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GB/T 46341-2025

Fundamental technical requirements for flexible operating hydropower turbines under ultra-wide load

超宽负荷灵活运行水轮机基本技术条件

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Table of Contents

Foreword

This document conforms to GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting is scheduled. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the China Electrical Equipment Industry Association. This document is under the jurisdiction of the National Technical Committee on Standardization of Hydropower Turbines (SAC/TC 175). This document was drafted by: Harbin Electric Machinery Co., Ltd., Chengdu Survey and Design Institute Co., Ltd. of China Power Construction Group, and Dongfang Electric Machinery Co., Ltd. Dongfang Electric Corporation, China Three Gorges Corporation, Datang Hydropower Research Institute Co., Ltd., China Electric Power Northwest Survey and Design Institute Co., Ltd. of China Construction Group, China Hydropower Engineering Consulting Group, Harbin Large Electric Machinery Research Institute Co., Ltd., State Grid Corporation of China Hunan Electric Power Research Institute, China Yangtze Power Co., Ltd., China Institute of Water Resources and Hydropower Research, China Hua... China Power Construction Corporation Limited, China Power Construction Group East China Survey and Design Institute Co., Ltd., and China Power Construction Group Beijing Survey and Design Institute Co., Ltd. Limited Company, China Power Construction Group Central and Southern Survey and Design Institute Co., Ltd., Huaneng Lancang River Hydropower Co., Ltd., Shanghai Voith Hydropower Equipment Co., Ltd., Andritz (China) Co., Ltd., Toshiba Hydroelectric Equipment (Hangzhou) Co., Ltd., Hangzhou Hangfa Power Equipment Co., Ltd. Company, China Huadian Electric Power Research Institute Co., Ltd., Zhejiang Fuchunjiang

Hydropower Equipment Co., Ltd., Yangtze River Survey, Planning and Design Research Co., Ltd. Company, Guoneng Dadu River Basin Hydropower Development Co., Ltd., Yalong River Basin Hydropower Development Co., Ltd., State Power Investment Corporation Yellow River Upper Reaches Hydropower Development Co., Ltd. Limited Liability Company. The main drafters of this document are. Qin Daqing, Jiang Dengyun, Wang Wei, Liu Demin, Liu Jie, Zhang Haiku, Duan Hongjiang, Tian Haiping, Zong Wanbo, and Ye Qingping. Fan Jiayi, Zhang Jianguang, Jiang Zhiqiang, Huang Jingqian, Zeng Mingfu, Zheng Yingxia, Yi Zhongyou, Wu Zhijun, Xu Dexin, Zhou Ye, Liu Tingting, Chen Peng, Wu Xidong Li Shuangjiang, Wu Zhenbo, Du Rongxing, Huang Qing, Lu Chi, Tian Ziqin, Sun Wenbin, Li Li, Langang, Zhang Huanneng, Liu Guofeng, Li Lin, Zhang Yong, Huang Haibing.

As the energy structure of new power systems continues to change, the proportion of intermittent energy sources such as wind and solar power is increasing, and hydropower units... Due to its rapid start-up and shutdown and strong load regulation capabilities, it can provide rapid compensation for load fluctuations from intermittent energy sources such as wind and solar power, thus contributing to the stability of the power grid. It is playing an increasingly important role. To ensure that mixed-flow turbines can fully function in new power systems, it is necessary to extend the long-term, continuous, safe, and stable operation of turbines. Operating load range. In recent years, the design, research and development, manufacturing quality, installation and commissioning level of my country's hydroelectric turbines have all greatly improved, and relevant standards have also... Changes have occurred, but there is still a lack of corresponding requirements in the research, development, manufacturing, installation, and commissioning of turbines capable of flexible operation under ultra-wide loads. To adapt to... This document was compiled to meet the needs of China's hydropower construction and the improvement of the new power system, and is intended to guide the flexible operation of ultra-wide load hydropower turbines in my country. The work includes bidding, tendering, ordering, design, manufacturing, and installation of the machine. This document is based on the summary, analysis, and conclusion of the design, manufacturing, and operation experience of existing and under-construction large-scale mixed-flow turbines. The above, taking into account the specific characteristics of water turbines that can operate flexibly under ultra-wide loads, is compiled in accordance with relevant current international, national, and industry standards or specifications. Made. The basic principle of this document is to fully consider the main characteristics of water turbines that can operate flexibly under ultra-wide loads and meet their key requirements. This document serves as the basis for the design and manufacture of ultra-wide load flexible operation turbine products, and can be used for bidding and ordering of such turbines. When... When there are other specific requirements regarding the performance, structure, and operation of the turbine products, these can be negotiated by both the supplier and the buyer and stipulated in the technical documents of the contract. clear. Basic technical conditions for ultra-wide load flexible operation of water turbines

