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Replacing GB/T 14478-1993

Fundamental technical requirements for large and medium inlet valves of hydraulic turbine

大中型水轮机进水阀门基本技术条件

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Foreword

This Standard was drafted according to rules given by GB/T 1.1 2009.

This Standard replaces GB/T 14478-1993 "*Fundamental technical requirements for large and medium inlet valves of hydraulic turbine*". The main technical changes in this part are as follows, compared with GB/T 14478-1993:

— Remove "and the above" in paragraph 2 of Chapter 1; it is replaced by "to 10 000 mm" and "to 5 000 mm" respectively (see Chapter 1 in this Standard; Chapter 1 in edition 1993);

— Add the normative references (see Chapter 2 in this Standard; Chapter 2 in edition 1993);

— Modify the "resistance factor" from "0.2" to ""0.15" (see 4.5 in this Standard; 4.4 in edition 1993);

— Add "The butterfly valve seal shall be solid shroud seal, which shall be set at the downstream side of butterfly valve, and there shall be sufficient bearing crush between shroud and seal seat" (see 4.9 in this Standard);

— Modify and define the lock mode of inlet valve, that is "Reliable automatic hydraulic locking device shall be arranged at the fully closed position of inlet valve; and manual mechanical locking device for maintenance shall be arranged at the fully open and closed position. In principle, automatic hydraulic locking device shall not be arranged at the fully open position of butterfly valve. However, the decision whether setting it shall be determined according to the negotiation by supplier and purchaser; automatic hydraulic locking device shall not be arranged at the fully open position of ball valve." (See 4.10 in this Standard; 4.9 in edition 1993);

— Add "Reliable locking device shall be arranged in the overhaul sealing of valve." (See 4.10 in this Standard);

— Add "bypass-valve switching signal" and "pressure difference signals of upstream and downstream of valve" [see 4. 18d) and e) in this Standard]

— Add "when the inlet valve uses a separate oil pressure device in operating oil sources, if a set of oil pressure device controls two or three sets of inlet valves, then hydrodynamic closure of the inlet valve shall be ensured when the oil pump cannot be started." (See 4.16 in this Standard);

— Modify "the strength water pressure test time" from "10 min" to "30 min" (see 5.1 in this Standard; 5.1 in edition 1993);

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— Modify the coefficients in the formula for calculating the amount of leakage. The “K=0.402”, “K=0.223” and “K=0.103” were changed to be “K=0.052”, “K=0.023” and “K=0.004” respectively (See 5.1 in this Standard; 5.3 in edition 1993);

— Modify the reference pressure of leak test of servomotor, from "2.5 MPa" to "4 MPa" [see 5.2b) in this Standard; 5.4 in edition 1993];

— Add recommended list of spare parts (see Annex B in this Standard).

This Standard was proposed by the China Electrical Equipment Industrial Association.

This Standard shall be under the jurisdiction of the National Hydraulic Turbine Technical Standardization Committee (SAC/TC 175).

Drafting organizations of this Standard: DEC DONGFANG ELECTRIC MACHINERY CO.,LTD., Chengdu Hydroelectric Investigation & Design Institute of SPC, HARBIN ELECTRIC MACHINERY COMPANY LIMITED, and Huaneng Manwan Hydropower Plant.

Main drafters of this Standard: Lin Hongde, Jiang Dengyun, Gao Hongjun, and Wang Wenbin.

The previous version replaced by this Standard is as follows:

- GB/T 14478-1993.

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Fundamental technical requirements for large and medium inlet valves of hydraulic turbine

1 Scope

This Standard specifies the fundamental technical requirements, model preparation methods and others of large and medium inlet valves of hydraulic turbine.

This Standard applies to butterfly valves of which the nominal diameter of inlet valve is 1 000 mm ~ 10 000 mm, and ball valve of with the nominal diameter is 500 mm ~ 5 000 mm. Other butterfly valves and ball valves (including storage pumps and pump turbines) can refer to this Standard.

2 Normative references

The articles contained in the following documents have become part of this document when they are quoted herein. For the dated documents so quoted, all the modifications (Including all corrections) or revisions made thereafter shall be applicable to this document.

GB 150 (All parts) Pressure vessels

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 8564 Specification installation of hydraulic turbine generator units

GB/T 15468 Fundamental technical requirements for hydraulic turbines

GB/T 2900.45 Electrotechnical terminology - Hydroelectric power plant machinery (GB/T 2900.45-2006, IEC/TR 61364: 1999, MOD)

GB/T 28546 Specification for package, transportation and storage of large and medium hydraulic units

HG 4-329 Rubber Sealing Products (Circular)

ASME Volume III Section 1

3 Terms and definitions

For the purpose of this document, the following terms AND definitions defined in GB/T

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2900 apply.

3.1

Nominal diameter of inlet valve

D

The inner diameter of through-flow at the valve-body at where the inlet valve connects with upstream and downstream pressure water pipe flanges, the unit is millimeters (mm).

Note: If the inner diameters on both sides are different, take the smaller value.

3.2

Maximum static head

H_{st}

The height of waterspout that is formed between the horizontal centerline of inlet valve and the upstream, when the inlet valve is closed, the unit is meters (m).

3.3 Maximum static pressure

P_c

The water pressure that is formed between the horizontal centerline of inlet valve and the upstream, when the inlet valve is closed, the unit is Mega Pascal (MPa).

3.4

Maximum momentary pressure

$P_{m\ max}$

The maximum gauge pressure that is generated at the horizontal centerline of inlet valve in transition process, the unit is Mega Pascal (MPa).

3.5

Design pressure

P_d

The design pressure for the flow passage components of inlet valves. It shall be equal to the maximum momentary pressure, the unit is Mega Pascal (MPa).

