



TYPE CERTIFICATION OF

WIND TURBINES

Certification Description
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DET NORSKE VERITAS, DANMARK A/S
DNV Wind Turbine Certification
a unit in technical co-operation with RISØ

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Type Certification of Wind Turbines **Certification Description**

Company Presentation

Det Norske Veritas (DNV) was established in 1864 as an independent foundation. The objective of DNV is:

To Safeguard Life, Property, and the Environment

DNV is a global provider of services for managing risk. The operating revenue for DNV was around NOK 7,300 millions in 2006.

DNV is divided in four business areas:

- DNV Energy
- DNV Industry
- DNV IT Global Services
- DNV Maritime

each area with its own international network.

In addition to the four business areas, DNV has two independent business units:

- DNV Research and Innovation
- DNV Software

The DNV organisation:

- has close to 300 offices in 100 countries,
- employs about 8,000 persons,

In Denmark DNV is registered as a Danish company, Det Norske Veritas, Danmark A/S which employs approximately 150 people.

The main focus industries for DNV are:

- Maritime
- Oil, gas and energy
- Petrochemical
- Aerospace
- Automotive
- Finance
- Food and beverage
- Health care
- IT and telecom



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Certification Description

The Wind Turbine Certification activity is part of business area Energy.

The DNV Wind Turbine Certification unit is operated in technical co-operation with RISØ National Laboratory. RISØ has through a long term engagement in research and development projects obtained a leading role in the global wind turbine community.

The objective of this technical co-operation is to match the requests from the fast growing wind turbine industry for efficient and high quality certification services.

DNV is accredited for

- Type Certification of Wind Turbines according to the following systems:
 - IEC WT 01 Type Certification system
 - Dutch Type Certification Scheme
 - Danish Type Certification Scheme
 - DNV Type Certification which is based on the requirements of IEC WT 01 type certification system except that outstanding issues are accepted

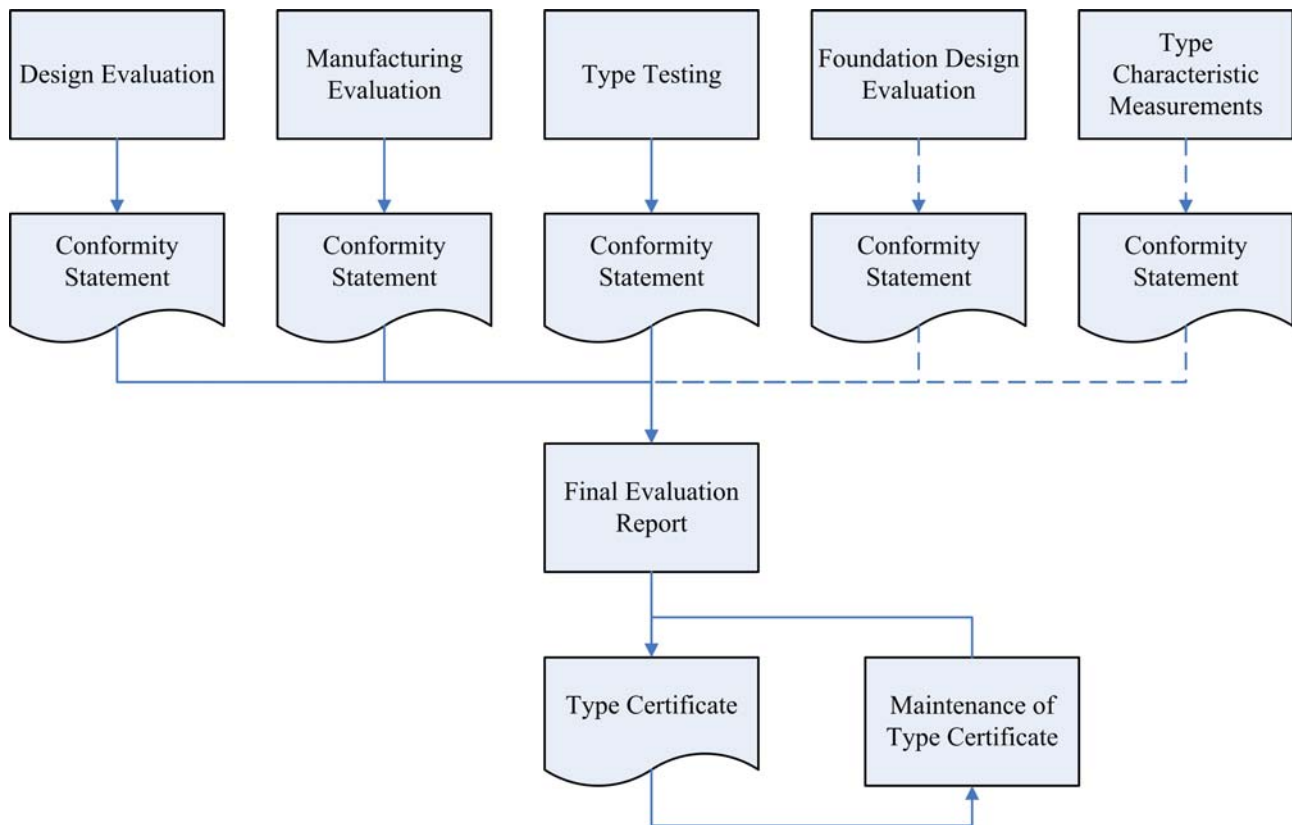
- Component Certification according to the following systems:
 - IEC WT 01 Type Certification system
 - Danish Type Certification Scheme
 - DNV Type Certification which is based on the requirements of IEC WT 01 type certification system except that outstanding issues are accepted

