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

Part 4: Washer-extractors

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

Partie 4: Laveuses-essoreuses

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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 9398-4 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 9398-4:1993), 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 4: Washer-extractors

1 Scope

This part of ISO 9398 defines the characteristics of washer-extractors and gives the usual test methods for these characteristics with regard to machine capacity, power and water consumption, and hourly productivity. It is applicable for use as a reference in the drafting of purchasing orders for washer-extractors whose net usable cage volume is greater than 60 dm^3 (litres). It does not cover safety requirements (see ISO 10472-2).

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*

IEC 60335-2-7:2000, *Safety of household and similar electrical appliances — Part 2-7: Particular requirements for washing 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 washer-extractor)
maximum load, in kilograms, of decatized cotton articles which may be washed and extracted in the machine under the specified test conditions

See 4.1.

NOTE 1 The mass of this load corresponds to the mass at $\left(8^{+1}_{0}\right)$ % residual moisture content of the cotton articles.

NOTE 2 The value of this load is given on the rating plate of the machine.

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

3.3
load ratio
c
ratio of the nominal capacity of the washer-extractor, expressed in kilograms, to the cage volume, expressed in cubic decimetres (litres), the optimum value of this ratio being 1:10

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

4.1.2 Nature of load

The test load shall comprise decatized white cotton sheets with a mass per unit area of (140 ± 20) g/m^2 and dimensions of (240 ± 20) cm × (180 ± 20) cm.

4.1.3 Number of loads

Two identical loads shall be used in carrying out the tests.

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 feed water

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

For tropical countries, a temperature of (25 ± 5) °C for the rinse water used in the test 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 machine

The washer-extractor shall be installed as indicated by the manufacturer and shall be clean.

4.6 Machine test cycles

At least one of the cycles A, B or C, in accordance with Tables 1, 2 and 3 respectively, shall be run.

NOTE The absence of any standard measure of the degree of soiling of the wash has led to only two test cycles being required.

Table 1 — Test cycle A for industrial washer-extractors

Operation	Duration[a] min	Temperature °C	Product added	Bath water level[b]
Soak	5	17 ± 3[e]	Wetting agent 2 g per kg of washing	high
Preliminary wash	8	40 ± 3	Washing powder[c] (8 g to 15 g) per kg of washing	low
Main wash	15	85 ± 3	Washing powder[c] (8 g to 15 g) per kg of washing	low
Drain/spin	2	—	—	—
Rinse	5	65 ± 3	—	high
Drain/spin	2		—	—
Bleaching	8	28 ± 3	48° Hypochlorite bleach[d] (10 cm^3 to 15 cm^3) per kg of washing	high
Drain/spin	2	—	—	—
Neutralization	5	17 ± 3[e]	Sodium hydrogen sulfite $c(NaHSO_3)$ = 1,32 mg/l 1 cm^3 to 2 cm^3	high
Drain/spin	2	—	—	—
Rinse	5	17 ± 3[e]	Acetic acid $c_{max}(CH_3COOH)$ = 800 g/l 2 cm^3	high
Drain/spin	2	—	—	—
Final rinse	5	17 ± 3[e]	—	high
Final spin	10	—	—	—

[a] Times measured once the desired levels and temperatures have been attained.

[b] Low level = 2,5 l of water per kilogram of washing; high level = 5 l of water per kilogram of washing.

[c] Washing powder as indicated in Annex B of IEC 60335-2-7:2000.

[d] 1° Hypochlorite corresponds to 3,17 g of active chlorine.

[e] For tropical countries, a (25 ± 5) °C temperature of the rinse water used in the test is allowed.

Table 2 — Test cycle B for industrial washer-extractors

Operation	Duration[a] min	Temperature °C	Product added	Bath water level[b]
Wash	8	80 ± 3	Washing powder[c] (8 g to 15 g) per kg of washing	low
Drain/spin	2	—	—	—
Rinse	5	65 ± 3	—	high
Drain/spin	2	—	—	—
Bleaching	6	28 ± 3	48° Hypochlorite bleach[d] (10 cm^3 to 15 cm^3) per kg of washing	high
Drain/spin	2	—	—	—
Neutralization	3	17 ± 3[e]	Sodium hydrogen sulfite $c(NaHSO_3)$ = 1,32 mg/l 1 cm^3 to 2 cm^3	high
Drain/spin	2	—	—	—
Final rinse	3	17 ± 3[e]	—	high
Final spin	10	—	—	—

[a] Times measured once the desired levels and temperatures have been attained.

[b] Low level = 2,5 l of water per kilogram of washing; high level = 5 l of water per kilogram of washing.

[c] Washing powder as indicated in Annex B of IEC 60335-2-7:2000.

[d] 1° Hypochlorite corresponds to 3,17 g of active chlorine.

