INTERNATIONAL STANDARD

ISO 9398-2

Second edition
2003-01-15

Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics —

Part 2: Batch drying tumblers

Spécifications pour les machines de blanchisserie industrielles — Définitions et contrôle des caractéristiques de capacité et de consommation —

Partie 2: Séchoirs rotatifs

Reference number
ISO 9398-2:2003(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 9398-2 was prepared by Technical Committee ISO/TC 72, *Textile machinery and machinery for drycleaning and industrial laundering*, Subcommittee SC 5, *Industrial laundry and dry-cleaning machinery and accessories*.

This second edition cancels and replaces the first edition (ISO 9398-2:1993), which has been technically revised.

ISO 9398 consists of the following parts, under the general title *Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics*:

— *Part 1: Flatwork ironing machines*

— *Part 2: Batch drying tumblers*

— *Part 3: Washing tunnels*

— *Part 4: Washer-extractors*

Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics —

Part 2: Batch drying tumblers

1 Scope

This part of ISO 9398 defines the characteristics of batch drying tumblers and gives the usual test methods for these characteristics with regard to machine capacity, power consumption and productivity. It is applicable for use as a reference in the drafting of purchasing orders for batch drying tumblers whose net usable cage volume is greater than 160 dm^3 (litres). It does not cover safety requirements (see ISO 10472-4).

NOTE If more detailed information on the effect of laundry machines on textiles is required, see ISO 7772 after agreement between the parties involved.

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.

ISO 9398-1:2002, *Specifications for industrial laundry machines — Definitions and testing of capacity and consumption characteristics — Part 1: Flatwork ironing machines*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9398-1 and the following apply.

3.1
nominal capacity (of a batch drying tumbler)
the maximum load, expressed in kilograms, of decatized cotton articles that may be dried in a dryer under the specified test conditions, corresponding to the mass of these cotton articles at $\left(8^{+1}_{0}\right)$ % residual moisture

See 4.1.

NOTE The value of this load is given on the rating plate of the machine.

3.2
cage (basket) volume
V
net usable volume of the cage, expressed in cubic decimetres (litres), equivalent to the inside volume minus all the inwardly projecting volumes, except those of baffles or bars

3.3
load ratio
c
ratio of the nominal capacity of the tumbler, expressed in kilograms, to the cage volume, expressed in cubic decimetres (litres), the value of this ratio being 1:25

4 General test conditions

4.1 Machine load

4.1.1 Amount of load

The test load shall correspond to the nominal capacity of the machine as defined in Clause 3.

4.1.2 Nature of load

The test load shall comprise decatized cotton towels with a mass per unit area of (420 ± 25) g/m^2 and dimensions of (90 ± 10) cm $\times$ (60 ± 10) cm.

4.1.3 Conditioning

The residual moisture content of the test load shall be (55 ± 1) % after rinsing in water and suitable extraction. This moisture level may also be expressed as a level of 51 % with respect to a dried mass which has regained moisture to a level of $\left(8^{+1}_{0}\right)$ %.

4.1.4 Number of loads

Two identical loads, as defined in 4.1.1, shall be tested.

If the test loads, conditioned in accordance with 4.1.3, have to be kept for a period of time in the area where the tests are carried out, they shall be stored under a cover which will prevent any evaporation.

4.2 Energy supply

Energy for the test shall be supplied by steam, gas, electricity or heat-transport fluid, as specified by the manufacturer.

4.3 Temperature of rinse water before extraction

The temperature of the rinse water used in the test shall be (17 ± 3) °C before extraction.

For tropical countries, a temperature of (25 ± 5) °C is allowed.

4.4 Ambient air

The ambient air temperature during the test shall be (24 ± 6) °C and the relative humidity (50 ± 10) %.

4.5 Condition of the machine

The tumbler shall be installed in accordance with the manufacturer's instructions and shall be clean.

5 Determination of residual moisture content after drying

5.1 Test method

5.1.1 Under the general test conditions specified in Clause 4, carry out two consecutive test cycles with a load corresponding to the nominal capacity in order to condition the machine.

