

INTERNATIONAL STANDARD

ISO
7772-3

First edition
1996-09-01

Assessment of industrial laundry machinery by its effect on textiles —

Part 3: **Flatwork-ironing machines**

ISO 7772-3:1996

<https://standards.iteh.ai/catalog/standards/sist/ae571a4d-4f5b-483f-9c90-4a92f2ec306c/iso-7772-3-1996>
Évaluation des machines à laver industrielles par leurs effets sur les textiles —

Partie 3: Sécheuses-repasseuses



Reference number
ISO 7772-3:1996(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 7772-3 was prepared jointly by Technical Committees ISO/TC 38, *Textiles*, and ISO/TC 72, *Textile machinery and allied machinery and accessories*.

ISO 7772 consists of the following parts, under the general title *Assessment of industrial laundry machinery by its effect on textiles*:

- Part 1: *Washing machines*
- Part 2: *Extracting machines*
- Part 3: *Flatwork-ironing machines*
- Part 4: *Batch-drying tumblers*

Annexes A to D form an integral part of this part of ISO 7772.

© ISO 1996

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

The rapid technical development of laundry machinery and the changes in the pattern of purchasing have led to an urgent need for a standard means of assessment of the effect of machine performance on textiles.

Two different approaches to the provision of the necessary information were considered:

- a) definition of essential specifications for laundry machinery for use by agreement between manufacturer and customer (see for example ISO 9398);
- b) preparation of standard methods for rating and assessing the effect of the principal types of machine so that the results obtained on machines of a similar type could be compared directly wherever the machines were located and whenever they were tested.

This International Standard deals with the second approach, since the urgent need was for procedures that could be used on a range of machines to evaluate their effects under reproducible conditions, including specification of the loads to be used.

Thus it will be possible to compare the basic effects of one machine against another, and a machine against a specification quoted in a contract. No performance level is set. Another advantage in the approach adopted is that the tests can be conducted at any location where the necessary services are available.

It is planned to publish the following four parts to ISO 7772:

Part 1: Washing machines

Part 2: Extracting machines

Part 3: Flatwork-ironing machines

Part 4: Batch-drying tumblers

It is hoped that, with the advance of techniques, and widespread use of these parts of ISO 7772, updated methods can be incorporated.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This page intentionally left blank

ISO 7772-3:1996

<https://standards.iteh.ai/catalog/standards/sist/ace71a4d-4f5b-482f-9c90-de92f4ec306c/iso-7772-3-1996>

Assessment of industrial laundry machinery by its effect on textiles —

Part 3: Flatwork-ironing machines

1 Scope

This part of ISO 7772 specifies methods for the assessment of flatwork-ironing machines with rolls of surface area greater than 1,0 m² that are used in the industrial-laundrying field. The types of flatwork-ironing machine covered by this part of ISO 7772 are described in annex A. This part of ISO 7772 applies to ironing machines heated by steam, thermal fluid, gas or electrical power. The standard does not apply to drying cylinders.

The tests can be conducted within an operating laundry and only require the use of equipment that is normally available, but this does not preclude use of the tests in other locations.

The test results do not establish an output rating, which is dependent upon the efficiency of the operators, but provide an indication of the performance of the ironing machine based on the following parameters:

- a) the rate at which the textile will give up moisture, expressed in kilograms per hour, from fabric of known bone-dry mass, when the machine is operated under the conditions and in the manner specified;
- b) the total energy consumption during processing as specified, expressed as kilojoules (or kilowatt hours) per kilogram of moisture removed;
- c) assessment of the finish of the test articles in terms of absence of creases or wrinkling on ironing.

The methods described in this part of ISO 7772 can be used separately, and therefore any combination of them can be agreed on between the interested parties.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7772. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7772 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3801:1977, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area*.

ISO 3932:1976, *Textiles — Woven fabrics — Measurement of width of pieces*.

ISO 5081:1977, *Textiles — Woven fabrics — Determination of breaking strength and elongation (Strip method)*.

ISO 7211-2:1984, *Textiles — Woven fabrics — Construction — Methods of analysis — Part 2: Determination of number of threads per unit length*.

