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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Supercritical carbon dioxide boilers

超临界二氧化碳锅炉

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting is required. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is proposed and coordinated by the National Technical Committee for Standardization of Boilers and Pressure Vessels (SAC/TC 262). This document was drafted by: China Special Equipment Testing and Research Institute, Harbin Boiler Factory Co., Ltd., Xi'an Thermal Engineering Research Institute Co., Ltd. Harbin Institute of Technology, North China Electric Power University, Harbin Electric Science and Technology Co., Ltd., Shanghai Power Generation Equipment Complete Design Institute Co., Ltd., Huazhong University of Science and Technology, Dongfang Boiler Co., Ltd. of Dongfang Electric Corporation, and Xi'an Jiaotong University. The main drafters of this document are. Li Jun, Liu Guangkui, Qian Gong, Wei Guohua, Gao Jianmin, Huang Ying, Xiang Jun, Li Hongzhi, Bai Wengang, Du Qian, Zhu Zhongliang, Xie Min, Su Hongliang, Chen Xinzhong, Wang Shuo, Dong Heming, Yan Kai, Hao Weixun, Zhao Guangbo, Zhang Naiqiang, Zhu Youjun, Zeng Jie, Liang Zhiyuan, and Zhao Jiaxing. Supercritical carbon dioxide boiler

1 Scope

China's national standard for supercritical carbon dioxide boilers. The supercritical CO2 cycle is the most seriously pursued alternative to the steam Rankine cycle for power generation. Above its critical point carbon dioxide is a dense fluid that compresses like a liquid and expands like a gas, and a Brayton cycle using it reaches efficiencies above those of steam at the same temperature while requiring turbomachinery an order of magnitude smaller - a turbine for a hundred megawatts is the size of a desk. The attraction for China is direct: the same efficiency from less fuel, applicable to coal, to nuclear, to concentrated solar and to waste heat. The engineering difficulties are equally direct, and the boiler is where they concentrate: the working pressures are far above steam practice, the heat transfer behaviour near the critical point is unusual and imperfectly predictable, and the fluid is corrosive to many alloys at temperature.

This document specifies the materials, design, manufacture and inspection, safety accessories and instrumentation of supercritical carbon dioxide boilers (hereinafter referred to as boilers). General technical requirements for table, installation and operation. This document is applicable to supercritical carbon dioxide as the working fluid, with a rated outlet working fluid temperature greater than or equal to 500 °C and a rated outlet working Boilers with a pressure greater than or equal to 14 MPa and a single unit output less than or equal to 50 MW.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this text. Among them, the referenced documents with dates are. Only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document. document. GBZ

2.1 Occupational exposure limits for hazardous factors in the workplace Part

1.Chemical hazardous factors GBZ /T 223 Specification for installation of toxic gas detection and alarm devices in the workplace

GB/T 2900.48 Electrical terminology boiler

GB/T 8174 Testing and evaluation of thermal insulation effect of equipment and pipelines

GB 13223 Emission Standard of Air Pollutants from Thermal Power Plants

GB 13271 Boiler Air Pollutant Emission Standard

GB/T 16507 (all parts) Water tube boilers

GB/T 17357 Field determination of surface heat loss of equipment and pipeline insulation layer - heat flow meter method and surface temperature method

GB/T 22395 Code for Design of Boiler Steel Structures

GB/T 23938 High purity carbon dioxide

GB/T 34348 Technical requirements for power station boilers DL/T 435 Explosion-proof regulations for boiler furnaces in power plants NB/T 10939 Rules for acceptance inspection of boiler materials NB/T 47043 Technical Specification for Boiler Steel Structure Manufacturing NB/T 47049 Technical requirements for manufacturing tubular air preheaters NB/T 47055 General technical requirements for boiler coating and packaging NB/T 47060 Rotary air preheater

3 Terms and definitions

The terms and definitions defined in GB/T 2900.48 and the following apply to this document.

3.1 Supercritical carbon dioxide Carbon dioxide with a pressure greater than

7.38 MPa and a temperature greater than 31.1 °C.