工艺、关键件等）管理和执行等的规定。

The factory shall establish and maintain the quality plans or similar documents for certification products systematically which can guarantee the related product quality progress to be operated and controlled effectively. The quality plan shall include the product design objectives, implementation process, testing and regulations of related resources, as well as the regulations of certified product changes (e.g.: standards, process, key parts ect.) management and implementation.

产品设计标准或规范应是质量计划的一个内容，其要求应不低于有关该产品的国家标准要求。

The requirements of the product design standard or specification, which shall be a part of the quality plan, shall not be lower than the national standard requirements for the product.

工厂应建立并保持文件化的程序以对本文件要求的文件和资料进行有效的控制。这些控制应确保：

The factory shall establish and maintain procedures of documentation to effectively control the documents and materials required by this document. These controls shall ensure that:

- a) 文件发布前和更改应由授权人批准，以确保其适宜性；
the document and its changes shall be approved by the authorized person to ensure its suitability prior to its release;
- b) 文件的更改和修订状态得到识别，防止作废文件的非预期使用；
the status of changes and revisions of documents shall be identified to prevent unexpected use of obsolete documents;
- c) 确保在使用处可获得相应文件的有效版本。
ensure that a valid version of the corresponding file is available for use.

工厂应建立并保持质量记录的标识、储存、保管和处理的文件化程序，质量记录应清晰、完整以作为产品符合规定要求的证据。

The factory shall establish and maintain procedures as documentation for the identification, storage, maintenance and handling for quality records, which shall be clear and complete as evidence of conformity of products to specified requirements.

质量记录应有适当的保存期限。

Quality records shall be kept for an appropriate period of time.

C.2.职责和资源 Responsibilities and resources

C.2.1 职责 responsibilities

制造厂应设有负责日常质量监督、验证、产品判定及产品放行和处理质量信息反馈的部门。这种部门应不受生产部门控制，且经工厂最高领导充分授权。

The manufacturer shall have a department which is responsible for daily quality supervision, verification, product judgment, product releasing and quality information feedback. Such department shall not be under the control of the production department and shall be fully authorized by the top management of the factory.

其他与质量有关的部门在质量控制上的职责、职权也应明确，并应按要求履行这些职责、职权。

The duty and authority of other quality-related departments shall also be clearly defined and shall be performed as required.

C.2.2 资源 resources

工厂应配备必须的生产设备和检验设备以满足稳定生产符合认证标准的产品要求；应配备相应的人力资源，确保从事对产品生产工作的人员具备必要的能力；建立并保持适宜产品生产、检验、试验、储存等必备的环境。

The factory shall have the necessary equipments of production and tests to meet the requirements of stable production consistent with the certification standards. Appropriate human resources shall be provided to ensure that the personnel who are engaged in production have necessary capabilities. The factory shall establish and maintain a suitable environment for production, inspection, testing and storage.

C.3.采购和进货检验 Purchase and incoming inspection

C.3.1 供应商的控制 Supplier control

工厂应制定对关键元器件和材料的供应商的选择、评定和日常管理的程序，以确保供应商具有保证生产关键元器件和材料满足要求的能力。

The factory shall establish procedures for the selection, evaluation and daily management of suppliers of key components and materials to ensure that suppliers have the ability to ensure that the production of key components and materials meets the requirements.

工厂应保存对供应商的选择评价和日常管理记录。

The factory shall keep records of selection evaluation and daily management for suppliers.

C.3.2 关键元器件和材料的检验/验证 Inspection/verification of key components and materials

工厂应建立并保持对供应商提供的关键元器件和材料的检验或验证的程序及定期确认检验的程序，以确保关键元器件和材料满足认证所规定的要求。关键元器件和材料的检验可由工厂进行，也可以由供应商完成。当由供应商检验时，工厂应对供应商提出明确的检验要求。

The factory shall establish and maintain procedures for the inspection or verification of the critical components and materials provided by the supplier and for the periodic verification inspection to ensure that the critical components and materials meet the requirements specified in the certification.

The inspection of key components and materials can be carried out by the factory or by the supplier. When inspected by the supplier, the factory shall make clear inspection requirements to the supplier.

工厂应保存关键件检验或验证记录、确认检验记录及供应商提供的合格证明及有关检验数据等。

The factory shall keep the records of inspection or verification, confirmation inspection, qualification certificates provided by suppliers and relevant inspection data, etc. for key components.

C.4 生产过程控制和过程检验 Production process control and process inspection

工厂应对关键生产工序进行识别，关键工序操作人员应具备相应的能力，如果该工序没有文件规定就不能保证产品质量时，则应制定相应的工艺作业指导书明确生产过程中的要求。

The factory shall identify the key production process, and the operators of the key process shall have the corresponding ability. If the product quality cannot be guaranteed without the documented provisions of the process, the corresponding process operation instruction shall be formulated to specify the detailed requirements.

产品生产过程中如对环境条件有要求，工厂应保证工作环境满足规定的要求。

If there are requirements for environmental conditions in the production process, the factory shall ensure that the working environment meets the requirements.

可行时，工厂应对适宜的过程参数和产品特性进行监控。

Where it is feasible, the factory shall monitor appropriate process parameters and product characteristics.

工厂应建立并保持对生产设备进行维护保养的制度。

The factory shall establish and maintain rules for the maintenance of production equipment.

工厂应在生产的适当阶段对产品进行检验，以确保产品及零部件与认证样品一致。

The factory shall inspect the products at the appropriate stages during production to ensure that the products and components are consistent with the certified samples.

C.5 例行检验和确认检验 Routine inspection and validation inspection

工厂应制定并保持文件化的例行检验和确认检验程序，以验证产品满足规定的要求。检验程序中应包括检验项目、内容、方法、判定等，并应保存检验记录。具体的例行检验和确认检验要求应满足相应产品的认证实施规则的要求。

The factory shall establish and maintain routine inspection and validation procedures in documentation to verify that products meet specified requirements. Inspection procedures shall include inspection items, contents, methods, judgments, etc., and inspection records shall be kept. Specific routine inspection and validation inspection requirements shall meet the corresponding product certification implementation rules.

例行检验是在生产的最终阶段对生产线上的产品进行的 100% 检验，通常检验后，除包装和加贴标签外，不再进一步加工。

Routine inspection is a 100% inspection of the products at the final stage of production. After the inspection, no further processing is required except packaging and labeling.

确认检验是为验证产品持续符合标准要求进行的抽样检验。

Validation inspection is a sampling inspection to verify that the product consistently meets standard requirements.

C.6 检验和试验仪器设备 Inspection and test instruments and equipment

用于检验和试验的设备应定期校准和检查，并满足检验试验能力。

The equipment used for inspection and testing shall be calibrated and checked periodically, and meet the inspection and test capability.

检验和试验的仪器设备应有操作规程，检验人员应能按操作规程要求，准确地使用仪器设备。

Inspection and testing instruments and equipment should have operating procedures, inspectors should be able to operate the instruments accurately in accordance with the requirements of the operating procedures.

检验、测量、试验设备的搬运、存放应满足要求，避免设备失准、数据丢失等情况的发生。

The transporting and storage of the instruments, which are used to inspect, measure and test the product, shall meet the relevant requirements to avoid equipment misalignment and data loss.

C.6.1 校准和检定 Calibration and verification

用于确定所生产的产品符合规定要求的检验试验设备，应按规定的周期进行校准或检定。

The inspection and test equipment that used to ensure the products accord with the specified requirements shall be calibrated or verified in a specified period.

校准或检定应溯源至国家或国际基准。对自行校准的，则应规定校准方法、验收准则和校准周期等。

Calibration or verification should be traceable to national or international benchmarks. For self-calibration, the calibration method, acceptance criteria and calibration period shall be specified.

设备的校准状态应能被使用及管理人员方便识别。

The calibration status of the equipment shall be easily identified by the user and management personnel.

应保存设备的校准记录。

Calibration records of equipment shall be kept.

