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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 43683.1-2024

Guidance on installation procedures and tolerances for hydroelectric generating units - Part 1: General

水轮发电机组安装程序与公差导则 第1部分：总则

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Table of Contents

Foreword

This document was issued on 15 March 2024 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 April 2025.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies.

The document runs to 20 pages in translation. The identification, the dates, the table of contents and the clauses reproduced on this page are taken from the standard itself.

GB/T 43683.1-2024 Guidance for installation procedures and tolerances of hydroelectric machines - Part 1: General aspects

1 Scope

GB/T 43683.1-2024 is the general part of the Chinese guidance on installing hydroelectric generating units. A hydro unit is one of the largest rotating machines ever built, up to a thousand tonnes of rotor turning in a concrete structure, and it is assembled in place from components that arrive separately; whether it runs smoothly for forty years is decided during that assembly, by alignment tolerances measured in hundredths of a millimetre on a machine several metres across. This part sets the general framework: the sequence of the installation and the milestones within it, the preparation of the site and the embedded parts, the requirements on the measurement systems and the reference axes used for alignment, the general principles governing the tolerances and how they are stated and verified, the requirements on the records, and the acceptance and handover of each stage. The later parts of the series apply this framework to the individual machine types. For a turbine or generator maker, an installation contractor or an owner supervising the work in China, this is the base document.

The document is to establish, in a general way, suitable procedures and tolerances for the installation of hydroelectric turbines and generators. This document presents a typical assembly. There are many possible ways to assemble a unit. The size of the machines, design of the machines, layout of the powerhouse and delivery schedule of the components

are some of the elements that could result in additional steps, the elimination of some steps and/or assembly sequences.

It is understood that a publication of this type will be binding only if, and to the extent that, both contracting parties have agreed upon it.

Installations for refurbishment projects or for small hydro projects are not in the scope of this document. An agreement between all parties is necessary.

This document excludes matters of purely commercial interest, except those inextricably bound up with the conduct of installation.

The tolerances in this document have been established upon best practices and experience, although it is recognized that other standards specify different tolerances.

Wherever this document specifies that documents, drawings or information is supplied by a manufacturer (or manufacturers), each individual manufacturer will furnish the appropriate information for their own supply only.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

4 Concept

4.1 General

For vertical units, reference axes are defined in relation to upstream, looking at the unit from the generator end (see Figure 1). Upstream corresponds to the Y+ axis, 0° and 12 h 00. The angles increase in the clockwise direction; therefore, the X+ axis corresponds to 90°, the right hand side and 3 h 00.

For horizontal units, upstream is replaced by vertical up and downstream replaced by vertical down.

Figure 1 Axes definition for vertical units

4.2 Reference centre

The reference centre is the best centre of the designated (or specific) component that all other components should be aligned to.

4.3 Best centre

The best centre of a circular shape component corresponds to the point for which the

circularity has the minimal deviation. Its location is calculated from a set of radii at equal angles and measured from the reference centre.

Determination: The components x and y of the best centre from the reference centre can be calculated with the following two formulae, where 0° is located upstream and the angle increases clockwise:

where

n--is the number of readings;

Ri--is the measured radius;

thetai--is the angular position of each measurement.

Table 1 shows a sample calculation.

Table 1 Sample calculation

The explanation of how to calculate the best centre is given below (see Figure 2):

Thus the best centre of the component is located 0,11 units upstream (Y+) and 0,33 units to the left (X-) of the reference centre. Calculated radii based on the Best Centre as the new reference can be calculated in order to calculate circularity.

Figure 2 Best centre sample calculation

4.4 Concentricity

The concentricity is the radial distance, d, from the reference centre to the best centre of

The component (see Figure 3).

Figure 3 Concentricity

4.5 Circularity

Circularity is the difference between the maximum and minimum radii, measured from the component best centre (see Figure 4).

Figure 4 Circularity

4.6 Reference horizontal plane

The reference horizontal plane is a horizontal plane located at the average elevation of a feature on the component that the other component should be aligned to.

4.7 Reference vertical plane

The reference vertical plane is a vertical plane located at the average distance of a feature on the component that the other component should be aligned to.