ISO 9398-1:1993, *Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics — Part 1: Flatwork ironing machines*.

ISO 9398-2:1993, *Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics — Part 2: Batch drying tumblers*.

ISO 9398-3:1993, *Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics — Part 3: Washing tunnels*.

ISO 9398-4:1993, *Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics — Part 4: Washer-extractors*.

3 Definitions

For the purposes of this part of ISO 7772, the following definitions apply.

NOTE 1 Definitions of the particular types of flatwork-ironing machine are given in annex A.

3.1 bed: A heated body shaped to correspond to the diameter of the clothed roll.

3.2 bone-dry mass (BDM) (moisture content between 0,5 % and 1,0 %): The mass of a clean textile article (or number of articles) after being dried in a specified manner, when successive determinations of mass after several drying procedures show no progressive change in mass of the textile greater than 0,5 %.

NOTE 2 Specified drying procedures include repeated processing of the article or articles in a heated tumbler from which the exhaust air reaches a temperature of not less than 80 °C nor more than 120 °C, or by repeatedly passing the article or articles through a flatwork-ironing machine. These temperatures are appropriate to cotton fabrics which constitute the test loads and test pieces specified in this part of ISO 7772.

3.3 clothing: The roll covering which provides a resilient surface to allow for unevenness of articles being processed, the absorption of moisture, and the drive.

3.4 accordian fold: The fold created when a textile article is folded backwards and forwards upon itself.

3.5 drying capacity: The amount of water removed by the process in unit time.

3.6 feed gap: The distance between the end of one article and the start of the next being fed into an ironing machine.

3.7 finish: The appearance and feel of a fabric which has been smoothed by being subjected to the appropriate finishing process.

3.8 flatwork: A textile article which can be satisfactorily dried and smoothed by being passed through a flatwork-ironing machine, e.g. large flatwork (typically a bed sheet).

3.9 flatwork-ironing machine: A machine for the mechanical smoothing and drying of damp washing, generally comprising one or more heated or non-heated rolls of ferrous or non-ferrous construction, wrapped with layers of resilient material.

These rolls are power-driven and revolve in heated beds, of ferrous construction, which are arranged in a segment of a circle such that any material inserted between the roll and bed will pass between them in a continuous motion. A multi-roll machine feeds the material through a succession of rolls and beds (see annex A).

3.10 heating fluid: Any fluid used as a heat-transfer medium.

3.11 hem (as on a sheet): The transverse borders formed by turning in the cut edge and sewing it down.

3.12 roll: A cylindrical body driven and rotating about a generally horizontal centreline in the bed.

3.13 selvages (as on a sheet): The woven longitudinal edges, so constructed that there are no loose ends and the weft will not unravel.

3.14 working surface: The contact surface useable for the ironing operation.

3.15 working width: The useable width of the working surface.

3.16 wrinkle: A type of fold deformation of the plane surface of the fabric. It is random in nature and typically shallow in form.

4 Apparatus and materials

4.1 Hygrometer, for measuring the ambient humidity.

4.2 Manufacturer-supplied equipment for measuring the roll circumference.

4.3 Vacuum-measurement U-tube, calibrated in centimetres, with a water gauge having a capacity of up to 45 cm, and with a hose and fitting for connecting it to the roll suction-fan intake duct.

4.4 Test meter, for volts and amps, accurate to $\pm 0,1$ %.

4.5 Integrating kilowatt-hour meter, accurate to $\pm 0,1$ %, for measuring electrical-energy consumption.

4.6 Scales, suitable for determining the mass of test articles.

Typical characteristics: platform size 1 000 mm $\times$ 1 000 mm, maximum load capacity 250 kg, scale graduated in 0,5 kg divisions, accuracy $\pm 0,1$ kg.

4.7 Steam/water separator, plate or centrifuge type.

4.8 Calibrated steam-pressure recording instrument, of appropriate range, the mid-point of the range being not less than the maximum operating pressure of the ironer.

