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Foreword

This document (prEN 12976-1:2004) has been prepared by Technical Committee CEN/TC 312 "Thermal solar systems and components", the secretariat of which is held by ELOT.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12976-1:2000.

Annex A is informative.

Introduction

Drinking water quality

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this standard:

a) This standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

Factory Made and Custom Built solar heating systems

The standards EN 12976-1:2000 as well as EN 12976-2:2000 and the prestandards prENV 12977-1:2000 to prENV 12977-3:2000 distinguish two categories of solar heating systems: **Factory Made** solar heating systems and **Custom Built** solar heating systems. The classification of a system as Factory Made or Custom Built is a choice of the final supplier, in accordance with the following definitions.

Factory Made solar heating systems are batch products with one trade name, sold as complete and ready to install kits, with fixed configurations. Systems of this category are considered as a single product and assessed as a whole. If a Factory Made Solar Heating System is modified by changing its configuration or by changing one or more of its components, the modified system is considered as a new system for which a new test report is necessary. Requirements and test methods for Factory Made solar heating systems are given in EN 12976-1:2000 and EN 12976-2:2000.

Custom Built solar heating systems are either uniquely built, or assembled by choosing from an assortment of components. Systems of this category are regarded as a set of components. The components are separately tested and test results are integrated to an assessment of the whole system. Requirements for Custom Built solar heating systems are given in prENV 12977-1:2000, test methods are specified in prENV 12977-2:2000 and prENV 12977-3:2000. Custom Built solar heating systems are subdivided into two categories:

- **Large Custom Built systems** are uniquely designed for a specific situation. In general HVAC engineers, manufacturers or other experts design them.

- **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. Each possible combination of a system configuration with components from the assortment is considered as **one** Custom Built system.

Table 1 shows the division for different system types:

Table 1 - Division for factory made and custom built solar heating systems

Factory Made Solar Heating Systems (EN 12976-1, -2)	Custom Built Solar Heating Systems (ENV 12977-1, -2, -3)
Integral collector-storage systems for domestic hot water preparation	Forced-circulation systems for hot water preparation and/or space heating, assembled using components and configurations described in a documentation file (mostly small systems)
Thermosiphon systems for domestic hot water preparation	
Forced-circulation systems as batch product with fixed configuration for domestic hot water preparation	Uniquely designed and assembled systems for hot water preparation and/or space heating (mostly large systems)

NOTE 1 Forced circulation systems can be classified either as Factory Made or as Custom Built, depending on the market approach chosen by the final supplier.

NOTE 2 Both Factory Made and Custom Built systems are performance tested under the same set of reference conditions as specified in annex B of EN 12976-2:2000 and annex A of prENV 12977-2:2000. In practice, the installation conditions may differ from these reference conditions.

NOTE 3 A Factory Made system for domestic hot water preparation may have an option for space heating, however this option should not be used or considered during testing as a Factory Made system.

1 Scope

This European Standard specifies requirements on durability, reliability and safety for Factory Made thermal solar heating systems. The standard also includes provisions for evaluation of conformity to these requirements.

The requirements in this standard apply to Factory Made solar systems as products. The installation of these systems itself is not considered, but requirements are given for the documentation for the installer and the user which is delivered with the system (see also the clause 3).

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 307, *Heat exchangers — Guidelines to prepare installation, operating and maintenance instructions required to maintain the performance of each type of heat exchanger*

EN 806-1:1999, *Specifications for installations inside buildings conveying water for human consumption — Part 1: General*

EN 809, *Pumps and pump units for liquids — General safety requirements*

EN 1151, *Pumps — Rotodynamic pumps — Circulation pumps having an electrical effect not exceeding 200 W for heating installations and domestic hot water installations — Requirements, testing, marking*

EN 1489, *Building valves — Pressure safety valve — Tests and requirements*

EN 1490, *Building valves — Combined temperature and pressure relief valves — Tests and requirements*

EN 1717, *Protection against pollution of potable water in drinking water installations and general requirements of devices to prevent pollution by backflow*

ENV 1991-2-3, *Eurocode 1 — Basis of design and actions on structures — Part 2 - 3: Action on structures - Snow loads*

ENV 1991-2-4, *Eurocode 1: Basis of design and actions on structures — Part 2 - 4: Action on structures - Wind loads*

EN 12975-1:2000, *Thermal solar systems and components — Solar collectors — Part 1: General requirements*

EN 12975-2, *Thermal solar systems and components — Solar collectors — Part 2: Test methods*

EN 12976-2:2000, *Thermal solar systems and components — Factory made systems — Part 2: Test methods*

EN 60335-1, *Safety of household and similar electrical appliances — Part 1: General requirements (IEC 60335-1:1991 modified)*

EN 60335-2-21, *Safety of household and similar electrical appliances — Part 2: Particular requirements for storage water heaters (IEC 60335-2-21:1997 + Corrigendum 1998, modified)*

ENV 61024-1, *Protection of structures against lightning — Part 1: General principles (IEC 61024-1:1990, modified)*

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

ISO/TR 10217, *Solar energy — Water heating systems — Guide to material selection with regard to internal corrosion*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN ISO 9488 apply, together with the following additional definition:

Factory Made solar system
A packaged solar energy system for the purpose of hot water preparation only, either of the close-coupled or remote-store type. The system consists of either one integral component or of a uniform set and configuration of components. It is produced under conditions, which are presumed uniform, and offered for sale under the same trade name.