- Component Certification of offshore foundation according to
 - 'Recommendation for Technical Approval of Offshore Wind Turbines'.

Furthermore, DNV is authorised by German authorities as "Gutachter" according to German Regulations.

Type Certification of Wind Turbines Certification Description

Type Certification



0. General

The description of the Type Certification is based on the international type certification system IEC WT 01:2001, 'IEC System for Conformity Testing and Certification of Wind Turbines, Rules and procedures'.

The following modules of the IEC WT 01 type certification system are mandatory:

- Design Evaluation
- Type Testing
- Manufacturing Evaluation
- Final Evaluation

The following modules of the IEC WT 01 type certification system are optional:

- Foundation Design Evaluation
- Type Characteristic Measurements



Type Certification of Wind Turbines

Certification Description

The Danish Type Certification scheme is based on IEC WT 01 with special Danish requirements as described in chapter 8.

The main differences between the Dutch Type Certification scheme and the IEC WT 01 type certification system are described in chapter 9.

DNV may in addition to the Type Certificate according to IEC WT 01 type certification system (DNV Type Certificate class A) issue the following certificates as described below:

- DNV prototype certificate, class C
- DNV Type Certificate class B

All suppliers of Wind Turbines have access to apply for Type Certification of Wind Turbines. Upon accept of the quotation, an agreement will be made stating scope of work and cost rate.

1. Design Evaluation

The Design Evaluation module comprises the following elements:

- Design Control
- Control and Protection System
- Load and Load Cases
- Structural, Mechanical and Electrical Components
- Component Tests
- Foundation Design Requirements
- Manufacturing Plan
- Installation Plan
- Maintenance Plan
- Personnel Safety

The Design Evaluation is carried out as a review of the design documentation received from the client. The design documentation must cover the whole wind turbine including service lift, crane(s), transformer, nacelle cover and spinner.

The Design Control is covered by the manufacturer's quality system in case this is certified according to ISO 9001:2000 with design included in the scope. In case of no ISO 9001:2000 certified quality system, a quality system evaluation will be carried out in connection with the Manufacturing Evaluation.

As part of the verification of Loads and Load Cases independent load calculations are carried out. The extent of the verification depends on size and concept of the wind turbine.



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For areas where the design documentation includes, e.g. FEM analyses of highly utilised components, an independent analysis may be carried out in order to verify the design documentation.

Component Tests may be used as full or partial documentation for the strength of a component.