4.9 Indicating pressure gauge, correctly calibrated for fitting into the steam supply to the machine.

4.10 Condensate-measurement tank, with temperature-measurement facilities as described in clause B.2.

4.11 Recording and integrating flow-meter, for measuring the flow of heat-transfer fluid, accurate to $\pm 0,2$ %.

4.12 Two temperature recorders or one multi-point temperature recorder, for testing ironing machines with a fluid heating medium, to be fitted on the machine circuit.

4.13 Two pressure gauges, for ironing machines with a fluid heating medium.

4.14 Stopwatch, accurate to $\pm 0,1$ %.

4.15 Pan-type weighing machine, capacity 20 kg accurate to $\pm 0,2$ %, suitable for weighing test articles.

4.16 Normal laundry equipment, to be used for wetting-out, washing, hydro-extracting and tumbling test articles in accordance with the test procedures.

4.17 Comparative smoothness-finish references, produced by the Association of American Textile Chemists and Colorists (see clause B.1).

4.18 Impermeable sheets, made of polyethylene, for protecting and inhibiting evaporation from damp test articles.

4.19 Dormant platform scales, suitable for weighing a filled laundry trolley.

Typical characteristics: platform size 1 000 mm $\times$ 1 000 mm, maximum load capacity 250 kg, in 0,5 kg divisions, accuracy $\pm 0,1$ kg.

4.20 Thermocouple device (an instant-reading type is preferred).

4.21 Flow-meter, for gas-fired machines: an integrating meter capable of providing a direct reading of the thermal energy supplied.

5 Tolerances

Tolerances are given for numerical values of dimensions, temperatures and times that are considered critical. If no tolerance is given, the precision of the measurements need be only that to be expected when using common instruments with reasonable care. The precision is further indicated by the number of significant figures in the values given.

6 Test articles

6.1 General

All test articles shall be in good repair, and shall be free from tears, snags or repaired sections.

6.2 Continuous-towel test articles

These shall be lengths of white 100 % cotton fabric in a 10 $\times$ 6 huckaback weave. Each towel shall be 270 mm $\pm$ 7 mm wide when measured in accordance with ISO 3932 and 42 m long when measured in accordance with ISO 3932, and shall comply with table 1. Sufficient lengths to provide a minimum 30 min test run and provide a bed coverage of not less than 80 % during the test described in 8.3 will be required. The finished fabric shall be free of dressing and shall be scoured, bleached and calendered.

6.3 Sheet test articles

Ten sheets, each of them measuring (1,8 $\pm$ 0,4) m $\times$ (2,5 $\pm$ 0,5) m, washed as described in annex C, and complying with the following requirements.

The test pieces shall be made up from plain weave sheeting of 100 % cotton. The yarn shall be evenly spun and the selvages shall be firm and straight and the fabric shall comply with the requirements of table 1.

Table 1 — Requirements for test articles

Property	Method of test	Requirement	
		Sheet test articles	Towel test articles
Mass per unit area	ISO 3801	185 g/m ² ± 10 g/m ²	225 g/m ² ± 10 g/m ²
Threads per centimetre, min.	ISO 7211-2		
warp		24,4	31
weft		22,4	12
Breaking strength, min.	ISO 5081		
warp		465 N	440 N
weft		510 N	370 N

6.4 Preparation of test articles

All new test pieces shall be washed three times at a temperature of 90 °C ± 5 °C, using the washing process described in annex C, before being used for the tests described in this part of ISO 7772.

Each test piece shall be discarded when its bone-dry mass has decreased to 93,5 % of the bone-dry mass after the first three washes by the process described in annex C.

7 Preparation

Particular attention is drawn to the care necessary in the organization of the test procedures. Adequate provision shall be made for the time that will be taken and the procedural rehearsal.

7.1 Machine identification

The physical details of the ironing machine to be evaluated shall be recorded for identification purposes by completing the schedule of items listed in annex D.

7.2 Installation of apparatus

7.2.1 General

The ironing machine shall be fitted with the necessary means to measure the total flow of heating medium as specified in 7.2.2 or 7.2.3.

