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## Wind energy generation systems—Assembling and installation specification of wind turbines

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# Foreword

This document was drafted in accordance with the provisions of GB/T 1.1—2020 Directives for Standardization—Part 1: Rules for the Structure and Drafting of Standardizing Documents.

This document replaces GB/T 19568—2017 Specification for Assembly and Installation of Wind Turbine Generators. Compared with GB/T 19568—2017, besides structural adjustments and editorial revisions, the main technical changes are as follows:

- a) Revised the "General Requirements" (see 4.1.4, 4.1.6, 4.1.7, 4.1.8; 3.1 of the 2017 edition);
- b) Revised the connection requirements for screws, bolts, and studs (see 4.2.1.1~4.2.1.3; 3.2.1 of the 2017 edition);
- c) Added installation requirements for ring-grooved lockbolt connections (see 4.2.6);
- d) Revised the content of "Main Bearing Housing Assembly and Gearbox Assembly" to "Drive Train Assembly" requirements (see 5.2; 3.3.2 of the 2017 edition);
- e) Revised the content of "Yaw and Pitch Bearing Assembly" to "Assembly of Yaw Bearings, Pitch Bearings, and Yaw Gear Rings" (see 5.3; 3.3.3 of the 2017 edition);
- f) Added assembly requirements for passive mechanical brakes and hydraulic gearbox elastic supports (see 5.4.2, 5.6.2);
- g) Added generator assembly requirements (see 5.8);
- h) Revised safety requirements (see 6.1; 4.1 of the 2017 edition);
- i) Revised the content of "Tower Installation" in wind farm installation to "Steel Tower Installation" and "Concrete Tower Installation" (see 6.4.1, 6.4.2; 4.5.1 of the 2017 edition);
- j) Revised the description of "Rotor Installation" and added single-blade installation requirements for wind farm installation (see 6.4.5; 4.5.4 of the 2017 edition);
- k) Added single-blade installation, cable laying, electrical wiring fabrication, and electrical wiring connection for wind farm installation (see 6.4.6~6.4.9);
- l) Added inspection requirements for workshop assembly (see 7.1).

Note that certain contents of this document may involve patents. The issuing body of this document assumes no responsibility for identifying patents.

This document was proposed by the China Machinery Industry Federation.

This document is under the jurisdiction of the National Technical Committee on Wind Power Generation of Standardization Administration of China (SAC/TC 50).

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This document was first released in 2004, revised for the first time in 2017, and this is the second revision.

# Wind energy generation systems—Assembling and installation specification of wind turbines

## 1 Scope

This document specifies the general requirements, assembly requirements for key components, wind farm installation requirements, inspection requirements, and validation methods for the assembly and installation of wind turbine generators.

This document applies to the assembly and installation of wind turbine generators.

## 2 Normative References

The contents of the following documents are incorporated into this document as essential provisions through normative reference in the text. For dated referenced documents, only the edition corresponding to the stated date applies to this document. For undated referenced documents, the latest edition (including all amendments) applies to this document.

GB/T 9327—2008 Test Methods and Requirements for Crimp-type and Mechanical Connectors for Conductors of Power Cables with Rated Voltage up to 35 kV ( $U_m=40.5$  kV)

GB/T 19072 Wind Turbine Generators – Towers

GB/T 20319 Wind Turbine Generators – Acceptance Specification

GB/T 33628 Wind Turbine Generators – Technical Requirements for Installation of High-strength Threaded Fastener Assemblies

GB/T 37898 Wind Turbine Generators – Safety Code for Hoisting Operations

DL/T 796 Safety Code for Wind Farms

## 3 Terms and Definitions

This document does not contain terms and definitions that require clarification.

## 4 General Requirements

### 4.1 General Provisions

**4.1.1** All personnel involved in assembly shall complete three-level safety education and job skill training. Personnel engaged in specialized trades (e.g., riggers, operators of special equipment) shall hold corresponding qualification certificates before taking up their posts. Operators responsible for key processes and special processes shall take up their posts only after passing training.

**4.1.2** Before assembly, the type and specification of all accessories shall be inspected to verify compliance with the requirements specified in the configuration list.

**4.1.3** Before assembly, parts entering the assembly area shall be inspected and can be put into assembly only if they meet the following requirements:

- a) Bear a qualification mark after passing inspection;
- b) Recheck the main matching dimensions and serial numbers of key parts and record the results in the quality assurance card;
- c) Matching dimensions trimmed by fitters shall be re-inspected by the quality inspection department of the complete machine manufacturer, with the results recorded in the quality assurance card.