C.6.2 运行检查 Operation inspection

对用于例行检验和确认检验的设备除应进行日常操作检查外，还应进行运行检查。当发现运行检查结果不能满足规定要求时，应能追溯至该周期内已检测过的产品。必要时，应对这些产品重新进行检测。应规定，操作人员在发现设备功能失效时需采取的措施。

The equipment used for routine inspection and confirmatory inspection shall be done for operation in addition to daily checking. When it is found that the operation inspection results cannot meet the specified requirements, it shall be traceable to the products which have been tested in this period. These products should be retested if necessary. Measures to be taken by operators in case of equipment failure shall be specified.

运行检查结果及采取的调整等措施应记录。

The result of operation inspection and adjustment actions should be recorded.

C.7. 不合格品的控制 Control of nonconforming products

工厂应建立不合格品控制程序，内容应包括不合格品的标识方法、隔离和处置及采取的纠正、预防措施。经返修、返工后的产品应重新检测。对重要部件或组件的返修应作相应的记录，应保存对不合格品的处置记录。

The factory shall establish control procedures for nonconforming products, which shall include identification methods, isolation and disposal of nonconforming products, as well as corrective actions and preventive actions. The products shall be retested after being repaired and reworked. The repair of important parts or components shall be recorded accordingly, and the disposition of nonconforming products shall be recorded.

C.8. 标识和可追溯性 Identification and traceability

制造厂应建立完善的识别和标记系统，宜采用状态标识和唯一性标识两套标记方法、以保证在生产、检验各环节不发生混淆，并能够可靠地追溯每件或每批成品所用的主要材料和主要零部件的来源。对重要轧制件或浇铸件等生产过程中不能连续保留标志的，应采取适当的方法保证能够追溯到原始炉号和浇次。对成品的标记办法应满足认证标准要求。

The manufacturer shall establish a complete identification and marking system, and shall adopt the status identification and unique identification as the two marking methods to ensure that there is no confusion in each link of production and inspection. And the source of main materials and main parts for each piece or batch of finished products can be traced reliably. If the marks cannot be kept continuously during the production of important rolling parts or casting parts, appropriate measures should be taken to ensure that the marks can be traced back to the original furnace number and casting number. The labelling of finished products shall be meet the requirements of certification standards.

采用抽样检验方法时，确保通过试样的标志能够追溯到试样所代表的产品。

When using the sampling inspection method, the product which be represented shall be traced by the mark of the sample.

C.9. 内部质量审核 Internal quality audit

工厂应建立文件化的内部质量审核程序，确保质量体系的有效性和认证产品的一致性，并记录内部审核结果。

The factory shall establish internal quality audit procedures in documentation to ensure the effectiveness of the quality system and the consistency of the certified products. And the internal audit results shall be recorded.

对工厂的投诉尤其是对产品不符合标准要求的投诉，应保存记录，并应作为内部质量审核的信息输入。

Complaints against the factory, especially complaints about non-conformance of the products to the standards, shall be recorded and shall be input information for internal quality audit.

对审核中发现的问题，应采取纠正和预防措施，并进行记录。

Corrective and preventive actions shall be taken for the problems found in the audit. And the records shall be kept.

C.10. 认证产品的一致性 Certified product consistency

工厂应对批量生产产品与型式试验合格的产品的一致性进行控制，以使产品持续符合规定的要求。The factory shall control the consistency between the mass production products and product passing type test so that the products can continuously meet the specified requirements.

工厂应建立产品关键元器件和材料、结构等影响产品符合规定要求因素的变更控制程序，认证产品的变更（可能影响与相关标准的符合性或型式试验样机的一致性）在实施前应向认证机构申报并获得批准后方可执行。

The factory shall establish the change control procedures for the key components, materials, structures and other factors affecting the conformity of the products to the specified requirements. The change of the certified products (which may affect the conformity with the relevant standards or the consistency of the type test prototype) shall be reported to the certification body. After the changes has been approved by certification body the changes can be implemented.

C.11. 包装、搬运和储存 Packing, transporting and storage

工厂所进行的任何包装、搬运操作和储存环境应不影响产品符合规定标准要求。

Any packaging, transporting as well as storage environment shall not affect the conformity of the products to the specified standard requirements in the factory.

第 4 节 认证导则

Chapter 4 Certification guidelines

4.1 TÜV NORD 风机型式认证导则 TÜV NORD Wind Turbines Type Certification Guidelines

认证是一种复杂的技术过程，第三方机构根据预先定义的模型、测试和检查标准评估产品的设计、安全性、性能和操作。

Certification is a complex technical process, according to standards of preliminary defined modules, test, inspection, the third party body evaluates the conformity of product design, safety, property and operability.

评估程序基于既定的工程和科学实践，可被分类为多个技术文件（被称为各类产品的认证标准）。第三方机构被称为认可组织所认可的认证机构，用于对申请认证的制造商所设计和生产的产品进行认证。

The evaluation process is based on the established engineering and scientific practices. It can be classified into multiple technical documentation (which is known as product certification guidelines). The third party is certification body which is accredited by accreditation organization. The certification body is taken responsible to evaluate the product design and manufacture procedure applied by manufacturer.

对于风机，大部分重要的认证标准均由国际电工委员会(IEC)（由来自风电产业、学术界和研究组织的专家组成）编写。除 IEC 之外，德国劳埃德船级社(GL)、美国风能协会(AWEA)和英国风能协会 (BWEA) 等组织基于 IEC 标准，作一些修订而获得他们自己的标准。

For wind energy, most important certification guidelines are prepared by the International Electrotechnical Commission (IEC, which is comprised by wind energy industry, academia, research organization specialists). Besides IEC, Germanischer Lloyd (GL), American Wind Energy Association (AWEA) as well as British Wind Energy Association (BWEA) have their own guidelines, which has derived and adjusted from the IEC standards.

4.2 简介 Brief Introduction

本文旨在为认证申请者提供初步指导，以及介绍了需向 TÜV NORD 提交的用于风机的设计评估以获得认证的信息。

The purpose of this document is to provide preliminary guidance to certification applicants. Meantime, it shows the brief documentation that should be submitted to TÜV NORD for the wind turbine design evaluation and type certification.

为了简化整个方法，我们将这些指南划分为各个小节，分节介绍认证申请人需提供的风机的结构、机械、控制和电气方面的文档。

In order to simplify the whole scheme, the guideline has been divided into several sections. Each section will introduce the required documents which need to provide by certification applicant for structure, machinery, control system as well as electrical system of wind turbines.

设计文件的开头应明确指出风机的基本说明，这一点对认证非常重要。TÜV NORD 将考虑到规格变更的情况，但是，如果变更影响到认证的服务范围，则可能需要重新评估设计。这种情况适用于本文中所述的所有分节的设计文件的要求。

At the beginning of the design document, it shall clearly indicate the description of the wind turbine, which is very important for certification. The change of the wind turbine configuration will be paid attention by TÜV NORD. Nevertheless, if the change has great influence to the scope of certification, then additional evaluation should be performed. This situation applied to the requirements of all sections for design documents in this certification rule.

注：本文所述的设计文档要求基于 **IECRE OD-501、IEC 61400-22、GB/Z 25458、GB/T 35792** 中的附录 A，应以标准 **IECRE OD-501、IEC 61400-22、GB/Z 25458、GB/T 35792** 中的附录 A 为准。本文并不打算在任何意义上降低 **IECRE OD-501、IEC 61400-22、GB/Z 25458、GB/T 35792** 设计文件要求。

通用指南中介绍了非常基本和简化的文件编制方法，本文并不涵盖所有要求；在 **TÜV NORD** 明确了申请认证的机组的配置之后，将向认证申请者提供相对来说更为详细的资料要求文件。如果本文与客户选择的认证方案（按照第 2.3 节选择）之间发生任何技术冲突，将以所选的 2.3 节的认证标准为准。

Note: The requirement of the design document is based on the appendix A in standards IECRE OD-501, IEC 61400-22, GB/Z 25458, GB/T 35792, which should be fulfilled by appendix A in IEC 61400-22, GB/Z 25458, GB/T 35792. The guideline is not intended to reduce the requirement of design document which described in IECRE OD-501, IEC 61400-22, GB/Z 25458, GB/T 35792. The general guideline shows the basic and brief introduction to prepare the document, but does not show all the requirements which are needed for certification. After the configurations of the wind turbine are confirmed to TÜV NORD by the certification applicant, the detailed requirements for documentation will be told to the applicant by TÜV NORD. If the conflicts are happened between this certification rule and the chosen certification scheme from section 2.3, the requirements shall be subject to the chosen certification scheme of section 2.3.

