



DPC: 25/30511386 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 09 September 2025

Origin: International

Latest date for receipt of comments: 01 October 2025

Project No. 2025/00827

Responsible committee: RHE/25 Solar Heating

Interested committees:

Title: Draft BS EN 62862-3-7 Ed.1.0 BS EN IEC 62862-3-7 Solar thermal electric plants. Part 3-7: Criteria for design, installation and performance verification of flexible pipe connectors in parabolic trough collector technology.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 01 October 2025

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



117/232/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 62862-3-7 ED1

DATE OF CIRCULATION:

2025-09-05

CLOSING DATE FOR COMMENTS:

2025-10-31

SUPERSEDES DOCUMENTS:

117/194/NP, 117/204A/RVN

IEC TC 117 : SOLAR THERMAL ELECTRIC PLANTS

SECRETARIAT:

Spain

SECRETARY:

Ms Lourdes González Martínez

OF INTEREST TO THE FOLLOWING COMMITTEES:

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

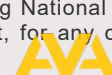
Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Solar thermal electric plants - Part 3-7: Requirements and test methods for flexible pipe connectors in parabolic trough collector technology

NOTE FROM TC/SC OFFICERS:

Copyright © 2025 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.



Documents

Document Sharing Hub

Link to Committee Draft (CD) online document:

<https://osd.iec.ch/#/editor/archive/23ef733b-733c-06e3-e063-2b13000a36b3/en/CD/1>

How to access

This link leads you to the Online Standards Development (OSD) platform for National Mirror Committee's (NMC) comments. The project draft may be found further down this document.

Resource materials

We recommend NCs to review the available materials to better understand the member commenting on the OSD platform. This includes the:

- [OSD NC roles overview](#)
- [How to add and submit comments to the IEC](#)

Contact

Should you require any assistance, please contact the [IEC IT Helpdesk](#).

CONTENTS

CONTENTS	1
FOREWORD	3
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Symbols and units	12
5 Characterization of flexible pipe connectors	12
5.1 General	12
5.2 Identification and geometry	12
5.3 Force transmitted to other components	14
5.4 Design requirements	14
5.5 Installation requirements for flexible pipe connectors	15
5.6 Performance verification test plan for flexible pipe connectors	15
5.7 Pressure loss test	15
5.8 Testing of mechanical load and longitudinal displacement and rotation of the flexible pipe connector	16
5.8.1 Objective and scope	16
5.8.2 Test conditions	16
5.8.3 Instrumentation	16
5.8.4 Testing methodology	17
5.8.5 Procedure	17
5.8.6 Evaluation	18
5.8.7 Calculations	18
5.8.8 Mechanical load curve examples of longitudinal and rotation movement	18
5.9 Thermal cycling test of the flexible pipe connector	19
5.9.1 Objective and scope	19
5.9.2 Test conditions	19
5.9.3 Instrumentation	20
5.9.4 Thermal cycling test procedure	20
5.9.5 Evaluation	21
5.9.6 Calculations	21
5.9.7 Thermal cycle curve models	21
5.10 Service life cycle test of the flexible pipe connector	22
5.10.1 Objective and scope	22
5.10.2 Test conditions	22
5.10.3 Instrumentation	23
5.10.4 Testing methodology	23
5.10.5 Test procedure	23
5.10.6 Evaluation	24
5.10.7 Calculations	24
5.11 Maximum torque test of a cylindrical rotary joint (<i>swivel</i> joint)	24
5.11.1 Objective and scope	24
5.11.2 Test conditions	24
5.11.3 Instrumentation and tooling	24
5.11.4 Testing methodology	25