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The working seal and overhaul seal shall be made of stainless steel; the seal position is required to be fit tightly.

4.10 Reliable locking device shall be arranged in the overhaul sealing of valve; manual mechanical locking device for maintenance shall be arranged at the fully open and closed positions.

Reliable locking device shall be set in the overhaul seal of inlet valve.

4.11 Bypass-valve or other structures with the same role shall be set in the inlet value. Expansion joint shall be arranged for the bypass pipeline that passes through the expansion joint of penstock. Reliable fixing measures shall be taken for bypass pipeline.

The nominal diameter of the bypass value shall be 10% of the nominal diameter of inlet valve.

4.12 Air valve shall be arranged for inlet valve; the air valve shall be equipped with the function of automatic intake and exhaust. The nominal diameter of air valve shall be less than 5% to 10% of the nominal diameter of inlet valve.

4.13 Expansion joint shall be arranged for inlet valve that is constructed to facilitate assembly and disassembly. The expansion joint seal shall not be leak after installed in power plant.

4.14 Overhaul valves are generally set for bypass-valves and air valves.

4.15 The moving sealing ring for the inlet valve may adopt either water pressure operation or oil pressure operation; if water pressure operation is adopted, then it shall use clean water; and take into account the sewage discharge measures at the bottom of the sealing ring. If oil pressure operation is adopted, then it shall ensure that the oil pressure is larger than the water pressure in steel pipes; and consider the discharge measures of oil-water.

4.16 When oil pressure hydraulic servomotor is used for the operation of inlet valve, it should set up oil leakage device, so as to collect the oil drained by automation elements and the oil discharged by the hydraulic servomotor at the time of maintenance.

When inlet valves operate the oil pressure devices that adopt independent oil sources, if one set of oil pressure device is used to control 2 or 3 sets of inlet valves, it needs to ensure the dynamic water closing of the inlet valve, under the condition that the oil pump could not be activated.

4.17 The inlet valve shall be capable of manual and automatic operation.

4.18 Generally, the inlet valve shall be equipped with signal devices as follows:

a) Valve opening and closing position signal;

b) Moving sealing ring position signal;

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q - The maximum allowable leakage amount when the rated operating oil pressure is 4 MPa, the unit is liters per minute (L/min);

p - The rated working oil pressure, the unit is mega Pascal (MPa).

5.3 When design pressure of the water seal weld of the valve of inlet valve is smaller than or equal to 0.6 MPa, it shall be subject to kerosene leakage test; penetration leakage is not allowed. When the design pressure is larger than 0.6MPa, magnetic particle or dye penetrant inspection shall be done to ensure water tightness.

5.4 Before the inlet valve is conducted for dynamic water closing test, detailed test plan shall be prepared by consulting with device contractor, so as to ensure the safety of test. After test, detailed examination shall be done for inlet valve and its ancillary equipment; there shall be no harmful damage.

6 Installations and operation

6.1 The installation at construction site shall be conducted according to requirements of GB/T 8564, drawings provided by device contractor, and requirements of related technical documents.

6.2 Water pressure or oil pressure test shall be done for oil pipeline, water pipeline and gas pipeline that are formed and welded at construction site; the test pressure shall be 1.5 times of the maximum working pressure of corresponding pipelines. The test time shall last for 30 minutes.

6.3 When the expansion joints and connecting pipes are welded with scroll extension tube or water steel pipe at construction site, the welding deformation shall be strictly controlled to ensure the vertical degree flange and concentricity of inlet valve centerline; the clearance around the extension joints shall be ensured to be even and meet the provisions of drawings. The 100% of non destructive examination shall be done for welding.

6.4 The operation shall be done strictly in accordance with relevant technical documents and automation operation procedure; maintenance shall be done regularly for inlet valve device and its accessories.

7 Supply range of complete set

7.1 The complete set of inlet valve that is operated by oil pressure generally includes:

a) The body of inlet valve and operating mechanism, expansion joints, the connecting pipes before water inlet and after water inlet, bypass-valve and bypass pipeline, air valve and oil collection equipment, pipeline and accessories;

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b) Oil pressure installation and oil pump group;

c) Automatic control elements.

7.2 Special tools and easy-wearable spare parts for inlet valve assembly and disassembly and maintenance.

7.3 Each inlet valve shall be equipped with the following technical documents:

a) Product installation and maintenance instructions;

b) The delivery schedule;

c) Record cards of product inspection and test in plant;

d) The main assembly drawings, basic free-body diagram, oil pressure installation drawing, automated operating system diagram, the main parts diagram, special tools diagram, and processing map of consumable parts.

Note: The types of drawings in term d) shall be specified specifically in the technical conditions signed by the supplier and purchaser.

8 Acceptance and assurance

8.1 Inlet valve products and main parts shall pass the inspection of manufacturer and be accompanied with documents that prove the qualification of the products before leaving factory. Users have the rights to inspect the quality and performance indicators of the products.

8.2 During product warranty, the leakage amount of inlet valve under normal working condition shall conform to the provisions in the technical agreement signed by supplier and purchaser.

8.3 In the condition that the product complies with technical condition and provisions of storage and use, the product warranty is 3 years from the date of delivery of the last batch of goods, or two years from the date of using with water. The period shall be subject to the earlier date of either one.

8.4 The overhaul warranty is five years. However, it shall be mutually agreed by both parties, for power plants with much mud and sand.

9 Nameplate, packaging, transportation and storage

9.1 Metal nameplate shall be installed on inlet valve, including manufacturer's name, valve model, nominal diameter, maximum static head, design pressure, rated oil pressure, date of production, etc.

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