4.3 风机特性和规格 Wind Turbine Characteristic and Specification

在此类中，申请者应提供有关额定功率、参考风速、轮毂高度运行风速范围、电力系统、工作环境温度范围、风机等级、安全等级、额定电压和频率范围、部件质量、重心和惯性矩等信息。

In this section, the applicant shall provide some detailed information about wind turbine, e.g. rated power, reference wind speed, the operational wind speed range in hub height, power system, environmental temperature range for working, wind turbine class, safety level, rated voltage and frequency range, as well as the mass, centre of gravity, inertia moment of key components.

上述规格类似于在 IEC 61400-1 外部条件中建议的风机标记内容。

The above specifications are similar to those recommended contents of wind turbine for external conditions in IEC 61400-1.

外部条件包括设计文件中应该规定的环境、电气和土壤条件。例如，环境条件包括需在设计说明报告详细规定的风力条件（正常和极端）、湍流参数和风机等级。有关更多详细要求，请参见 IEC 61400-1 设计标准中的第 6.3 条。

External condition in design document should include specified environmental, electrical and soil conditions. For example, environmental conditions, such as wind speed conditions (normal and extreme), turbulence parameters, wind turbine class, should be specified in the design specification report. More relevant detailed requirements, please refer to chapter 6.3 of design standard IEC 61400-1.

4.4 术语 Term

申请者应该定义其技术参数以及在其设计文件中所用的术语。本节中还包括坐标系的使用和说明。有关更多详细信息，请参见 IEC 61400-1 中的第 3 条和 IEC 61400-2 中的第 4.2 条，说明示例如下所述：

The applicant should define the technical parameters and terms used in design document. The choosing and specification of coordinate system are also involved in this chapter. More relevant detailed information, please refer to chapter 3 of standard IEC 61400-1 or chapter 4.2 of IEC 61400-2. The example of the description of coordinate system is given in following.

塔基坐标系：此系统定义基础与塔架之间连接的局部固定坐标系。原点位于塔座，与塔架的中心轴重合。

Tower base coordinate system: this system defines the partial fixed coordinate system between the base and the tower. The origin is located in tower base, coincident with central axis of the tower.

x 轴沿水平线从风轮指向机舱，y 轴与 x/z 轴形成的面垂直，z 轴沿着塔轴。

The X-axis is horizontal from rotor to nacelle, the Y-axis is vertical to the area combined by X-axis and Z-axis downwind, and the z-axis is along the tower axis.

4.5 规范和标准 Standard and Criteria

本节说明申请者应描述选择用于认证的标准的介绍和理由。例如，如果申请者选择 IEC 61400-2 作为主要认证标准，则申请者需提供风机参数（指出其风机属于小型风机）的相关信息。

This section specify that the introduction and reason of the applied standards should be described by the applicant. For example, if the IEC 61400-2 is selected as the main certification guideline by the applicant, then the applicant should provide the relevant information about wind turbine parameters (which can declare that the turbine is small wind turbine).

设计控制程序：申请者应提供在风机的设计过程中遵守的质量控制程序。有关设计和开发规定，请参见 ISO 9001 中的第 7.3 条。

Design control procedure: the applicant shall submit the quality control procedure during the wind turbine designing process. Please refer to chapter 7.3 of ISO 9001 to have some more detailed requirements about design and development.

4.6 风机部件和系统 Wind turbine components and subsystem

本节介绍风机各系统、子系统或部件的设计文件要求。使用 IEC 61400-1 和 -2 中所述的设计载荷进行风机系统评估之后，需对上述系统进行单独评估。为此，设计文件应根据以下分节说明这些系统的设计依据和设计细节。

The requirements of the design documents which are about each system /subsystem or components of wind turbine are introduced in this chapter. Each subsystem or components should be evaluated independently after the design loads of wind turbine has been assessed according to the requirement in IEC 61400-1 and IEC 61400-2. Thus, the design criteria and detailed design for these systems shall be described according to the bellowing sections.

4.6.1 载荷和载荷工况 Load and load cases

气动载荷通过对整体风机结构的气动弹性分析进行估算。气动弹性分析是材料有限元分析（FEA）和计算流体动力（CFD）的结合。

The aerodynamic load is estimated by aero elastic analysis of the complete wind turbine structure. Aero elastic analysis is the combination of the finite element analysis (FEA) and computational fluid dynamics (CFD).

当在风机上进行气动弹性分析时，通过模态分析、质量、阻尼和刚度矩阵分析结构，并计算振型。

When aero elastic analysis is performed on wind turbine, the structure is analyzed by modal analysis, mass, damping and stiffness matrix, the vibration model is calculated as well.

在估计结构动力的每个时步时估算运动的偏微分方程。对于空气动力，随时间变化的紊流风场及其定常和非定常效应、机翼上的气动升力和拖曳力等与结构特性相结合，以创建多体动力学模型。

A partial differential equation is used for estimating the motion at each time step of the structural dynamics. For aerodynamics, the time-varying wind farm turbulence and its steady and unsteady effects, the aerodynamic lift and drag forces of the blade are combined with the structural characteristics to create a multi-body dynamics model.

应根据 IEC 标准在载荷分析中涵盖振动、惯性和重力分析。应按照适用性说明所有可能的振动模式。

除上述信息之外，报告中须包括所有结构部件（例如，转子、叶片、驱动机构、支撑结构等）的静态和动态结构响应模拟结果。

The vibration, inertia and gravity analysis shall be included in the load analysis in accordance with IEC standards. All possible vibration models shall be specified as applicable. In addition to the above information, the report shall contain static and dynamic structural response simulation results of all structure components (e.g. rotor, blade, drive mechanism, support structure...).

应通过支持性技术和/或数学推理清楚地阐明所有假设。有关设计文件的其他信息，请参见下述章节：All assumptions should be clearly stated through supportive and/or mathematical reasoning. For additional information about the design document, see the following sections:

申请者应说明风机可在整个使用寿命期间承受的环境条件，应先解释正常和极端风力条件（对于 1 年和 50 年重现时间周期）以及风机等级的相关定义。

The applicant shall describe the environmental conditions that wind turbine can withstand throughout its service life. Normal and extreme wind conditions (with a recurrence period of 1 year and 50 years) and the definition of wind turbine class should be described first.

应按照轮毂高度上的平均风速和平均湍流强度定义风机等级。必须就轮毂高度上的湍流尺度参数、表面粗糙度和合成风速提供正交风力部件的功率谱密度（PSD）之间的数值关系。

The wind turbine class should be defined according to the average wind speed and average turbulence intensity at hub height. A numerical relationship among the power spectral densities (PSD) of an orthogonal wind turbine components, turbulence scale parameters at the hub height, surface roughness and resultant wind speed must be provided.

可通过“Mann 均匀切变模型”或“Kaimal 谱和指数相干模型”进行上述计算。上述两种模型明确的详细说明见 IEC 61400-1 中的附件 B。申请者须说明用于为模拟设计载荷工况生成速度谱的湍流模型。

The Mann uniform shear model or the Kaimal spectral and exponential coherence model can be chosen to do the above calculation. The detailed explanation of above two models can be found in annex B of IEC 61400-1. The applicant shall describe the turbulence model which is used to generate the velocity spectrum for the simulated design load cases.