5.1.2 Load the dryer with a first test load (see 4.1) and, after $0{,}85t_0$ — where t_0 (in minutes) is the drying duration for the test load according to the manufacturer's instructions — remove the load, weigh it and calculate its residual moisture content in accordance with definition 3.7 of ISO 9398-1:2002.

5.1.3 Introduce into the dryer a second test load (see 4.1) and, after $1{,}15t_0$, remove the load, weigh it and calculate its residual moisture content in accordance with ISO 9398-1.

5.1.4 Repeat the operations in 5.1.2 and 5.1.3 once more.

5.2 Expression of results

5.2.1 Plot the values found in 5.1.2, 5.1.3 and 5.1.4 on a graph and draw the curve of the residual moisture content after drying as a function of the time.

5.2.2 Determine from the graph the time, t, which permits drying of the test load (see 4.1) to give a residual moisture content after drying of $\left(8^{+1}_{0}\right)$ %.

6 Energy consumption of machine

6.1 General

The energy consumption of a batch drying tumbler is defined as the number of kilojoules or kilowatt hours of steam, gas, electricity or heat-transport fluid energy required for the drying of a test load (see 4.1) to obtain a residual moisture content after drying of $\left(8^{+1}_{0}\right)$ % (see 6.3).

6.2 Test method

6.2.1 Under the general test conditions specified in clause 4, carry out one test cycle with a machine load in accordance with 4.1 in order to condition the machine.

6.2.2 Carry out two series of operations in succession with a test load (see 4.1) using the drying time t determined in 5.2.2.

6.2.3 Using suitable instruments, record the corresponding energy consumptions and take the mean value of the two tests.

6.3 Expression of results

6.3.1 Indicate the energy consumption of the machine, expressed as kilojoules or kilowatt hours, for the drying of 1 kg of decatized cotton towels, as specified in 4.1, whose residual moisture content has been reduced from (55 ± 1) % to $\left(8^{+1}_{0}\right)$ % after drying.

6.3.2 Indicate the energy consumption required by the motor or motors for the mechanical drive of the drum and the ventilator.

6.3.3 The total energy consumption required by a batch drying tumbler is the sum of the mechanical and thermal energies required.

EXAMPLE

Motor(s) ..... kWh

Heating ..... kWh

Total ..... kWh

7 Hourly productivity of a tumbler

7.1 General

The hourly productivity of a batch drying tumbler shall be controlled simultaneously with its energy consumption.

The hourly productivity of a tumbler is defined as the mass, in kilograms, of decatized cotton towels, as specified in 4.1, which may be dried in 1 h (not including the time necessary for loading and unloading the machine) to give a moisture content reduced from (55 ± 1) % to $\left(8^{+1}_{0}\right)$ %.

7.2 Test method

The test conditions for determining the hourly productivity are identical to those specified in 6.2.

7.3 Expression of results

The hourly productivity of a batch drying tumbler shall be expressed as

a) the mass of water evaporated during 1 h under the test conditions specified in 6.2, and

b) the number of kilograms of decatized cotton towels (as specified in 4.1) that can be dried in 1 h under the test conditions specified in 6.2.

8 Machine information

8.1 Identification

The following information shall be used to identify the machine:

— manufacturer;

— manufacturer's address;

— machine type and reference number.

8.2 Specifications

The following information shall be given in the machine specifications:

a) cage diameter, in millimetres;

b) cage length, in millimetres;

c) net cage usable volume, in cubic decimetres (litres);

d) speed, in revolutions per minute;

e) whether the cage reverses direction;

f) air flow, in cubic metres per second, at outlet duct;

g) nominal steam pressure, in kilopascals, for steam energy;

h) machine mass, in kilograms;

i) type of heating energy

   1) electrical — electrical energy consumption in kilowatt hours,

   2) steam — pressure in kilopascals; consumption in kilowatt hours,

   3) gas — thermal consumption in kilowatt hours,

   4) thermal oil — thermal consumption in kilowatt hours;

j) maximum electric power supply in kilowatts.

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ICS 97.060

Price based on 6 pages