**4.1.4** An assembly process control card shall be prepared for each assembly procedure, and the card shall be recorded and filed in the wind turbine generator archive.

**4.1.5** Parts shall be cleaned before assembly, and shall be free of burrs, flanges, scale, rust, chips, oil stains, colorants and dust. Sharp corners or high spots on the matching surfaces shall be trimmed before assembly. Unless otherwise specified, sharp corners and edges of parts shall be blunted prior to assembly. Parts shall be protected from nicks, dents, scratches and rust during the assembly process.

**4.1.6** Damaged anti-corrosion coatings caused by assembly, turnover and other activities, as well as exposed machined surfaces after assembly, shall undergo secondary anti-corrosion treatment. Specific anti-corrosion requirements are specified in Appendix A.

**4.1.7** Before hoisting, the lifting tackle, rigging, hoisting equipment and other tools to be used shall be inspected to ensure compliance with safe hoisting requirements. The lifting rigging used shall be within the validity period of its verification and maintenance cycle and bear an inspection mark. Protective pads shall be added to positions (components, lifting rigging) that may be damaged during hoisting.

**4.1.8** Measuring tools, hydraulic tools and tightening tools used for workpiece measurement shall be calibrated and within their validity period.

**4.1.9** Before use, equipment and special tools shall be inspected for their operating status and can be used only if no abnormalities are identified.

**4.1.10** After assembly, lubricating oil or grease shall be injected into all lubrication points of components in accordance with the assembly process specifications. Unless otherwise specified, lubricating oil and grease of different types and brands shall not be mixed.

## **4.2 Connection Requirements**

### **4.2.1 Screw, Bolt and Stud Connections**

**4.2.1.1** The tightening of fasteners shall be performed in accordance with design requirements, using methods such as the torque method, tension method or torque-angle method. Torque wrenches or tensioners shall be used for tightening. The allowable deviation of torque wrenches shall be  $\pm 5\%$ , and that of tensioners shall be  $\pm 3\%$ .

**4.2.1.2** For fasteners with specified tightening torque requirements, the designated tightening tools shall be used and tightened to the specified torque. For fasteners without specified tightening torque, the preload and tightening torque during assembly shall comply with the requirements specified in Appendix B.

4.2.1.3 When installing washers for bolt or stud fastener assemblies, the chamfered side shall face the bearing surface of the nut and bolt head respectively. When installing nuts, the end face with the character head shall face outward. The following operations shall be performed before screwing in:

- a) Inspect the surface of the fastener assembly to ensure it is free of burrs, damaged threads and zinc nodules;
- b) When adopting the torque method for tightening, for bolts, screws and studs of M16 and above, apply anti-seize compound evenly to their effective engagement areas and the contact surfaces of washers, nuts or bolt heads in accordance with the relevant requirements of GB/T 33628;
- c) When adopting the torque method for tightening, for bolts, screws and studs smaller than M16, apply thread-locking adhesive evenly to their effective engagement areas (excluding self-locking nuts).

4.2.1.4 When a single part is connected with multiple bolts or screws, Arabic numerals shall be marked on the heads of the relevant fasteners to indicate the tightening sequence. The marking method for tightening sequence numbers shall be in accordance with Figures 1~3 based on the distribution of fasteners. Tightening shall be carried out following the crosswise, symmetrical, gradual and uniform principle. If dowel pins are provided, tightening shall start from the dowel pins unless otherwise specified.



Figure 1 Tightening Sequence of Fasteners in Linear Distribution

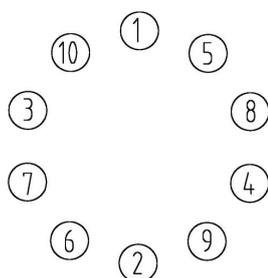


Figure 2 Tightening Sequence of Fasteners in Circular Distribution

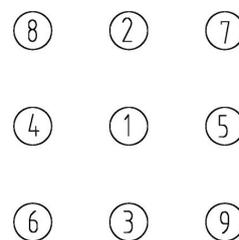


Figure 3 Tightening Sequence of Fasteners in Square Distribution

4.2.1.5 For bolt or screw connections with nuts, the nuts shall be tightened unless otherwise specified. When tightened by the torque method, the nuts shall protrude beyond the bolt end face by at least 2 - 3 thread pitches. When tightened by the tension method, the distance between the nut and the bolt end face shall be at least 1.0 times the nominal diameter. After countersunk head screws are tightened, the countersunk heads shall not protrude above the end face of the countersunk holes. After tightening, the screw slots, nuts and bolt heads shall not be damaged.