5.11.5	Test procedure	25
5.11.6	Evaluation	25
5.11.7	Calculations.....	25
5.11.8	Peak torque curve models	25
5.12	Leak verification test.....	26
5.12.1	Objective and scope	26
5.12.2	Leak detection	26
5.12.3	Test conditions	27
5.12.4	Instrumentation.....	27
5.12.5	Testing methodology	27
5.12.6	Procedure.....	27
5.12.7	Evaluation	28
5.12.8	Calculations.....	28
6	Bibliography	28
Annex A	(normative) Test report for the flexible pipe connector	29
A.1	Test results - Stress and longitudinal displacement and rotation	29
A.2	Test results - Thermal cycle	30
A.3	Test results - Life cycle	30
A.4	Test results - Maximum torque	31
A.5	Test results - Leakage	31
Figure 1	– Example of a thermal cycle	7
Figure 2	– Longitudinal structural displacement of a parabolic trough solar collector: reference position ($x_0 = 0$) and position when there is displacement on the longitudinal axis of the reflector supporting structure (x_1 , with $x_1 > x_0$).....	8
Figure 3	– Axial distance and axial displacement	9
Figure 4	– Bending angle, rotational movement and alignment distance.....	10
Figure 5	– Angular travel and rotating radius	11
Figure 6	– Example of a system of three flexible joints (rotary joints)	11
Figure 7	– Flexible pipe connector composed of rotary joints	13
Figure 8	– Flexible pipe connector of flexible hoses	13
Figure 9	– Flexible pipe connector composed of flexible hose and swivel joint	14
Figure 10	– Example of a flexible pipe connector rotational stress curve.....	18
Figure 11	– Example of stress curve in translation movement of a flexible pipe connector.....	19
Figure 12	– Example of thermal cycling curves: upper: thermal cycles in an installation with direct heating of the heat transfer fluid by solar energy, lower: thermal cycles in an installation with direct heating of the heat transfer fluid by means of an auxiliary source (heater, electric resistances, etc.) allowing 24 h/day operation	22
Figure 13	– Specific tool for acting on the rotary joint - Wrench extension for applying higher torque values	25
Figure 14	– Grip and wear process for rotary joint failure process (torque values are indicative of previous experiences)	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Solar thermal electric plants -
Part 3-7: Criteria for installation and performance verification of flexible
pipe connectors in parabolic trough collector technology**

FOREWORD

- a) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- b) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- c) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- d) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- e) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- f) All users should ensure that they have the latest edition of this publication.
- g) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- h) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- i) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC [had/had not] received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62862-3-7 has been prepared by IEC technical committee 117: Solar thermal electric plants. It is an International Standard.

This **XXX** edition cancels and replaces the **XXX** edition published in [publication_date], **Amendment 1:[publication_date]** and **Amendment 2:[publication_date]**. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) ...;

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English [change language if necessary].

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

Introduction

In solar thermal power plants with parabolic trough collector technology, the solar field is made up of a set of parabolic trough collector loops, which track the sun to collect the concentrated solar energy in a linear focus where the receiver tubes are located. A heat transfer fluid circulates through the receivers collecting the thermal energy absorbed by them, transporting it to the power block where the electrical energy is generated, or thermal energy is used. The interconnection between collectors or between collectors and the field piping is made by means of flexible pipe connectors, which shall allow the angular tracking to the sun of the collectors and absorb the dilatations of the tubes, allowing the flow of the heat transfer fluid with the lowest possible losses of thermal energy and load and avoiding leaks of the heat transfer fluid.

This document is a result of the decision to develop a basic standard for the testing of flexible pipe connectors intended for use in solar thermal power plants with parabolic trough collector technology. Flexible pipe connectors that are following all aspects of this standard are considered to be designed, manufactured, installed and maintained in agreement with good engineering practice.

The requirements considered in this standard are important for designers, manufacturers, users and suppliers of flexible pipe connectors for solar thermal power plants with parabolic trough collector technology.

