# Thermal solar systems and components - Custom built systems - Part 5: Performance test methods for control equipment

EESTI STANDARDIKESKUS
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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD



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|---|---|
| See Eesti standard EVS-EN 12977-5:2018 sisaldab Euroopa standardi EN 12977-5:2018 ingliskeelset teksti. | This Estonian standard EVS-EN 12977-5:2018 consists of the English text of the European standard EN 12977-5:2018. |
| Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. | This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation. |
| Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 04.04.2018. | Date of Availability of the European standard is 04.04.2018. |
| Standard on kättesaadav Eesti Standardikeskusest. | The standard is available from the Estonian Centre for Standardisation. |

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 27.160

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 12977-5

April 2018

ICS 27.160

Supersedes EN 12977-5:2012

English Version

# Thermal solar systems and components - Custom built systems - Part 5: Performance test methods for control equipment

Installations solaires thermiques et leurs composants - Installations assemblées à façon - Partie 5 : Méthodes d'essai de performances pour systèmes de régulation

Thermische Solaranlagen und ihre Bauteile - Kundenspezifisch gefertigte Anlagen - Teil 5: Prüfmethoden für die Regeleinrichtungen

This European Standard was approved by CEN on 29 October 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (EN 12977-5:2018) has been prepared by Technical Committee CEN/TC 312 “Thermal solar systems and components”, the secretariat of which is held by ELOT.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2018, and conflicting national standards shall be withdrawn at the latest by October 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12977-5:2012.

This document has been prepared under the Mandate M/534 “Standardisation request to the European standardisation organisations pursuant to Article 10(1) of Regulation (EU) No 1025/2012 of the European Parliament and of the Council in support of implementation of Commission Regulation (EU) No 814/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water heaters and hot water storage tanks and Commission Delegated Regulation (EU) No 812/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of water heaters, hot water storage tanks and packages of water heater and solar device” which was given to CEN by the European Commission and the European Free Trade Association.

EN 12977 is currently composed with the following parts:

— *Thermal solar systems and components — Custom built systems — Part 1: General requirements for solar water heaters and combisystems*;

— *Thermal solar systems and components — Custom built systems — Part 2: Test methods for solar water heaters and combisystems*;

— *Thermal solar systems and components — Custom built systems — Part 3: Performance test methods for solar water heater stores*;

— *Thermal solar systems and components — Custom built systems — Part 4: Performance test methods for solar combistores*;

— *Thermal solar systems and components — Custom built systems — Part 5: Performance test methods for control equipment*.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

# Introduction

One purpose of this document is to define how to check that a controller is behaving as it is intended when in combination with associated equipment (e.g. sensors, pumps and other actuators). In addition, function testing of differential thermostats and so-called “multi-function” controllers are described in order to determine switch on and switch off temperature differentials as well as control algorithms where dependent on temperature differences, temperature levels or operating conditions of the system. For all functions and operations, it should be tested and documented, whether the controller and control equipment comply with the manufacturer's guidance.

In addition, the capability for all sensors to resist extreme operating conditions and to determine any significant drift in accuracy caused by this should be tested. The energy consumption of the controller and the associated control equipment should be documented, e.g. actuators. If the electrical supply is different from the mains supply this should be documented, e.g. PV powered pumps.

Performance predictions for the associated system that the control equipment belongs to are considered. For the determination of the component parameters according to the CTSS method, as specified in EN 12977-2:2018, a detailed investigation of all relevant algorithms, features and parameters controlling the system is relevant.

The most widely used control equipment for solar heating systems is described in EN 12977-5:2018. For control equipment not widely used in solar heating systems or auxiliary heaters, if part of the system, accompanying standards should be applied if available.

In respect of potential adverse effects to human health or life (e.g. drinking water quality) caused by the products covered by EN 12977-5:2018 it should be noted that:

— this document provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

— while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

EN 12976-1:2017, EN 12976-2:2017 as well as EN 12977-1:2018, EN 12977-2:2018, EN 12977-3:2018, and EN 12977-4:2018 distinguish two categories of solar heating systems:

1) factory made solar heating systems;

2) custom built solar heating systems.

As defined in EN 12977-1:2018, the classification of a system as factory made or custom built is a choice of the final supplier.

Custom built solar heating systems are subdivided into two categories:

a) large custom built systems are uniquely designed for a specific situation;

b) small custom built systems offered by a company are described in a so-called assortment file, in which all components and possible system configurations, marketed by the company, are specified;

# 1 Scope

This European Standard specifies performance test methods for control equipment. Furthermore, this document contains requirements on accuracy, durability and reliability of control equipment.

The tests described in this document are limited to electrically activated components delivered with or for the system by the final supplier. For the purposes of this document controller and control equipment for solar heating systems and auxiliary heaters, if part of the system, are restricted to the following:

a) Controllers as:

   1) system clocks, timers and counters;

   2) differential thermostats;

   3) multi-function controllers.

b) Sensors as:

   1) temperature sensors;

   2) irradiance sensors (for short wave radiation);

   3) pressure sensors;

   4) level sensors;

   5) flow meters;

   6) heat meters.

c) Actuators as:

   1) pumps;

   2) solenoid and motor valves;

   3) relays.

d) Combinations of controllers, sensors and actuators listed above.

An additional objective of the procedures described in this document is to verify control algorithms and, together with the accuracy of sensors, to determine control parameters. In addition to verifying the functioning of a controller, its equipment and actuators, the determined parameters may be used for numerical system simulations.

Typically, electrical anodes are not part of the control equipment and are not controlled by the control equipment. However, because they are electrical appliances, electrical anodes are included in this document.

This document is valid for control equipment of solar heating systems for the purpose of hot water preparation and/or space heating. If the solar system is connected to or part of a conventional heating system, the validity is extended to the entire system. In combination with the standards EN 12976-1:2017, EN 12976-2:2017 as well as EN 12977-1:2018, EN 12977-2:2018, EN 12977-3:2018 and EN 12977-4:2018, this document is valid for:

e) factory made solar heating systems,

f) small custom built solar heating systems,

g) large custom built solar heating systems,

h) auxiliary heater equipment used in connection with e), f) and g).

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12976-1:2017, *Thermal solar systems and components - Factory made systems - Part 1: General requirements*

EN 12977-1:2018, *Thermal solar systems and components — Custom built systems — Part 1: General requirements for solar water heaters and combisystems*

EN 16297 (all parts), *Pumps - Rotodynamic pumps - Glandless circulators*

EN 60255 (all parts), *Measuring relays and protection equipment (IEC 60255, all parts)*

EN 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1)*

EN 60335-2-21, *Household and similar electrical appliances - Safety - Part 2-21: Particular requirements for storage water heaters (IEC 60335-2-21)*

EN 60730 (all parts), *Automatic electrical controls for household and similar use (IEC 60730, all parts)*

EN 62305-3, *Protection against lightning - Part 3: Physical damage to structures and life hazard*

EN ISO 4413, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010)*

EN ISO 9488:1999, *Solar energy - Vocabulary (ISO 9488:1999)*

EN ISO 9806, *Solar energy - Solar thermal collectors - Test methods (ISO 9806:2013)*

ISO 9060, *Solar energy — Specification and classification of instruments for measuring hemispherical solar and direct solar radiation*

ISO 15218, *Pneumatic fluid power — 3/2 solenoid valves — Mounting interface surfaces*