7.2.2 Steam-heated ironing machines

The steam consumption shall be measured with the condensate-measurement tank (4.10). The conden-

sate-receiving tank(s) shall be loaded with a predetermined quantity of cold water sufficient to ensure that, at the end of the test, the tank water temperature does not exceed 70 °C, thus minimizing the escape of the flash steam.

A pressure gauge (4.9) shall be fitted in the steam input line immediately adjacent to the ironing machine and connected up to the recorder (4.8).

The steam entry shall be fitted with a steam/water separator (4.7) to ensure dry, saturated conditions at the inlet to heat-exchange surfaces. The steam/water separator shall be fitted as near as practicable to the machine steam inlet. The water from the separator shall not be included in the condensate recovery content.¹⁾

7.2.3 Fluid-heated ironing machines

The temperature-recording and pressure-indicating equipment (4.12 and 4.13) shall be fitted to flow and return lines. A flow-meter (4.11) shall be fitted in the main flow line. The ironing machine shall be fitted with a pressure gauge on both the inlet and outlet pipes, immediately adjacent to the inlet to the ironing machine and the outlet from the ironing machine. A schematic diagram of a fluid-heated ironing machine is given in figure 1.

7.2.4 Gas-fired ironing machines

The flow-meter (4.21) shall be fitted to the input to the machine. The energy content of the gas shall be determined in kilojoules per cubic centimetre as applied to the flow-meter.

1) The dryness fraction of steam is not taken into account in the calculations as the steam/water separator is fitted to the steam supply.