[e] For tropical countries, a (25 ± 5) °C temperature of the rinse water used in the test is allowed

Table 3 — Test cycle C for industrial washer-extractors

Operation	Duration[a] min	Temperature °C	Product added	Bath water level[b]
Wash	5	60 ± 3	Washing powder[c] (8 g to 15 g) per kg of washing	low
Drain/spin	1	—	—	—
Bleaching	4	—	48° Hypochlorite bleach[d] (10 cm^3 to 15 cm^3) per kg of washing	high
Drain/spin	1	—	—	—
Rinse	2	—	—	high
Drain/spin	1	—	—	—
Neutralization	3	—	Sodium hydrogen sulfite $c(NaHSO_3)$ = 1,32 mg/l 1 cm^3 to 2 cm^3	high
Final spin	5	—	—	—

[a] Times measured once the desired levels and temperatures have been attained.

[b] Low level = 2,5 l of water per kilogram of washing ; high level = 5 l of water per kilogram of washing.

[c] Washing powder as indicated in Annex B of IEC 60335-2-7:2000.

[d] 1° Hypochlorite corresponds to 3,17 g of active chlorine.

5 Determination of residual moisture content after extraction

5.1 Test method

5.1.1 Under the general test conditions specified in 4.1 to 4.5, carry out one rinse cycle of 5 min duration, spin for 10 min and immediately weigh the laundry.

5.1.2 Carry out three such rinse–spin operations in succession.

5.1.3 Ascertain the mean value of the three extraction tests specified in 5.1.2.

5.2 Expression of results

Indicate the mean residual moisture value of the test load after extraction, as determined in 5.1.

6 Energy consumption of machine

6.1 General

The energy consumption of a washer-extractor is defined as the number of kilojoules or kilowatt hours of steam, gas, electricity or heat-transport fluid energy required during washing and extraction of a load (see 4.1) in a machine operating at its nominal capacity during the time corresponding to cycle A, B or C (see 6.3).

6.2 Test method

6.2.1 Under the general test conditions specified in Clause 4, carry out one test cycle (either cycle A, B or C) with one test load (see 4.1) in order to condition the machine.

6.2.2 Run the cycle chosen in 6.2.1 three times in succession, using the same test load (see 4.1).

6.2.3 Using suitable instruments, check the values of parameters allowing the calculation of the corresponding energy consumption for a determined cycle (A or B or C) and take the mean value of the three tests. For machines using electric or gas energy for heating, energy meters are reliable; for machines using steam as the heat source, for the preliminary wash and main wash, measure the water quantities to be heated, as well as the temperatures before and after steam injection.

6.3 Expression of results

6.3.1 Indicate the energy consumption, expressed as kilojoules or kilowatt hours, per kilogram, for the washing and extraction of a test load of decatized cotton sheets in accordance with 4.1 (cycle A, B or C to be specified).

6.3.2 Indicate the energy consumption required by the motor or motors for the mechanical drive of the cage during the washing/extraction phases.

6.3.3 The total energy consumption required by washer-extractor is the sum of the mechanical and thermal energies required.

EXAMPLE

Motor(s) ..... kWh

Heating ..... kWh

Total ..... kWh

7 Determination of water consumption

7.1 General

The water consumption (including the water needed for both washing and rinsing) of a washer-extractor is defined as the number of litres of water necessary for washing one test load (see 4.1) in a machine operating at its nominal capacity in the specified test cycle (see 4.6 and 7.3).

7.2 Test method

7.2.1 Under the general test conditions as specified in Clause 4, carry out one cycle (A, B or C) with one load (see 4.1) to condition the machine.

7.2.2 Run the cycle chosen in 7.2.1 three times in succession, using the same test load as specified in 4.1.

7.2.3 Using suitable instruments, record the corresponding water consumption required for each of the three tests and take the mean value.

7.3 Expression of results

Indicate the water consumption, expressed in litres per cycle (A, B or C to be specified) and per kilogram, required for the washing and extraction of decatized cotton sheets as specified in 4.1.

8 Hourly productivity of machine

8.1 General

The hourly productivity of a washer-extractor is defined as the mass, in kilograms, of a load of decatized cotton sheets as specified in 4.1 that can be washed and extracted in 1 h, not including the time for loading and unloading the machine, using the test cycle (A, B or C to be specified).

8.2 Expression of results

Indicate the hourly productivity, in kilograms, of the machine per cycle (A, B or C to be specified) and the degree of residual moisture obtained after the final extraction.

9 Machine information

9.1 Identification

The following information shall be used to identify the machine:

— manufacturer;

— manufacturer's address;

— machine type and reference number.

9.2 Specifications

The following information shall be given in the machine specifications:

a) nominal capacity, in kilograms;

b) load ratio, in kilograms per cubic decimetre (litres);

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

d) internal cage diameter, in millimetres;

e) internal cage length, in millimetres;

f) number and arrangement of compartments;

g) overall dimensions of length, height and width, in millimetres;

h) machine mass, in kilograms;

i) steam supply pipe diameter, in millimetres, and pressure, in kilopascals (for steam heating);

j) nominal water supply pipe diameter, in millimetres;

k) maximum cage speed, in revolutions per minute, and value of *g* factor;

l) 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;

m) maximum electric power supply in kilowatts.

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