如前所述，应使用各种建模理论（例如，叶素动量理论等）进行并说明 CFD 建模。确定气动载荷以及叶片翼型几何机构及升阻特性（也应包含在报告中）后，应为每个设计载荷工况生成并记录基于时域的载荷历史，以用作模拟软件的输入。

As aforementioned, the CFD modeling should be performed and described by various modeling theories (e.g. blade-element momentum theory). After determination of the aerodynamic loads and the geometry of the blade airfoil and lift-drag characteristic (also should be involved in report), the time domain loads history should be generated and recorded for each design load case as the input to the simulation software.

申请者应说明按照 IEC 61400-1 或 IV-Part1/GL (GL2010) 或 DNVGL-SE-0441 所述的代表疲劳和极限载荷的所有设计载荷工况的详细仿真参数设置。可按照设计的复杂度（比如低温、结冰等）添加其他 DLC。

The applicant shall specify the detailed simulation parameters of all the fatigue and extreme design load cases stated in IEC 61400-1 or IV-Part1/GL (GL2010) or DNVGL-SE-0441. Additional DLC should be added according to the complexity of the design (e.g.: low temperature, icing ect.).

根据不同风力谱下至少 30 个十分钟的模拟对每个载荷工况进行评估。如前所述，应通过结构响应的时域和频域分析进行气动弹性分析。

At least 30 ten-minute simulations under different wind model shall be assessed for each design load case. As mentioned above, the aero-elastic analysis should be achieved through the time-domain and frequency-domain of the structural response.

设计载荷工况必须调查风机的结果响应，即风机在正常/故障操作过程中表现的行为和载荷。申请者应计算考虑了载荷正常或故障时不同的部分安全系数的载荷，并统计关键部件最终的疲劳和极限载荷。

The design load case must investigate the wind turbine consequence response, i.e., the wind turbine behaviors and load during the normal or fault operations. The applicant shall calculate the loads with different the partial safety factors for normal or fault operations and do statistic to get final fatigue and extreme loads for key components.

IEC 61400-1/-2、IV-Part1/GL、DNVGL-ST-0437 中详细说明了载荷的部分安全系数（PSF）。如果这些标准中未说明相关 PSF，则应将相关国家/地区规范和标准用作参考。

The IEC 61400-1/-2, IV-Part1/GL, DNVGL-ST-0437 has specified the partial safety factors (PSF). If the relevant description about PSF is not specified in these standards, the relevant national/regional codes and standards shall be taken as reference.

现场评估对估计和评估风机的耐受性至关重要，因此，当机组设计考虑了详细的现场条件，应在设计文件中说明现场具体条件。

The site assessment is critical to estimate and evaluate the tolerance of the wind turbine. Therefore, the specific site conditions should be specified in the design document when the site condition has been considered in turbine designing.

除上述模拟结果之外，风机应按照 IEC 61400-13 进行载荷测试。应当包含仪表和数据采集规范，以评估数据的精度。

In addition to the above mentioned simulation consequence, the load measurements of wind turbine should be done according to the IEC 61400-13. Instrumentation and data acquisition specifications should be included to assess the accuracy of the data.

应详细提供风机的功率曲线以及相关信息，例如，切入、切出风速等。进行测试前，测试计划应获得认证机构的批准。结构部件应大量配备传感器，例如，加速计、增量应变计、称重传感器等，以采集数据和作报告。

The power curve and some other relevant information of wind turbine should be provided, such as, cut-in and cut-out wind speed, etc. Before testing, the test specification should be approved by certification body. The structural component should be equipped with plenty of sensors, e.g. accelerometer, incremental strain gauge, weighing sensor, etc., for data acquisition and preparing report.

分析程序应包括坎贝尔图、1P、3P 转子频率的计算和分析以及各种自由度组合的分析等。处理数据并获得结果后，应使用多体动力学模拟和数据处理软件校准和验证从模拟和物理测试中所获得的结果。这是认证过程中至关重要的一步。如果计算值与测量值之间的结果不匹配，则根据最小特征定义增加部分安全系数。

The analysis procedure should contain Campbell diagram, 1P and 3P rotor frequency calculation and analysis, and various degrees of freedom combinations analysis. After data processed and results acquired, the acquired consequence of simulation and physical tests should be calibrated and verified by means of multi-body dynamic simulation and data processing software. That is one of the critical step in the certification process. If the calculated value mismatch the measure value, the partial safety factor will increase in accordance with the minimum feature definition.

最终载荷结果应包括各种结构的不同极限和疲劳载荷的响应、马尔可夫矩阵、极限状态分析、载荷持续时序等。

The final load results shall include the response of different extreme and fatigue loads, markov matrix of the extreme status analysis, load duration distribution, etc. for various structures.

这里应该注意的是，由于系统动力和响应在约束/自由度、载荷和振动特性方面有所不同，因此，叶片和其他部件的单独部件将基于其整机载荷设计中的载荷结果，再进一步进行结构或者性能分析。

Here's the thing to note, since the difference in constraints/ degrees of freedom, loads, and vibration features of system power and response. Therefore, the further analysis of blade and other individual components shall be done on their structure and features based on their loads got from turbine load design.

4.6.2 控制和安全系统 Control and Safety System

控制和安全系统的功能是在使用不同风速和相应载荷进行有效操作时调节风机。风机设计者所规定的正常操作限值是这些系统的驱动标准。

The functions of control and safety system are applied to adjust the wind turbine in different wind speed and corresponding load. The operational limitation values which are defined by wind turbine designer are the active condition of the subsystems.

如果出现任何操作故障，控制系统或者安全系统会识别故障报出相应的故障信号，并驱动相应的程序使风机停机。

If any failure occurs, control system or safety system will identify the failure and send out the related failure signal, and then active relevant program to stop the turbine.

风轮的转速与风速之间的非线性的典型示例如图 4.1 所示。在该图中，风机不同速度随着风速的增加进行显示。

A typical example is illustrated in Figure 4.1 to show the non-linear relationship between rotor speed and wind speed. It indicates that the different rotational speed ranges of wind turbine increase with the wind speed.

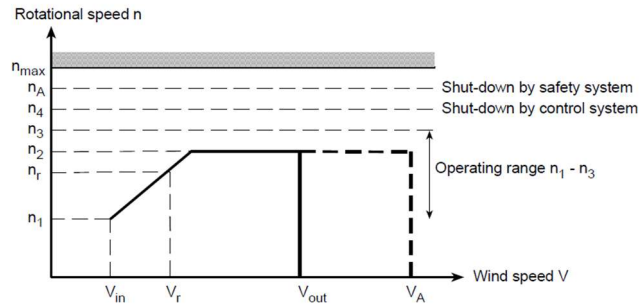


图 4.1 控制和安全系统对应机组风轮转速运行范围限值
Figure 4.1 Sketch of control and safety system operation range

一旦工作速度因风速的增加或系统故障（如电网连接中断）而增加，控制将传递给安全系统。申请者需提供的系统设计文件如下所述。

Once the rotational speed is increasing due to the wind speed or system failure (e.g. grid loss), the control system will transfer to the safety system. The required system design documentation provided by applicant are as follow.

➤ 控制原理和逻辑 Control principle and logic

本节应解释特定于正在进行评估的风机的控制系统的必备基础、原理和应用。

The necessary basis, principle, and application of the specific assessing wind turbine control system will be explained in this section.

要以流程图的形式提供控制系统的基本逻辑以及可解释所涉及到的不同步骤的支持信息。而且，须在上述信息中添加操作模式，解释在风机操作过程中控制系统的各种控制功能。

After that flow chart is necessary to provide the basic logic of the control system, as well as the explanation to the supporting information of all the relevant different procedures. And that, operation mode should be supplemented into the above information to explain the various control function of the control system during the operating procedures.

➤ 控制系统规范 Control system criterion

控制系统可分为不同的基本设计，例如，电气、机械、液压、气动等。详细信息包括结构图、电路图、启动和停止程序、设定点列表、反馈系统、控制方程以及应在本节中说明的其他特性参数。

The control system can be divided into different basic design parts, e.g. electrical system, machinery, hydraulic, aerodynamic. The detail information should be described clearly, including structure chart, circuit diagram, startup and stop procedure, limitation value list, feedback system, governing equation and some other characteristic parameters.