1 Scope

This standard specifies the minimum requirements for the design and verification of the performance of flexible pipe connectors in solar thermal power plants with parabolic trough collector technology. It also includes guidelines or aspects to be considered for the installation of these components in the solar field. In particular, the following are included:

- Manufacturer's design requirements, instructions and tests
- Installation requirements for flexible pipe connectors
- Pressure drop test
- Testing of stresses and longitudinal displacements and rotations
- Thermal cycling test
- Life cycle testing
- Maximum torque test
- Leakage verification test

Flexible pipe connectors can be:

- Rotary joints
- Flexible hoses
- Joints composed of flexible hoses and rotary joints

Other types and applications not explicitly mentioned in this document are outside the scope of this standard.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

UNE 206009, Centrales termosolares. Terminología (Solar thermal electric plants. Terminology)

UNE-EN 60534-1, Industrial-process control valves. Part 1: Control valve terminology and general considerations

UNE-EN 60534-2-3, Industrial-process control valves. Part 2-3: Flow capacity. Test procedures

UNE-EN ISO 9488, Solar energy. Vocabulary (urn:iec:std:iso:9488:::ISO 9488)

UNE-EN ISO 10380, Pipework. Corrugated metal hoses and hose assemblies (urn:iec:std:iso:10380:::ISO 10380)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Standards UNE 206009, UNE- EN ISO 9488, UNE- EN ISO 10380 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>

- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

bending angle

in a joint, angle between the axis of the fixed pipe and that of the movable pipe

3.2

mechanical cycle

process, or set of processes, corresponding to a rotational movement of a flexible pipe connector designed to connect two parabolic trough collector units or to connect a parabolic trough collector to the main supply or return pipe

3.3

thermal cycle

process or set of processes by which the temperature of a heat transfer fluid or component evolves over a time interval

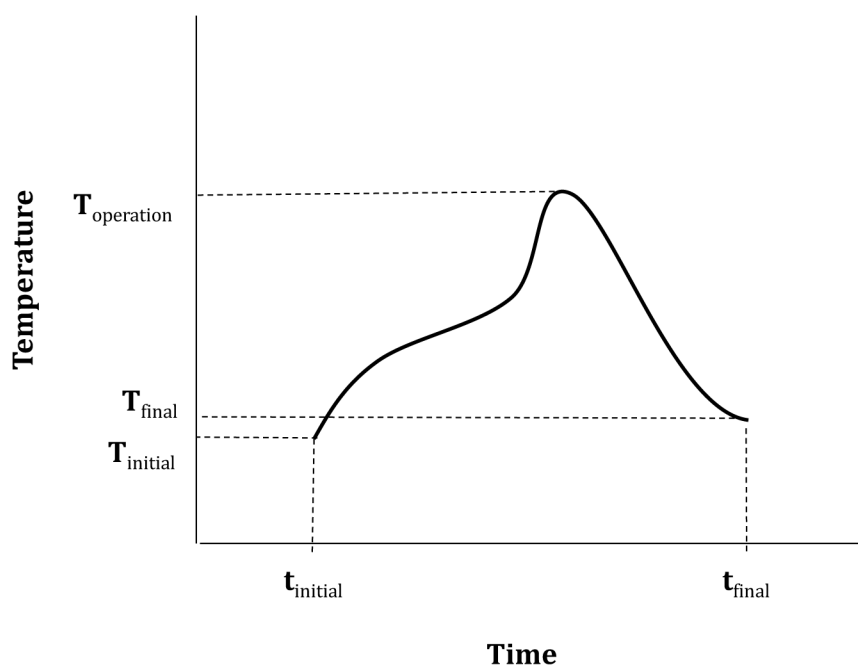


Figure 1 – Example of a thermal cycle

3.4

flow coefficient (K_v)

flow rate in m^3/h of water at a temperature between $5\text{ }^{\circ}\text{C}$ and $40\text{ }^{\circ}\text{C}$ that will pass through the pressurized equipment when there is a pressure drop of 1 bar (as defined in section 4.6.1 of UNE-EN 60534-1).

3.5

axial displacement

linear or angular distance due to expansion of the receiver tube by the temperature variation, which is absorbed by the flexible pipe connector

3.6

longitudinal structural displacement

expansion of the support structure of a parabolic trough solar collector that occurs in its longitudinal axis from the fixed point, i.e., the point where the collector drive system is located,