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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 31066-2026

Replacing GB/T 31066-2014

**Electro-technical terminology - Control system for hydraulic
turbines**

电工术语 水轮机控制系统

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Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020, Directives for standardization-Part 1: Rules for the structure and drafting of standardizing documents.

This document replaces GB/T 31066-2014, Electro-technical terminology-Control system for hydraulic turbines. Compared with GB/T 31066-2014, and apart from structural adjustments and editorial changes, the main technical changes are set out in the document as a list of the definitions that have been revised, the English equivalents that have been corrected, the terms that have been renamed, and the terms and definitions that have been added.

Attention is drawn to the possibility that some of the content of this document may be the subject of patent rights. The issuing body of this document bears no responsibility for identifying patent rights.

This document was proposed by the China Electrical Equipment Industry Association. It is under the jurisdiction of the National Technical Committee on Hydraulic Turbines of

Standardization Administration of China (SAC/TC 175).

The previous editions of this document and of the document it replaces are as follows: first published in 2014 as GB/T 31066-2014; this is the first revision.

1 Scope

This document defines the terms specific to hydraulic turbine control systems.

This document applies to the drafting of standardizing documents in the field of hydraulic turbine control and to the preparation of technical documents and of tender and bid documents; it is used for reference in the writing and translation of specialist literature, teaching material, books and periodicals.

2 Normative references

There are no normative references in this document.

3 Types of equipment

3.1 governor; speed governor: General term for the one or several devices, made up of the mechanisms and indicating instruments, that carry out the regulation of a hydraulic turbine and the corresponding control.

3.2 mechanical hydraulic governor: Governor in which the speed measuring, damping and feedback signals are produced by mechanical means and combined by mechanical means, and in which the turbine servomotor is driven through a hydraulic amplification stage.

3.3 electric-hydraulic governor: Governor in which the detection of the controlled variable and the damping and feedback signals are produced by electrical means and are combined and amplified by electrical circuits, and in which the turbine servomotor is driven through an electro-hydraulic conversion and a hydraulic amplification stage.

3.4 microcomputer based governor: Electro-hydraulic governor that uses a microcomputer controller as the platform on which signals are measured, converted and transmitted and the control law is combined.

3.5 dual regulating governor: Governor that carries out the dual regulation of the guide vanes and the runner blades of a Kaplan turbine, of the needles and the deflectors (cut-in deflectors) of an impulse turbine, and of the guide vanes and the pressure regulating valve of a turbine fitted with a pressure regulating (relief) valve. [SOURCE: DL/T 563-2016, 3.6, modified]

3.6 governor without pressure vessel; through flow type governor: Governor with no pressure tank or accumulator, in which the oil pump (hydraulic pump) supplies oil directly to the turbine governing system.

3.7 governor with pressure tank: Governor in which oil is supplied to the turbine governing system by a pressure tank (a non-separated accumulator).

3.8 governor with accumulator: Governor in which oil is supplied to the turbine governing system by a hydraulically separated accumulator.

3.9 governor for pump-turbine: Governor used for the control of a pump-turbine.

3.10 governor for variable speed turbine/pump-turbine: Governor used for the control of a variable speed turbine or of a variable speed pump-turbine.

3.11 position operator; gate operator: Operating/control device that exerts no automatic regulating action on the unit and is able only to start and stop the unit, to bring it to a predetermined load once it has been connected to the grid, and to stop it automatically on receipt of an emergency signal.

3.12 electronic load controller: Electronic regulating device, built from electronic circuits, that controls the speed of the unit by balancing the load.

3.13 governor with electric motor driving opening operator: Governor that controls the opening of the turbine by means of an electric motor acting through a reduction gear or a ball screw.

3.14 oil pressure (supply) unit: Unit made up of a pressure tank/accumulator, a return oil tank, a motor, oil pumps, control valves, oil filters, connecting pipework and the associated ancillary components, which supplies hydraulic power to the control equipment of hydroelectric generating units and to the operating equipment of hydraulic steel structures.

4 Control system

4.1 hydraulic turbine governor (control) system: System made up of the items of equipment that detect the deviation between the controlled variables (speed, power, water level, flow, and so on) and the set (target) variables and convert that deviation, according to a given characteristic, into a travel of the main servomotor. NOTE: That is, the combination of the control equipment and components belonging to the hydraulic turbine governing system, including the control cubicle/governing cubicle, the oil pressure unit, the servo-system and the main servomotor.

4.2 controlled system/process: System controlled by the hydraulic turbine governor system. NOTE: It includes the turbine/pump-turbine, the water conveyance and discharge system, the generator/generator-motor together with its voltage regulator, and the grid into which the machine is connected.

4.3 hydraulic turbine governing/regulating system: Closed-loop regulating system made up of the hydraulic turbine governor system and the controlled system.

4.4 droop control: Regulating mode in which the hydraulic turbine governor system is in the

automatic regulating state and the permanent speed droop is not zero.

4.5 isochronous control: Regulating mode in which the hydraulic turbine governor system is in the automatic regulating state and the permanent speed droop is equal to zero.

4.6 servo-system; servo-positioner: Displacement feedback control system/device that automatically follows the output of the controller (regulator) and carries out signal conversion and power amplification.

5 Control functions

5.1 frequency [speed] control: Control mode in which the regulating system takes the frequency [speed] of the unit as the target of regulation.

5.2 power control: Autonomous closed-loop control mode in which the regulating system takes the active power of the unit as the target of regulation.

5.3 opening control: Control mode in which the regulating system takes the opening as the target of regulation.

5.4 level control: Control mode in which the regulating system takes the water level as the target of regulation.

5.5 flow control: Control mode in which the regulating system takes the flow as the target of regulation.

5.6 surge control: Control mode in which, in a low head turbine, a specific control is applied to the guide vanes and the runner blades of the turbine in order to limit the surge of the river.

5.7 primary frequency control/regulation; PFC/PFR: Control function by which, while the unit is running connected to the grid and the frequency of the local grid departs beyond the frequency (speed) dead band, the regulating system autonomously changes the active power of the unit or the opening of the guide vanes/needles (or the opening of the runner blades and of the deflectors), according to the droop or the permanent speed droop coefficient that has been set, so as to stop the frequency departing further from its rated value. NOTE: The primary frequency control function appears only in the opening regulating mode or in the power regulating mode, its target of regulation being the opening or the active power of the unit. In that situation the capacity of this unit is a small share of the current regulating capacity of the grid, the grid has a certain stability margin, and the change in the power of a single unit has only a limited effect on the grid, not enough to bring about frequency-power hunting and instability. Unlike AGC, it is an adjustment made to load changes of short period (below the minute scale), and what it responds to is the instantaneous deviation of the local frequency of the unit, whereas what AGC responds to is generally a remote power target command from the dispatching centre. [SOURCE: DL/T 563-2016, 3.29, modified]