此信息还应包括手动控制系统的规范，例如，可忽略上述自动控制逻辑的紧急停止开关。

The criterion of the manual control system should be involved as well, such as the emergency stop button which can overrule the above auto-control logic.

➤ 系统软件 System software

控制系统通常通过一套自定义代码/程序进行控制，以实现自动化。不同的软件语言/平台（如 MATLAB-Simulink）被用于设计和评估这些系统。申请者应就系统的控制方程与代码的控制逻辑之间的联系详细说明每个代码。申请者还应提交，用作认证的进行设计载荷模拟计算输入的仿真控制代码或文件给 TÜV NORD。

Normally control system is comprised of a set of user-defined codes or programs to realize auto-control. Different software language or platforms (e.g. MATLAB-Simulink) are applied to design and evaluate those system. The applicant shall specify the relationship between system governing equation and control logic of codes and explain each code. Meanwhile, the applicant shall provide the simulation control code or files to TÜV NORD to do the design load simulation calculation in the certification.

➤ 远程控制和状态监控 Remote control and condition monitoring

控制系统的另一个用途是有效地远程监控风机的操作和状态。通常执行数据采集与监视控制（SCADA）系统。

The control system is also can be used to efficiently monitor the operation and status of the wind turbine remotely. Normally it also can supervisory control and data acquisition (SCADA).

一系列传感器输入位于各种风电机组上的数据采集系统。本节应包括上述系统的技术信息、规格和说明。

A series of sensors are applied in the data acquisition system of wind turbines. The technical information, specification and description of above system shall be involved for the remote control and condition monitoring.

➤ 故障分析 Fault analysis

申请者需说明风机中可能会出现故障情况以及控制系统的相应程序化响应。除此信息之外，申请者还应说明风机在故障下的行为，例如，超速、超功率等。

The applicant should describe the probable failures and the corresponding reaction of the control system. Besides that, applicant also need to describ the behavior of the wind turbine when failure occurred, e.g. over-speed, over-power ect..

故障情况下的电压和电流响应的一个示例如图 4.2 所示：

An example illustrated in Figure 4.2 indicates that the corresponding relationship between voltage and current in the fault case.

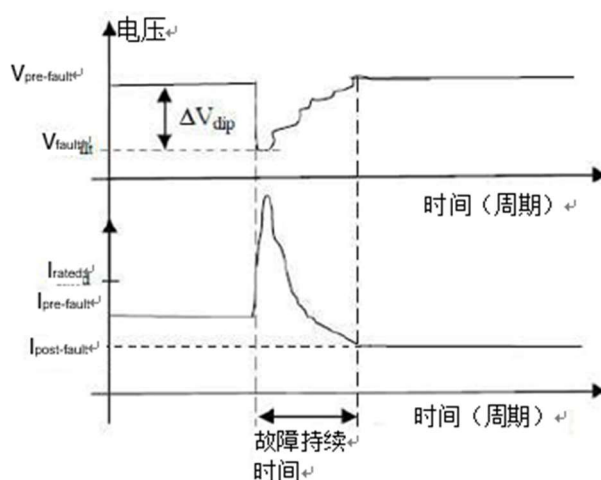


图 4.2: 故障时的系统电压和电流响应分析

Figure 4.2 System voltage and the response current analysis in failure case

➤ 安全说明 Safety instruction

申请者需提供基本指南，以便相关人员操作和维护控制和安全系统。这些说明应与系统的基本结构和控制逻辑相结合。

The applicant should provide the basic guidelines, so that relevant person can operate and maintenance the control and safety system. The instruction should comply with the basic system structure and the control logic.

➤ 控制系统传感器 Sensor in control system

传感器是远程控制和监控系统的一个主要部分。常见的传感能力包括振动传感、超速传感、温度传感、变桨/偏航角度误差等。这些传感器的说明、规格和位置以及从传感器所获得的相应信息应包含在设计文件的本部分。

Sensors are critical parts of the remote control and monitoring system. Normally the type of the sensor includes vibration sensor, over-speed sensor, and temperature sensor, pith /yaw angle misalignment, etc.

The description, specification and location, the information obtained from these sensors should be included by the design document.

➤ 测试计划 Test plan

通过将物理测试结果与模拟结果进行对比来验证控制系统设计。模拟结果从模拟软件（如 MATLAB-Simulink）中获得。同样地，所进行的物理测试旨在确保系统正常运行。因此，申请者需提供模拟和物理测试的测试和验证计划。

The control system design is verified by comparing the physical test results with the simulation results. The simulation results are achieved from the simulation software (e.g. MATLAB-Simulink). Meantime, all performed physical tests are aim to ensure that the system is operating properly. Thus, the applicant should submit the test and verification plan of simulation and physical tests.

➤ 安全/保护系统 Safety and protection system

上述信息也适用于安全和保护系统，因此，也应为这些系统提供类似的说明。此外，申请者需详细说明按照主要控制逻辑激活的制动系统。

The above information is also applicable to the safety and protection system. Thus, similar description of safety and protection systems are also needed. Additionally, the applicant should specify the braking system that is activated according to the main control logic.

定义制动系统的典型参数为激活特征、结构、温度控制、时间常数、扭矩曲线等，需包含在设计文件中。

The defined typical parameters of the braking system are active characteristic, structure, temperature control, time constant, torque curve, etc. They all need to be involved in the design document.

4.6.3 结构系统和部件 Structural system and components

本节包含风机的结构系统和部件，包括对应的机械系统和部件。主要结构和机械系统/部件包括转子叶片、轮毂、驱动链、塔架、基础和机舱罩等的外壳。这些系统和部件的设计文件要求如下所述：

This section contains structural system and components of wind turbine, including the corresponding mechanical system and components. Main structural and mechanical system or components includes rotor blade, hub, drive chain, tower, base and nacelle cover. The requirement of all those system and components design document are as follow clauses.

➤ 转子叶片 Rotor blade

转子叶片的组合结构是维持转子完整性的重要驱动因素之一。申请者需提供叶片的全局几何数据，包括叶片长度、弦长方案、扭角和锥形模式等。

The composite structure of rotor blade is one of the critical factor to maintain the integrity of rotor. The applicant should provide the basic geometry data of blade, including the length of blade, chord length protocol, twist angle and cone mode.

此外，还应包括复合材料、纤维、加固剂和粘合剂、树脂、泡沫、支持聚合物等全局结构规格。还需详细说明这些子部件的局部结构组成，例如，纤维的连续性/不连续性、纤维数量、纤维直径等。

Additionally, the specification of overall structure, composites, fibers, reinforcement and adhesives, resins, foams, supporting polymers should be included. It is also necessary to describe the local structural composition of these subcomponents in detail, such as fiber continuity/discontinuity, fiber number, fiber diameter, etc.

需提供所有上述全局和局部结构的示意图及其相关设计文件。有关叶片的示意图示例，请参见 IEC 61400-23 的第 15 页。

The schematic diagram and relevant design document of all above mentioned overall and partial structure should be provided. Please see page 15 of IEC 61400-23 for a schematic example of rotor blade.

报告中应包括叶片特征信息，例如，主要内部部件（抗剪腹板）的位置、叶片的生产顺序及其复合材料、叶片中片层和夹层结构的分布、叶片中金属部件的位置和类型，例如，紧固件（铆钉）和粘接接头属性等。

The report should also contain the blade characteristic information, for example, location of mainly internal components (shear web), manufacture sequence of blade, and composites material, distribution of

lamination and layer structures in blades, type and location of metal component in blade, such as fasteners (rivets) and adhesive joint properties, etc.

除叶片特征之外，还应包含叶片根部与尖部之间至少五个部位的叶片弹性属性，例如，弯曲和扭转刚度、重心、固有频率、振型等。有关设计文件的更多详细信息，请参见 IEC 61400-23 中的第 6 条。

In addition to blade characteristics, blade elastic properties of at least five positions between blade root and tip should be included, such as bending and torsional stiffness, center of gravity, natural frequency and vibration module, etc. For more details of the design document, see IEC 61400-23, clause 6.