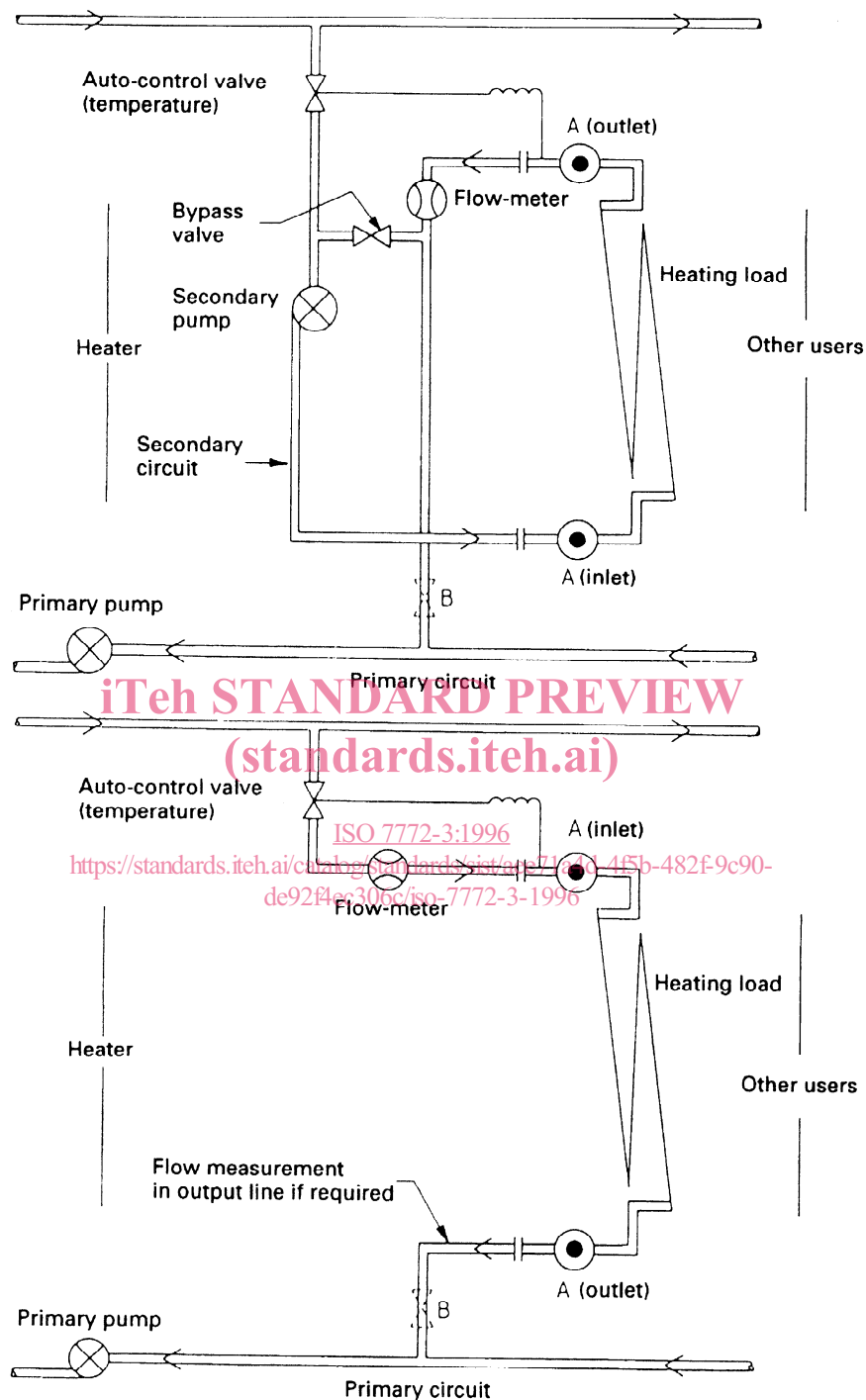


Figure 1 — Schematic diagram of a fluid-heated machine

7.3 Ambient, supply and machine conditions

7.3.1 Determine and record the ironing-machine roll circumference, in millimetres, for three positions on each roll, 460 mm from each end and in the middle, by the method described by the manufacturer. Record the manufacturer's indicated circumference. This subclause does not apply to drying cylinders.

7.3.2 Note the following electrical characteristics under load for each phase:

- a) ironing machine: voltage, in volts; current, in amps;
- b) fluid heat pump: voltage, in volts; current, in amps.

7.3.3 If the machine is designed with fan suction to the rolls and has test holes provided, record the pressure, in millimetres of water, on the inlet side of the fan unit, with the machine idling and no contact between the rolls and the bed.

7.3.4 Measure and record the ambient conditions. If they fall outside the following limits, the test results may not be valid for comparative purposes with machines operating within these limits: temperature between 15 °C and 27 °C, relative humidity 50 % to 75 %, altitude sea level to 1 000 m. Take two sets of readings for humidity at each corner of the machine at a level of 1 m from the floor in a horizontal plane 1 m to 2 m from the machine. Determine the average of the readings in each set. Note the estimated altitude from information available locally if over 1 000 m.

7.3.5 Immediately prior to the test, wax the heated ironing-machine bed by passing the manufacturer's recommended waxing cloth through the machine three times, ensuring that the whole width of the bed is lubricated.

7.3.6 Record the supply conditions, as follows:

- a) the input steam pressure, in kilopascals;
- b) the reading on the ironing-machine roll air or hydraulic-pressure gauge, in kilopascals, if provided by the manufacturer;
- c) the gas pressure, in kilopascals, if applicable.

7.3.7 The manufacturer shall be invited to ensure that the ironing machine is installed in accordance with his recommendations. Record any deviation from these recommendations in the test report.

8 Drying capacity and energy consumption

8.1 Principle

This test determines the rate at which the textile will give up moisture under controlled conditions at an established test speed. The articles are weighed before and after processing and the moisture-removal rate is calculated. Data for calculation of energy consumption are also measured.

8.2 Preliminary procedures

8.2.1 Calculate the number of lanes of test articles that will be fed simultaneously through the ironing machine to provide not less than 80 % bed coverage for the test. Calculate the percentage bed coverage employed.

Place two batches of continuous-towel test articles (6.2), the number of articles in each batch being equal to the number of lanes, to one side for the purpose of establishing the test speed (see 8.2.3). Divide the number of articles remaining by the number of lanes to be fed and round down the result to give a whole number.

8.2.2 Prepare all the test articles in a concertina fold approximately 1 m long. Tie them securely at two positions at least 500 mm apart and place them in a washing machine for washing as described in annex C.

Mechanically extract the test articles so that they have a moisture content between 65 % and 70 % of bone-dry mass.