1 Scope

GB/T 46341-2025 is the Chinese national standard covering the hydro turbine asked to run far outside its best efficiency point - the cavitation and the pressure pulsation in the draft tube at part load, the fatigue that follows from cycling, the number of starts and stops per day, and the design and monitoring that make it survivable. At 21,500 words. Hydro is being made to balance wind and solar, which is a duty these machines were not designed for. First edition, in force from 1 May 2026. Issued on 5 October 2025, it has been in force since 1 May 2026.

This document specifies the main technical parameters and performance requirements, structural design, and supply scope of ultra-wide load flexible operation turbines. The scope and interface, spare parts, factory inspection and testing items are specified, and the nameplate, packaging, transportation, storage, installation, operation, maintenance and verification are also outlined. The regulations to be followed during the acceptance test, etc. This document applies to vertical shaft mixed-flow turbines capable of long-term, continuous, ultra-wide load, and safe and stable operation, meeting the regulation requirements of new power systems. Hydro turbine. Suitable for both newly built hydroelectric power station shaft-mounted mixed-flow turbines and retrofitting/upgrading existing hydroelectric power station shaft-mounted mixed-flow turbines. The products for upgrading and retrofitting water turbines include upgrading only the water turbine runner, and upgrading the water turbine runner together with other components. This document provides guidance for the preparation of tender documents, design, manufacturing, installation, commissioning, and operation of ultra-wide load flexible operation hydro turbines. And for reference. This document applies to ultra-wide load flexible operation turbine products that meet one of the following conditions. Other types of turbines (including retrofitted turbines) are excluded. (For the water turbine group) can be implemented by reference.

a) Vertical shaft mixed-flow turbine with a rated power >= 50 MW.

b) Based on the characteristics of turbines at different head levels and the operational requirements of the unit, the following limits are set for the nominal diameter of the runner. --Vertical shaft mixed-flow turbines with a rated head <= 50 m and a runner nominal diameter D1 >=

4.0 m; For vertical shaft mixed-flow turbines with a rated head of <=100 m and a runner nominal diameter D1 >=

3.5 m; --100 m < Rated head <= 150 m for vertical shaft mixed-flow turbines, with runner nominal diameter D1 >= 3 m; --Vertical shaft mixed-flow turbines with a rated head of <=200 m and a runner nominal diameter D1 >=2 m; --For vertical shaft mixed-flow turbines with a rated head >.200 m, the nominal diameter of the runner D1 >= 2 m.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are listed below. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 191 Pictorial Symbols for Packaging and Storage

GB/T 2900.45 Electrical Engineering Terminology - Hydropower Station Hydraulic Machinery and Equipment

GB/T 3323.1 Nondestructive testing of welds-Radiological inspection-Part

5 Hydropower plants and pumping station units

GB/T 11805 Basic Technical Conditions for Automation Components (Device) and Systems of Hydropower Generator Sets

GB/T 15468 Basic Technical Conditions for Hydropower Turbines

GB/T 15469.1 Cavitation assessment of water turbines, pumps and pump-turbines - Part