报告中应说明可分为材料的部分安全系数、故障后果和载荷的安全系数。随着设计载荷、故障类型和叶片材料的变化，这些系数会按照所涉及到的不确定性发生变化。有关更多详细信息，请参见 ISO 2394。

The report shall state the partial safety factor of the material, the failure consequence and the safety factor of the load. These coefficients vary with the design loads, fault types and blade materials, depending on the related uncertainties. See ISO 2394 for more details.

报告中应包含模拟和物理测试的静态测试结果。基于强度的测试也包含在此类别中，除载荷组合、载荷持续时间等之外，申请者还应提供强度分布曲线。

The report should include static test results for both simulated and physical tests. Strength based tests are also included in this category. In addition to load combinations, load durations, etc, the applicants should also provide strength distribution curves.

因施加载荷（应进行测量）而产生的叶片力学为局部和全局压曲和剪切稳定性，应由申请者针对许多各种不同的适用静态载荷进行提供。同样地，在疲劳试验中，应报告叶片展向方向上的强度曲线。此外，还应包括基于疲劳的故障，例如，疲劳载荷施加过程中的定界或层数偏差。应记录试验参数，例如，疲劳循环水平的调节系数、载荷方向、载荷组合、测试时间补偿参数、载荷大小和频率调制等。

The local and global buckling and shear stability of the blades resulting from applied loads (which should be measured), shall be provided by the applicant for many different applicable static loads. Similarly, the strength curve in the direction of blade extension should be reported in fatigue test. In addition, fatigue based failures should be included, such as delimiting or number of layers in the process of fatigue loading. Test parameters should be recorded, such as regulation factor of fatigue cycle level, load direction, load combination, test time compensation parameters, load value and frequency modulation.

评估标准应包括载荷部件分布分析、静态强度系数计算、使用部分安全系数的最低静强度等。对于疲劳载荷，申请者应报告有关疲劳应力系数计算、最低疲劳强度、故障模式等的记录。

Evaluation criteria shall include load component distribution analysis, static strength coefficient calculation, minimum static strength using partial safety factor, etc. For fatigue loads, the applicant shall provide the records relating to the calculation of the fatigue stress coefficient, minimum fatigue strength, failure modes, etc.

叶片根部分析应包括设计规格和特性参数（例如，内径和外径、螺栓模式、螺栓类型、公差等）的计算。

The blade root analysis should contain design specification and the calculation of characteristic parameters (e.g. inner and outer diameters, bolt modes, bolt types, tolerances, etc.).

应包括圆柱形根环与玻璃纤维/木材之间的叶片/轮毂连接的类似信息，例如，嵌入式金属嵌钉或 T 形螺栓连接。铝合金通常被用作制造叶片根环的基材。材料强度信息应附在根环的设计数据上。叶片根部直径受翼形厚度和过渡区的影响，应在报告中以图示的形式对其进行解释。

Similar information for blade/hub connections between cylindrical root rings and fiber-glass/wood should be contained, such as embedded metal studs or T-bolts. Aluminum alloys are commonly used as the substrate for blade root rings. Material strength information should be attached to the root ring design data. Blade root diameter is affected by airfoil thickness and transition zone, it should be explained in the report by graphical representation.

对于极限和疲劳载荷分析，结构响应基于根部法兰中由重力引起的弯曲和拉伸载荷。这些设计的安全系数应符合 IEC 或 ASME 标准。商业仿真软件可用作叶片结构响应的模拟和计算。

For extreme and fatigue load analysis, the structural response is based on the root flange bending and tensile loads due to gravity. The safety factors of these designs shall comply with IEC or ASME standards. Commercial simulation software can be used to simulate and calculate blade structure response.

应详细说明叶片的生产顺序，例如，预浸固结、真空树脂灌注技术、真空/手工涂敷方法等。生产过程可被认证机构用作参考。因此，制造商必须拥有符合 ISO 9001 等认证的所需生产质量。

The manufacture sequence of the blade should be specified, for example, pre-impregnation, vacuum resin filling technology, vacuum/manual coating method, etc. The manufacture process can be used to the certification body for reference. Thus, the manufacturer must meet the requirement of production quality according to the ISO 9001 and other certification guideline.

IEC 61400-23 中详细说明了认证用结构测试程序指南。根据该信息，申请者需提交叶片的全尺寸结构测试报告。

Certification Guidelines for structural testing procedures are detailed specified in IEC 61400-23. According this information, the applicant should submit the full-scale structure blade test report.

这些程序可分为基于载荷的测试和基于强度的测试。时间域和频率域中的测试结果必须使用数值模拟结果进行验证，公差在 10% 之内。

These procedure can be divided into load-based test and strength-based test. Test results in the time and frequency domains must be validated by numerical simulation results, the tolerance should less than 10%.

测试报告中须包含的信息为叶片、破坏性和非破坏性测试类别、试验装置和程序、仪器和校准、测试结果，例如，展向和沿边偏转、具有方向的静态和动态载荷、实验不确定度和安全系数、测试载荷的评估，包括测试载荷分布、故障说明、应变和载荷测量。上述要求基于 IEC 61400-23 中的第 14 节。

Test report shall contain the information of blade, destructive and non-destructive test categories, test device and procedure, calibration of the instrument, test results, for example, stretch and edge deflection, directional static and dynamic loads, the experimental uncertainty and safety factor, test load evaluation, including test load distribution, failure explanation, strain and load measurement. The above requirements are based on section 14 of IEC 61400-23.

➤ 变桨系统 Pitch system

申请者需提供叶片变桨系统的部件和组件图。图纸文件应附在主要设计文件中，遵循设计评估报告中给定的相同符号命名，数值必须采用标准国际单位。

The applicant shall provide the list and drawing of the sub-components of pitch system. The schematic diagram should be attached to the main design document, and shall be named with the same symbol given in the design evaluation report, and the value must be in standard international units.

典型部件包括独立变桨驱动装置、控制和通信装置、供电电源和储存装置。设计文件应包括上述四类。Typical components include independent pitch drive devices, control and communication devices, power supply and storage devices. The design document shall include the four categories mentioned above.

除本报告的控制系统章节中所述的信息之外，申请者需提供变桨系统的类型，例如，独立或集体变桨、设计参数和控制功能，例如，周期性和非周期性、线性和非线性模型方程、电路原理图、桨距锁定机构、机械连接件、控制设计和软件逻辑（支撑风机的主控制器）、时域模拟和测试结果等。

In addition to the stated information in control system chapter of the report, applicant shall provide the pitch system category, for example, independent or collective pitch system, design parameters and control functions, such as periodic and aperiodic, linear and nonlinear module equation, circuit diagram, pitch locking device, mechanical connection, control design and software logic (main controller to the wind turbine supporting), time domain simulation and test result, etc.

材料数据应包括定子、转子、轴承和框架的规格。报告中还应包括齿轮箱部件和外壳材料规格。提供齿轮设计文件时应遵循 ISO 6336。

The material data should contain the specification of stator, rotator, bearing and frame. The report should also include specifications of gearbox components and housing materials. The gear design document shall be provided and comply with ISO 6336.

➤ 偏航系统 Yaw system

与变桨系统设计文件类似，应提交偏航系统的偏航系统规格和分析文件（如适用）。基线偏航控制系统的其他信息包括详细的设计规格，应对偏航齿轮箱、电机和制动、控制系统和软件、变频调速等进行分析。

Similar to the pitch system design document, the specification of yaw system and analysis document (if applicable) should be submitted. Some other information about the baseline of the yaw control system includes the detailed design specification. The yaw gearbox, motor and brake, control system and software, variable-frequency and variable-speed control should be analyzed.