The Manufacturing, Installation and Maintenance Plans and Personnel Safety must normally be covered by specifications, instructions and manuals. The final manuals will be reviewed in connection with the Final Evaluation.

2. Type Testing

The Type Testing module comprises the following elements:

- Safety and Function Tests
- Load Measurements
- Power Performance Measurements
- Blade Tests, Static and Fatigue
- Other Tests

The Type Testing elements shall be carried out by accredited testing laboratories. Otherwise DNV will verify that the testing is carried out according to IEC/ISO 17020 or IEC/ISO 17025, as applicable.

DNV will witness the Safety and Function Tests. In connection with this test the wind turbine will be inspected for compliance with design drawings and specifications.

3. Manufacturing Evaluation

The Manufacturing Evaluation module comprises the following elements:

- Quality System Evaluation
- Manufacturing Inspection

The requirements for the Quality System Evaluation are satisfied if the client's Quality Management System is certified by an accredited Certification Body to ISO 9001:2000 with scope including design. If this is not the case, DNV will perform an audit for verification of compliance with ISO 9001:2000.

During the Manufacturing Inspection the manufacturing of at least one wind turbine will be inspected for compliance with design drawings and specifications.



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4. Foundation Design Evaluation

The Foundation Design Evaluation module is carried out as a review of the design documentation received from the client.

5. Type Characteristic Measurements

The Type Characteristic Measurements module comprises one or more of the following elements:

- Power Quality Tests
- Acoustic Noise Measurements

The measurements shall be carried out by accredited testing laboratories. Otherwise DNV will verify that the testing is carried out according to IEC/ISO 17020 or IEC/ISO 17025, as applicable.

6. Final Evaluation & Type Certificate

The Final Evaluation module summarises the mandatory and the selected optional modules. Furthermore, it is evaluated whether the design documentation is complete, and whether the type test results confirm the relevant design assumptions. Also the final turbine documentation including drawings, specifications and manual is reviewed for compliance with the Manufacturing Evaluation and the design calculations and assumptions.

The Final Evaluation Report and the Type Certificate for the wind turbine type are issued when a satisfactory result of the evaluation of the above items has been completed.

7. Maintenance of Type Certificate

The validity period of a wind turbine Type Certificate is normally 5 years, unless otherwise specified by codes/authorities.

The client shall take appropriate actions according to the certified ISO 9001:2000 system with respect to complaints and any deficiencies that affect compliance with the requirements for the Type Certificate. The client shall keep records of all complaints relating to the compliance for the wind turbine with the standards and requirements used for the Type Certificate. These records as well as documentation for actions taken shall be available to DNV and to the certification body which have certified the ISO 9001:2000 system. Reporting of these records as well as minor modifications must be submitted to DNV.

Major modifications to the design, procedures, specifications etc. must be reported without delay together with all documentation affected by the modification for the Type Certificate to be maintained/extended.



Type Certification of Wind Turbines

Certification Description

Surveys of randomly chosen specimens of each type of turbine are carried out during the validity period of the Type Certificate for the purpose of verification of the manufacturer's design procedures, their maintenance and implementations in relation to the design procedures and design parameters initially approved by DNV. The client must provide access to the turbine chosen for inspection.

The client shall, immediately upon knowledge of any safety related accident/failure of the installed Type Certified Turbines, report this to DNV. Such major accidents/failures may result in request for corrective actions to be taken by the client in order to maintain the Type Certificate. Based on an evaluation of the accident/failure and if relevant an evaluation of the corrective actions, DNV will decide if the Type Certificate shall be suspended until a satisfactory corrective action is implemented. A suspension means that turbines may not be advertised, sold, manufactured or installed with reference to the suspended Type Certificate. The Type Certificate may be suspended up to maximum one year provided that a plan for Corrective Action is agreed with DNV.

If no satisfactory corrective action is taken, the Type Certificate in question will be withdrawn and the accreditation authority, under whose authority the Type Certificate was issued, will be informed accordingly. Certification documents issued by DNV shall upon withdrawal or suspension be returned as requested by DNV.