NOTE 1 A single system can be tested as a whole in a test laboratory, leading to representative results for all systems with the same trade name, configuration, components and dimensions (see also the Introduction).

NOTE 2 External auxiliary water heating devices that are placed in series with the Factory Made system are not considered to be part of the system.
Cold water piping from the cold water grid to the system as well as piping from the system to an external auxiliary heater or to tapping points is not considered to be part of the system.
Piping between components of the Factory Made system is considered to be part of the system.
Any integrated heat exchanger or piping for space heating option (see Introduction, NOTE 3) is not considered to be part of the system.

4 Requirements

4.1 General

The system shall fulfil general safety requirements, e.g. care shall be taken to avoid protruding sharp edges on the outside of the system.

4.1.1 Suitability for drinking water

The system shall conform to EN 806-1:1999 (see also Introduction).

4.1.2 Water contamination

The system shall conform to EN 1717.

4.1.3 Freeze resistance

4.1.3.1 General

The manufacturer shall state a minimal allowed temperature for the system. The parts of the system that are exposed to the outdoors shall be able to withstand freezing to this specified temperature without any permanent damage.

The manufacturer shall describe the method of freeze protection used for the system.

Any indoor components that are to be installed in places where temperatures can drop below 0 °C, shall be protected against freezing.

The freezing mechanism shall be tested in accordance with 5.1 of EN 12976-2.

4.1.3.2 Freeze protection by means of antifreeze fluid

The manufacturer shall define the composition of the heat transfer fluid, including additives, allowed for the system.

Precautions shall be taken to prevent the antifreeze fluid from deterioration as a result of high temperature conditions. These precautions shall be checked in accordance with 5.2 of EN 12976-2.

NOTE In general the minimal allowed temperature of the system is equal to the freezing point of the antifreeze fluid. If the concentration of some antifreeze fluids - like glycols - exceeds a certain limit, they can freeze without damaging the system. In this case the minimal allowed temperature can be lower than the freezing point of the antifreeze fluid.

4.1.4 Overtemperature protection

The system shall have been designed in such a way that prolonged high solar irradiation without heat consumption does not cause any situation in which special action by the user is required to bring the system back to normal operation.

When the system has a provision to drain an amount of drinking water as a protection against overheating, the hot water drain shall be constructed in such a way that no damage is done to the system or any other materials in the house by the drained hot water. The construction shall be such that there is no danger to inhabitants from steam or hot water from the drain (see 4.6.2).

When the overheating protection of the system is dependent on electricity supply and/or cold water supply, this shall be stated clearly in the instructions and on the system (see 4.6.3 and 4.7).

In case of drainback, system shall be checked in accordance with 5.1 of EN 12976-2.

4.1.4.1 Scald protection

When the system is tested in accordance with 5.2 of EN 12976-2, no steam shall escape from any tapping point. When this test has been performed with other than the highest irradiations this shall be mentioned in the documentation for the user (see 4.6.3).

For systems in which the temperature of the domestic hot water delivered to the user can exceed 60 °C, the assembly instructions shall mention that an automatic cold water mixing device or any other device to limit the tapping temperature to at most 60 °C+/- 5°C shall be installed on the solar system or elsewhere in the domestic hot water installation (see also 4.6.2).

This device shall be able to withstand the maximum possible tap water temperature from the solar system.

4.1.4.2 Over temperature protection for materials

The system shall have been designed in such a way that the maximal allowed temperature of any material in the system is never exceeded.

4.1.5 Reverse flow protection

The system shall contain provisions in order to prevent increased heat loss resulting from reverse flow in any circuit. This shall be checked in accordance with 5.11 of EN 12976-2:2000.

4.1.6 Pressure resistance

The storage tank and heat exchangers in this tank shall withstand the lowest of the following pressures:

- 1,5 times the manufacturer's stated maximum working pressure;
- the manufacturer's stated maximum test pressure.

When tested in accordance with 5.3 of EN 12976-2:2000 to the above pressures, there shall be no visible permanent damage or leakage of the system components and interconnections. After the waiting period in the test, the hydraulic pressure shall not have dropped more than 10 % from the value measured at the start of the waiting period.

When non-metallic materials are used in any circuit, this circuit shall withstand the above-mentioned pressures for at least one hour when tested at high temperature in accordance with EN 12975-1:2000.

The drinking water circuit shall withstand the maximum pressure required by national/European drinking water regulations for open or closed drinking water installations.

The system shall have been designed in such a way that the maximal allowed pressure of any materials in the system is never exceeded.

Every closed circuit in the system shall contain a safety valve. This safety valve shall withstand the highest temperature that can be reached at its location. It shall conform to EN 1489. If thermostatic valves are used, these shall conform to EN 1490.