➤ 轮毂 Hub

设计文件应包括概念生成和机械规格，例如，孔和定位销杆的排列、自力式电子蜗轮等。应在本节中详细说明轮毂系统和部件（例如，翼梁固定器、顶板、底板、外部和内部固定装置等）的示意图和工程图。The design document shall contain the concept and mechanical specification, for example, the arrangement of the hole and alignment pin, self-powered electronic turbine, etc. the schematic and engineering drawings of hub system and components (e.g. wing spar holder, roof, baseboard, external and internal fixing devices, etc) should be clearly stated in this section.

轮毂材料通常为铸件。设计文件中应包括相应材料选择过程、固有特性和支持测试报告。The hub material is usually casting. The design document shall include the corresponding procedure of material selection, natural characteristic and supporting test report.

分析应包括轴承寿命计算；应提供与叶片根部圆柱环相关的螺栓应力分析等。测试报告应详细说明力、力矩、载荷、应变以及对轴承和螺栓的其他系统反应。

The analysis should contain bearing life calculation, the bolt stress analysis related to the circular ring at the blade root should be submitted as well. The test report should state the forces, torques, loads, strains and the reaction of other system to the bearing and bolts in detail.

除此信息之外，还应通过示意图和设计规格说明变桨控制系统与低速轴之间的互联。Besides that, the connection between pitch control system and low-speed shaft should be illustrated by schematic and design specification.

➤ 低速轴和高速轴 Low-speed shaft and high-speed shaft

制造商或申请者应详细说明图纸和示意图。此外，还应详细说明部件设计参数，例如，轴径、表面光洁度、额定速度、功率、扭矩等。

The manufacturer or applicant shall detailed specify the drawings and schematics. In addition, the design parameters of components should be specified as well. For example, shaft diameter, surface smoothness, rated speed, rated power, rated torque, etc.

应包含材料选择程序和规格，例如，屈曲、拉伸、压缩强度等。应详细说明设计特征参数、扭矩与速度控制属性。除物理测试之外，还应进行并报告载荷、应力和应变的全尺寸动态模拟，例如，疲劳寿命测量的耐久度测试、制动事件测试、载荷事件测试等。

The material selection procedures and specification should be included. E.g. buckling, tensile, compression strength, etc. The design characteristic parameters, torques and speed control property should be specified. In addition to the physical tests, full scale dynamic simulation of loads, stress and strains should be performed and reported, such as, duration test for fatigue life measurement, brake event test, load event test, etc.

➤ 齿轮箱 Main gearbox

与其他驱动机构部件类似，设计文件中需提供图纸和示意图。必须包含设计控制和参数，例如，结构、齿轮类型、齿轮支架轴和装置、比率、润滑和冷却规范。

Similar to the other drive mechanism components, the design document should involve drawings and schematics, as well as design control and parameters. Such as, structure, gear type, gear shaft bracket and devices, ratio, lubrication and cooling specification.

材料选择标准和强度分析报告应符合制造商所提供的规范。模拟和物理测试分析包括轮齿载荷、齿磨损机制、套管应力测量、轴承寿命评估、齿面啮合和、扭矩转换评估、微点蚀影响等。

The criteria of the material selection and strength analysis should comply with the specification provided by manufacturer. The simulation and physical test analysis contain gear load, gear abrasion mechanism, sleeving stress measurement, bearing lifetime assessment, gear surface meshing, torque conversion assessment, Micro-pitting effect, etc.

应评估的主要驱动机构和/或齿轮箱部件为齿轮箱外壳和元件、轴和联轴器、制动系统和轴承。应分别以时间和频率域报告载荷和系统反应测量。设计文件还应符合 IEC 61400-4 — 最近引入的齿轮箱设计评估标准。

Major drive mechanism and gearbox components to be evaluated are gearbox housing, shaft and coupling, brake, bearing. The load and system response measurement should be reported in time period and frequency domain, respectively. The design document should also comply with the IEC61400-4, which is introduced main gearbox evaluation standard recently.

➤ 塔架 Tower

风机塔架是重要的结构部件之一。各种设计（例如，格架式和管式类别）中均有风机塔架，管式风机是最常用的设计。

The tower of wind turbine is one of the important structure components. There are various wind turbine tower designs (e.g. lattice and tubular type), and the tubular type wind turbine is most commonly used design.

申请者或制造商需向认证机构提供设计控制和基础信息并通过部件图纸和设计计算值提供设计规格，例如，横截面和尺寸、局部屈曲极限、弹性强度、允许的塔顶线性和旋转挠度极限等。

The applicant or manufacturer shall provide design control and basic information to the certification body, as well as design specifications through component drawings and design calculation. For example, cross section area and dimension, partial buckling limits, elastic strength, permissible top linear and rotational deflection limits, etc.

应提供显示各种设计载荷条件（本报告中将在后文进行讨论）下 CFD 和 FEA 模拟的详细报告。结果通过在认可的实验室中进行的结构测试进行验证。

The detailed report about the CFD and FEA simulation under the various design load conditions (discussed later in this report) will be provided. The test results should be verified by structure tests carried out in accredited laboratories.

通常需分析的参数包括在时间和频率域方面的前后和侧对侧偏转、角度扭曲等。载荷分析的下一可选类别为地震载荷，这是罕见的事件，但是可造成使塔架的结构完整性发生改变的瞬态载荷。这些载荷应添加到气动载荷中，应通过模态分析进行评估。

Normally, the front and back as well as side to side deflection, angle distortion in time and frequency domains should be analyzed. The next optional category for load analysis is seismic loads, which are rare events, but can cause transient loads that change the structural integrity of the tower. These load conditions should be taken into account in aerodynamic loads and shall be evaluated by model analysis.

圆筒式塔架通常拥有通过圆柱环连接在一起的 3-4 段。这些环承载扭转和弯曲载荷，应对疲劳和极限载荷进行分析。塔架包含其他电气和机械设备，例如，传导电缆、梯子、平台、门孔等，因此这些外部部件也应使用 FEA 进行评估，以维持结构完整性。

Cylindrical towers usually have 3-4 sections connected by cylindrical rings. These rings carry the torsional and bending loads, thus the fatigue and extreme loads should be analyzed. The tower is consist of other electrical and mechanical devices, e.g. conductive cables, ladder, platform, door opening, etc. Thus all these external components shall be evaluated by FEA to keep the integrity of the structure.

申请者需提供上述部件的设计规格。有关更多详细信息，请参见 IEC 61400-22。

The applicant shall provide the design specification of above mentioned components. For more details, see IEC 61400-22.

➤ 塔基 Foundation

风机的基础是混凝土结构，其设计要求主要取决于岩土工程条件。申请者需提供基础的详细图纸和示意图。

The foundation of wind turbine is concrete structure, and its design requirements mainly depend on the geotechnical engineering conditions. Applicant shall provide the detailed drawings and schematics of the foundation.

应增加基础设计要求，例如，有关承载能力、刚度和倾覆力矩限制的详细规格。此外，必须通过计算值详细说明结构信息，例如，框架类型、钻孔规范、钢筋笼规格、桩数、混凝土的化学和机械属性等。

The requirement of the foundation design should be added, such as, detailed specification about bearing capacity, stiffness, and capsizing moment limits. In addition, the structure information should be detailed specified through calculation values, e.g. frame type, drilling specification, reinforcement cage specification, pile number, chemical and mechanical properties of concrete, etc.

申请者或认可的测试实验室应提供材料强度和测试报告。应连同塔架一起进行模态分析测试，应报告坎贝尔图，确保频带间拥有足够的频差。

Applicant or the accredited test laboratory should provide the material strength and test reports. The modal analysis tests shall be performed in conjunction with the tower, and the Campbell diagram shall be reported to ensure adequate frequency differences between bands.

载荷分析报告应包括总垂直载荷、土壤上的最大压力、刚度和阻尼特性等，同时应采用适用的国家/地区规范和标准中的安全系数。

The load analysis report should contain the total vertical load, the maximum stress on the soil, stiffness and damping characteristics, etc. Meantime, the safety factor shall be applicable to the country or district codes and standards.