Place the test articles in layers in airtight containers, each layer being covered with an impermeable sheet (4.18). Record the tare weight of container and sheets.

Determine the mass of the damp test articles. Determine the temperature of each batch by inserting the thermocouple of the thermocouple device (4.20). Record the total mass m_d , in kilograms, of all the damp batches and the average temperature θ_i , in degrees Celsius, of all the ironed batches.

8.2.3 To establish the ironing-machine test speed prior to the test take the two batches of test articles referred to in 8.2.1, and the remainder. Set the machine at the speed which it is estimated will result in an article being dried to a total mass between 105 % and 110 % of bone-dry mass. Feed individual test articles through and check their mass on the platform scales (4.19). Having arrived at a satisfactory speed, confirm this by feeding through one complete batch of articles. Should the result be outside the preferred

limit for the moisture content, adjust the speed and perform a second trial. When a satisfactory speed is achieved, record the value as the test speed.

8.2.4 To allow all conditions to stabilize, for 30 min prior to the test use the ironing machine either under normal commercial conditions, or, if in doubt, to iron cotton sheets of moisture content not less than 48 % of bone-dry mass at the manufacturer's rated optimum speed with a feed gap of not greater than 300 mm, or iron five cotton sheets of moisture content exceeding 100 % of bone-dry mass at the manufacturer's rated optimum speed with a feed gap of not greater than 300 mm.

8.3 Test procedure for standard test articles

8.3.1 Prepare the first test articles for feeding through the ironing machine and ensure that subsequent test articles are readily available to ensure continuity throughout the test.

8.3.2 Record the data for energy consumption and power utilization immediately prior to feeding the first of the test articles through the machine, by taking the reading of the integrating meter (4.5) and recording the initial condensate-tank temperature θ_i , in degrees Celsius, and the condensate-tank level.

8.3.3 Immediately upon completion of the stabilization procedure, commence the test by carrying out the following operations simultaneously:

- a) start feeding the test articles, with the ironing machine running at test speed and the gaps between successive test articles at a maximum of 300 mm;
- b) start the stopwatch (4.14);
- c) for steam-heated machines, divert the condensation flow to the collecting tank and note the steam pressure;
- d) for fluid-heated machines, start the temperature-recording equipment.

8.3.4 Record the following during the test:

- a) for steam-heated machines, record the steam pressure, in kilopascals, from either a recording chart (see 4.8) or gauge readings (see 4.9), plus the steam temperature, in degrees Celsius, at 5-min intervals, for calculation of quantity of superheat from steam tables (the maximum variation shall not exceed 40 kPa from the initial pressure for the test to be valid);
- b) for fluid-heated machines, from the recording instrument determine the average fluid tempera-

ture at the inlet and outlet and the pressure drop between the inlet and outlet;

- c) for gas-fired machines, take readings at the beginning and end of the test to measure the volume of gas consumed.

8.3.5 As the articles are discharged from the ironing machine, weigh them in batches of convenient quantity. Record the temperature of each batch and calculate the temperature θ_i .

8.3.6 As the last test article passes out of the ironing machine, switch off the machine, redirect the condensate valve to normal operation and record the energy-consumption reading.

8.3.7 At the end of the test sequence, reduce all test articles to bone-dry mass and weigh.

8.4 Calculation and expression of results

8.4.1 Calculation of moisture removal

Calculate the rate of moisture removal, expressed in kilograms per hour, using the formula

$$\frac{60(m_d - m_i)}{t}$$

where

m_d is the total mass, in kilograms, of all the damp batches;

m_i is the total mass, in kilograms, of all the ironed batches;

t is the duration, in minutes, of the test.

8.4.2 Calculation of electrical energy

Calculate the total electrical energy H_e , expressed in kilojoules, using the formula

$$3\,600 \times E$$

where E is the energy used, in kilowatt-hours.

8.4.3 Calculation of heating energy for steam-heated machines

Calculate the heating energy H_s , expressed in kilojoules, for this type of machine, using the formula

$$L_s(V_i\rho_f - V_i\rho_i)$$