Modifications to a wind turbine for which a Type Certificate has been issued are permitted only if they do not change or affect the principle characteristics at all, or to the extent described in the applicable design code/standard.

As an example the principle characteristics for Dutch Type Certificates are defined as follows:

- a change in rotor diameter and rotor rotational speed by more than 2%;
- a different design of safety system;
- a different way of limiting the power input;
- modified blade profiles;
- modifications which lead to a significant increase in the load spectrum;
- increase of the power output by more than 5%.

If modifications outside the limitations have been carried out this means that a different type of wind turbine has been produced, and a separate Type Certificate for this type should be applied for.

Re-certification may be required if additional requirements for maintenance of the Type Certificate are set by the national authorities or the applicable design code/standard during the validity period of the certificate.

Upon failure to conform to the conditions of the Type Certificate, the Certificate Holder is requested to correct the non-conforming situation within a specified time frame.



Type Certification of Wind Turbines

Certification Description

If no satisfactory corrective action is taken, the Type Certificate in question will be withdrawn and the accreditation authority, under whose authority the Type Certificate was issued, will be informed accordingly. Certification documents issued by DNV shall upon withdrawal or suspension be returned as requested by DNV.

8. Danish Type Certification Scheme

The Danish Type Certification scheme is defined in Executive Order BEK no. 1018 of 20/08/2007 'Bekendtgørelse om teknisk godkendelsesordning for konstruktion, fremstilling og opstilling af vindmøller'. This scheme is based on the international IEC WT 01 Type Certification system 'IEC System for Conformity Testing and Certification of Wind Turbines Rules and procedures'. For the Danish type certification scheme all the modules of the IEC WT 01 type certification system are mandatory. Special requirements for the Danish scheme are defined in Executive Order BEK no. 1018.

9. Dutch Type Certification Scheme

The Dutch Certification scheme is defined in NVN 11400-0:1999, 'Wind turbines – Part 0: Criteria for type-certification – Technical criteria'.

The main differences compared to the IEC WT 01 type certification system are the following:

- Manufacturing Evaluation is not required. However, a Quality Management System must be present
- Foundation Design Requirements and Foundation Design Evaluation is not included
- Acoustic Noise Measurement is required

Special requirements for the Dutch scheme are defined in NVN 11400-0.

10. DNV Type Certification

In order to account for the different stages in the development of a wind turbine DNV may in addition to the Type Certificate according to IEC WT 01 type certification system (DNV Type Certificate class A) issue the following certificates:

DNV prototype certificate, class C

This certificate is issued to enable testing of prototypes and is based on a design evaluation issued according to the IEC WT 01 type certification system. The location of the turbine is stated on the certificate. The certificate may have outstanding matters limited to:

- quality control system and procedures
- matters with no safety implication within the period of validity (up to 3 years)
- manufacturing, installation and maintenance plans



Type Certification of Wind Turbines **Certification Description**

DNV Type Certificate class B

The Type Certificate class B is issued to allow for 0-series production as well as to allow for outstanding matters with no safety implication. The Type Certificate class B is based on the IEC WT 01 type certification system with the exception that outstanding matters are allowed. The outstanding matters are however limited to:

- matters with no safety implication within the period of validity (maximum 1 year)
- matters related to the finalization of manuals and quality control procedures

Rules for the use of the Certification

The Type Certificate must not be used in such a manner as to bring DNV into disrepute. Furthermore, misleading or unauthorised statements regarding the Type Certificate are not allowed.

The certification mark, as shown in appendix 1, may only be used on or with a reference to the Type Certified Product.

The certification mark should not be used in such a way that it can mislead or give the impression that other products than the type certified are covered by the Type Certificate.

When used in brochures, letters and other printed material, a distinct reference to the Type Certified Products must be stated.

Any claims regarding the Type Certificate must be with reference to a specific item in the scope for certification.



APPENDIX 1

CERTIFICATION MARK



The colours of the DNV logo are:
The colours of the RvA mark is:

Green: PMS 370 and Blue: PMS 286
Ochre: PMS 131 and Blue: PMS 296.