➤ 外壳 Housing

这些外壳用于保护内部子系统，例如，变桨和偏航系统、驱动机构等。申请者需提供设计规格、详细的图纸、CFD 分析（以估算对结构的风力载荷、防腐、容纳各种部件的配件）、应力集中区（例如，外壳开口等）的 FMEA 分析。应采用适用的国家和地区规范标准中的安全系数。

These housings are used to protect the internal subsystems. e.g. pitch and yaw system, drive mechanism, etc. Applicant should provide the design specification, detailed drawings, CFD analysis (to estimate the wind power load to structure, anticorrosion, accommodation of various parts of the accessories), FMEA analysis of the area of stress concentration (e.g. housing opening). The adopted safety factor shall be applicable to the country or district codes and standards.

4.6.4 电气系统和部件 Electrical system and components

属于此类的电气部件包括发电机、变压器、变流器、中压和高压连接和部件、电力驱动、充电设备和蓄电池、开关设备和保护设备、电缆和电气安装设备、以及接地和防雷保护设备，例如，防雷区、避雷针和防雷装置、接地电极、等电位连接带位置、隔离建筑物的连接。

The belonging electrical components including generator, transformer, medium-voltage and high-voltage connection and components, electrical drive devices, charging devices and storage batteries, switch devices and protection equipment, cables and electrical installations, as well as grounding and lightning protection devices, e.g. lightning protection zone, lightning rod and lightning protection devices, earth electrode, equipotential bonding connection, isolation connection of the construction.

设计文件应包括所有系统、子系统、部件和子部件的列表和层次结构以及相应的规格和特性参数。

The design document should include a list and hierarchy structure of all systems, subsystems, components and subcomponents, as well as corresponding specifications and characteristic parameters.

- 结构、电气和功能说明及维护说明。
Structure, electrical and functional instructions and maintenance instructions.
- 电气系统（包括辅助电路）图纸。
Electrical system (including auxiliary circuits) drawings
- 电路（如电源电路）示意图及相应线路图。
Circuit diagrams(e.g. power supply circuits) and corresponding schematics
- 备用和紧急系统。
Backup and emergency systems
- 辅助存储设备，例如，充电系统和蓄电池。
Auxiliary storage devices, such as charging system and batteries

所有符合性测试的规格和数据表，通常以测试报告、测试计划、仪表、数据采集类型、先前测试和认证历史的形式进行表示。

Specifications and data sheets for all conformance tests are typical presented by test reports, test plans, instrument, data acquisition type, previous tests and certification history.

- 设计计算和系统兼容性报告。
Design calculation and system compatibility reports.
- 电气和机械连接（例如，电缆、轴承、框架等）的规格。
Specifications of the connection of electrical and mechanical system (such as, cables, bearings, frames...)
- 适用规范、标准和参考资料。
Applicable criteria, standards and reference.
- 设计要求和相关外部条件（例如，温度、湿度等）、部件操作的边界条件等。
Design requirement and relevant external condition (such as, temperature, humidity), components operation boundary conditions.
- 电磁兼容性报告。
Electromagnetic compatibility reports
- 制造和材料特性数据表中所用的材料。
Material applied in the manufacture and material characteristic data sheet

系统动力，例如，与其他部件的电气和机械相互作用。

System power supply, such as, electrical and mechanical, interacts with other components.

传热机理，例如，气流概念、冷却系统属性和可靠性等。

Heat transfer mechanisms, such as, flow concepts, cooling system property and reliability.

相应电气/保护部件建议的符合性标准为：

The recommended conformance standards for the corresponding electrical / protective components:

- 变压器 – IEC 60076;
Transformer- IEC 60076
- 防雷 – IEC 61400-24 或 IEC 61024-1 和 IEC 61312-1;
Lightning protection- IEC 61400-24 or IEC 61024-1 and IEC 61312-1
- 发电机 – IEC 60034;
Generator- IEC 60034
- 整体电力机械 – IEC 60204-1 和 -11;
Electrical equipment of machines- IEC 60204-1 and IEC 60204-11
- 电磁兼容性 – IEC 61000-6-1、-2、-4 等。
Electromagnetic compatibility- IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-4...

➤ 发电机 Generator

必须在文件中根据 IEC 60204 和 IEC 60034 说明风机发电机系统的详细设计规格。电气要求在单独的报告中说明。

Detailed design specification of wind turbine generator system must be documented in accordance with the IEC 60204 and IEC 60034. The electrical requirement is stated in the separate report.

机械要求以及定子、转子、轴承和框架的材料应由制造商/申请者确定。还应包括额定参数，例如，电压、电流、驱动扭矩等。

Mechanical requirement as well as material of stator, rotator, bearing and frame should be defined by manufacturer and/or applicant. The rated parameters should also be included, e.g. rated voltage, rated current, drive torque, etc.

风机的机械测试包括机械故障诊断和公差、轴承和绕组温度、扭矩-速度特性、断裂扭矩和极端操作性能、系统效率、瞬态响应特性。

The wind turbine mechanical test contains mechanical failure diagnosis and tolerance, bearings and windings temperature, torque-speed characteristic, breakaway torque and extreme operating characteristic, system efficiency, transient response characteristic.

报告中应包括基于这些测试的分析和系统特征。说明直驱式发电机的设计特性时要求会有所不同。

The report is accordance with the analysis result of these tests and system characteristics. It should be declared that there are some different requirements to the direct driven wind turbine design characteristic.

4.6.5 说明手册 Instruction and manuals

风机使用和操作手册应提交给认证机构且必须符合 IEC 标准。所有手册的内容应符合 IEC 62079 和 IEC 61400-1。

The wind turbine operation manual should be submitted to certification body and shall comply with the IEC standards. All manuals shall fulfill the requirement of the IEC 62079 and IEC 61400-1.

手册与风电场的类型和项目认证的审批有关。组件手册中的典型章节包括部件和子系统图纸、组装、警告和紧急情况中的安全要求等。

The manual is related to the wind farm category and the approval of project certification. Typical chapters of the component manual include component and subsystem drawings, assembly, warnings and safety requirement in emergency situation.

现场组装风机后，应起草组件报告，记录正常和异常组装操作。调试手册应规定预调试系统分析、警告和紧急情况以及风机检测的方法等。

After the wind turbine erecting on site, a component report should be drafted to record normal and abnormal erecting operation. The commission manual shall specify the pre-commissioning system analysis, warnings, emergencies and wind turbine testing methods, etc.

操作手册的起草方式与调试手册基本相同，只是所提供的信息略有不同。该手册应包括故障探测、风机等级类型、运行特征说明的用户指南信息。

The operation manual is drafted with the similar way to the commission manual, except that the provided information is slightly different. This manual includes user guide information for fault detection, wind turbine class category and description of operation characteristics.

制造商需提供的最后一本手册是维护手册，该手册的编写方式与上述手册相同，依据 IEC 62079 进行编写。

The last manual to be provided by the manufacturer is maintenance manual, which shall be drafted in the same manner as the above manual and in accordance with IEC 62079.

报告应包括预维护分析、风机等级类型、诊断程序和故障诊断指导、完整的接线和互连图、润滑程序等用户指南。

The report shall include pre-maintenance analysis, wind turbine class category, diagnostic procedures and failure diagnosis instructions, complete wiring and interconnection diagrams, lubrication procedure and other user guides.

对于执行运输、安装和维护及其他物流程序等任务的人员，应提供详细的安全培训和说明文件，该文件必须包括整个装置适用的安全协议和信息，例如，攀爬设施、进出通道、通路、平台、楼层、扶手、固定点等。

Detailed safety training and instructions shall be provided for the person who perform the tasks such as the transportation, installation and maintenance and other logistics procedures. The document should include applicable safety protocols and information of the entire equipment, such as, climbing facilities, access ways and passages, platforms and floors, hand rails and fixing points, etc.

必须采取针对气候事件（如雷电）的预防措施，并在制造商发布的安全文件中说明相应的疏散通道。

Precautions must be taken in case of the weather event (such as lightning), and the appropriate evacuation route must be specified in the safety document issued by the manufacturer.

-文件结束-

-End-