
INTERNATIONAL STANDARD



3147

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Heat exchangers — Verification of thermal balance of water-fed or steam-fed primary circuits — Principles and test requirements

Échangeurs thermiques — Établissement du bilan thermique des circuits primaires alimentés en eau ou en vapeur — Principes et conditions d'essai

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3147 was drawn up by Technical Committee ISO/TC 116, *Space-heating appliances*, and circulated to the Member Bodies in October 1973.

It has been approved by the Member Bodies of the following countries :

Australia	France	Romania
Belgium	Germany	South Africa, Rep. of
Bulgaria	Italy	Sweden
Czechoslovakia	Korea, Rep. of	Thailand
Denmark	Netherlands	Turkey
Egypt, Arab Rep. of	New Zealand	United Kingdom
Finland	Norway	Yugoslavia

No Member Body expressed disapproval of the document.

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Heat exchangers — Verification of thermal balance of water-fed or steam-fed primary circuits — Principles and test requirements

1 SCOPE

This International Standard defines the principles and test requirements for the experimental verification of the thermal balance of water-fed or steam-fed primary circuits of heat exchangers.

A number of suitable arrangements of test apparatus are illustrated in the annex.

2 FIELD OF APPLICATION

This International Standard is applicable to tests performed in the steady-state condition, in accordance with the specifications laid down for each type of appliance in the relevant International Standards.

Where appropriate, special arrangements required for certain types of appliance may also be given in these International Standards.

3 TESTS

3.1 Principles

The energy input to the heat exchanger via the primary fluid may be ascertained by means of measurements performed in accordance with either of the following principles :

3.1.1 Measurement of the flow of primary fluid through the heat exchanger and of its thermodynamic characteristics at inlet and outlet.

The energy input is then given by the formula :

$$\phi = q_m (h_1 - h_2)$$

where

ϕ is the energy input to the heat exchanger, in watts;

q_m is the mean mass flow of the primary fluid, in kilograms per second;

h_1 and h_2 are the specific enthalpies of the primary fluid at the inlet and outlet respectively of the appliance, in joules per kilogram.

The values of h_1 and h_2 are deduced from the pressures, the temperatures and the state of the primary fluid at the inlet and outlet of the appliances under test, as presented in the current data published by the International Conference on Properties of Steam.

The value of q_m is measured throughout the course of the test.

3.1.2 Measurement of the energy input to the primary fluid circuit (for example, by electrical immersion units) and subtraction from this value of the losses other than those from the appliance itself, determined for each test by calibration

The entire circuit comprising the heat source and the heat exchanger must be so insulated (with the single exception of the heat exchanger itself) that heat losses are kept low.

The procedure adopted for determining these losses during calibration and the choice of parameters to be used to calculate them shall be stated jointly in the test report.¹⁾

The energy input is then given by the formula :

$$\phi = \phi_c - \phi_p$$

where

ϕ is the energy input to the heat exchanger, in watts;

ϕ_c is the energy input to the entire circuit, in watts;

ϕ_p are the losses, in watts, calculated for the particular test conditions, with the heat exchanger connected. These losses must be as small as possible, and must not exceed 10 % of the output of the appliance under test in any circumstances.

1) These losses depend on

- the temperatures of the primary fluid, which will be affected by the presence of the appliance under test; this will be of greater significance as the temperature drop increases;
- the methods adopted for the cooling of various components of the primary circuit (steam generator, pump, pipework); this cooling is not generally controlled and can vary during calibration and testing.