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**General requirements and test methods for receivers of solar
thermal power plants**

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Table of Contents

1 Scope	1
2 Normative references	1
3 Terms, definitions, symbols and units	1
4 Collector tube performance test	2
4.1 General provisions	2
4.2 Identification and parameters	2
4.3 Manufacturing Instructions	2
4.4 Test instrument calibration	2
4.5 Heat loss test	2
4.6 Optical characteristic test	13
4.7 Durability test of collector tube	21
Appendix A (informative) Test report format	32
A.1 Description of collector tube (provided by manufacturer)	32
A.2 Test results---heat loss	33
A.3 Test Results---Optical Characteristic Test	34
A.4 Test results---Optical efficiency test	34
A.5 Test Results---Static Abrasion Test	35
A.6 Test results---Condensation test	35
A.7 Test Results---Impact Resistance Test. Method 1---Ice Hockey	35
A.8 Test Results---Impact Resistance Test. Method 2---Steel Ball	36
A.9 Test Results---The thermal stability test of the selective absorption coating of the collector tube	36
A.10 Test Results --- Thermal Stability Test of Selective Absorption Film of Steel Pipe Sample	36
A.11 Test results---thermal cycle test	37
A.12 Test results --- Bellows test	37
Appendix A (informative) Test report format	32
Appendix B (Informative) Application Note. Temperature Measurement in Heat Loss Test of Cartridge Heater --- Temperature Measurement Offset Correction	38
Reference	39

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 of Standardization Documents" Drafting.

The translation method used in this document is equivalent to the IEC TS62862-3-3.2020 "Solar Thermal Power Station Part 3-3. System and Department

General Requirements and Test Methods for Heat Collecting Tubes", the document type is adjusted from IEC technical specifications to my country's national standards.

The Chinese documents that have consistent correspondence with the normatively cited international documents in this document are as follows.

---GB/T 12936-2007 Solar thermal utilization term (ISO 9488.1999, NEQ).

The following editorial changes have been made to this document.

---Formula (3) parameter description "T1/2/N/N-1" amended to "T1, T2, TN, TN-1";

--- Formula (7) Supplementary parameter description. "dabs is the inner diameter of the heat absorption tube";

---"Labs,RT" in formula (7) is revised to "labs,RT";

---The unit "[m/ degrees C]" of kabs in the parameter description of formula (9) is revised to "[W/(m. degrees C)]";

--- "ST" in formula (12) is revised to "STH";

--- The unit of coefficient a2 in formula (18) "[W/(m. degrees C4)]" is revised to "[W/(m. degrees C4)]";

--- The number "(12)" of formula (12) mentioned in 4.5.8.2 is amended to "(18)";

--- The number "(12)" of formula (12) mentioned in 4.5.8.3 is amended to "(18)";

--- The unit "(W/(m. degrees C))" of the coefficient b1 in 4.5.8.4 is redundant and deleted;

--- The unit of coefficient b2 in 4.5.8.4 "(W/(m. degrees C2))" is revised to "(degrees C-2)";

--- The number "(13)" of formula (13) mentioned in 4.5.8.4 is amended to "(19)";

--- Formula (24) supplementary parameter description. "deltaT---fluid temperature rise, in degrees Celsius (degrees C)";

--- "4.7.1" mentioned in 4.7.6.3 is amended to "4.6.2";

--- "4.7" mentioned in 4.7.7.2 is amended to "4.6";

--- Formula (B.2) Supplementary parameter description. "In the formula, A, B, C, D, E, F are polynomial coefficients.".

Introduction

The collector tube is one of the core components of the solar thermal power station. The performance and durability of the collector tube are essential for the successful implementation of the solar thermal power station.

And stable operation is very important. In order to standardize the general requirements of solar thermal power station heat collector tubes and unify the test method, it is necessary to standardize it.

change. With the continuous construction of domestic solar thermal power plants, it is very necessary to establish universal and unified heat collection tube requirements and test methods.

Objectively and reasonably evaluate the performance and durability of the collector tube, promote the standardized development of solar thermal power stations, and ensure the long-term stability of solar thermal power stations.

Scheduled to run.

The collector tube is one of the most important and sensitive parts of Fresnel and parabolic trough power stations. The large mirror group is aligned and arranged along the mirror

The focal line concentrates up to 80 times the solar radiation onto the coated and evacuated heat collector tube. The generated heat is transported to the power generation device through the heat transfer fluid,

And converted into electrical energy.

The long-term stability of the quality and performance of the collector tube has a decisive influence on whether solar radiation can be effectively converted into heat energy. In order to make the power station

To achieve the highest efficiency, the collector tube must absorb as much solar radiation as possible and convert it into heat with minimal loss.

The collector tube (see Figure 1) mainly includes.

- * Steel heat-absorbing tube. The heat transfer fluid flows through the stainless steel heat-absorbing tube. The high-quality heat-absorbing tube coating can convert solar radiation into heat energy, and at the same time

Minimize infrared heat loss;

- * Glass casing. The casing is made of borosilicate glass and coated with an anti-reflection coating to increase the solar transmittance;

- * The area (annular space) filled with inert gas or evacuated between the heat absorption tube and the glass sleeve. between the heat absorption tube and the glass sleeve

The vacuum between is a necessary condition to suppress the convective heat transfer of the gas;

* Bellows. The bellows is necessary to compensate the different thermal expansion coefficients of the steel heat-absorbing tube and the glass sleeve. Contrary to glass sleeve, suction

The heat pipe expands greatly during operation.

Figure 1 Schematic diagram of collector tube

General requirements for collector tubes in solar thermal power stations and

Test Methods

1 Scope

This document specifies the use of line-focusing collectors in solar thermal power plants for absorbing focused solar radiation and heating it.

The technical requirements, test methods, durability and technical performance parameters of the heat collection tube that can be transferred to the heat transfer fluid. The collector tube described in this document consists of

It consists of a heat-absorbing tube and an insulating glass sleeve.

Note 1. Most of the test methods contained in this document are applicable to the collector tubes in parabolic trough CSP stations and Fresnel CSP stations.

This document contains the definitions of the technical characteristics, geometric characteristics and performance parameters of the collector tube, as well as the measurement of optical characteristics, heat loss and durability.

Try the method.

Note 2. At present, the accumulated experience of different test methods for collector tubes is not enough to determine which test method is the best. This document describes the currently available

All the different methods used, but no recommended method is defined.

For the sake of clarity, it is hereby stated that the heat loss test results described in this document do not represent the collector tubes installed in the collector field of a commercial power station

The heat loss.

The heat loss value obtained in the indoor test on a single collector tube is significantly lower than that under the actual outdoor operating conditions of the collector field of a commercial power station