
British Standard

Industrial laundry machinery

Part 3. Methods for the assessment of the effect
of flatwork ironing machines on textiles

Machines de blanchisserie automatiques

Partie 3. Méthodes d'évaluation de l'effet des machines à repasser à plat sur les textiles

Industriewaschmaschinen

Teil 3. Verfahren zur Beurteilung der Wirkung von Bügelmaschinen auf Textilien

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Foreword

This Part of this British Standard has been prepared under the direction of the Fibres, Yarns, Fabrics and Production Standards Committee. 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. It has therefore become necessary to draw up standard methods of test for rating or assessing the effects of the principal types of industrial laundry machinery.

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

- (a) verification of the claims made by the manufacturer on the performance of the machine, using conditions arbitrarily agreed between the manufacturer and the user;
- (b) preparation of standard methods of test for rating and assessing the effect of the principal types of machines, so that the test results obtained on machines of similar type could be compared directly wherever the machines were located and whenever they were tested.

It was agreed to adopt the second of these options in the preparation of the various Parts of this British Standard since the urgent need was for procedures that could be used on a range of machines to evaluate their effect 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 performance 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. Information on the number and qualifications of the personnel required is given in appendix E.

The procedures for energy consumption and drying capacity evaluation are conducted simultaneously and the results of the evaluation of the quality of finish are assessed subjectively as this is considered the most satisfactory method available at present.

There are, at present, no existing British Standards in the industrial laundering industry on any facet of the work, although a few standards exist in the related textile and chemical fields. This lack of published work has led to the problem of breaking new ground and great use has been made of original work by the former British Launderers' Research Association (now incorporated in the Fabric Care Research Association). This British Standard consists of the following four Parts.

- *Part 1 Methods for the assessment of the effect of rotary washing machines on textiles
- Part 2 Methods for the assessment of the effect of extracting machines on textiles
- Part 3 Methods for the assessment of the effect of flatwork ironing machines on textiles
- Part 4 Methods for the assessment of the effect of batch drying tumblers on textiles

It is hoped that with the advance of techniques, and widespread use of this standard, updated methods can be incorporated.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

*In course of preparation.

British Standard

Industrial laundry machinery

Part 3. Methods for the assessment of the effect of flatwork ironing machines on textiles

1. Scope

This Part of this British Standard describes methods of assessing the effects on textiles of flatwork ironing machines with rolls of surface area greater than 0.5 m^2 that are used in the laundering process. The types of flatwork ironing machines covered by this standard are described in appendix A.

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 operators, but provide an indication of the performance of the ironing machine based on the following parameters:

- (a) the capacity to remove moisture, expressed in kilograms per hour, from the standard fabric of known bone-dry mass, when operated under the conditions and in the manner specified;
- (b) the total energy consumption during processing as specified, expressed as kilojoules per kilogram of moisture removed;
- (c) the ability to iron and smooth flatwork free from creases and wrinkles;
- (d) the ability to remove moisture from small flatwork having significant multi-thickness areas, expressed as a percentage moisture content relative to bone-dry mass.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2. Definitions

For the purposes of this Part of BS 6246 the following definitions apply.

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

2.2 bone-dry mass. The mass of a 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 greater than 0.10 %.

NOTE. For the purposes of this standard, specified drying procedures include repeated processing of the article in a heated tumbler, the exhaust air temperature of which reaches not less than 80°C , or repeated passing of the article through an ironing machine.

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

2.4 concertina fold. The fold created when a textile article is folded backwards and forwards upon itself.

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

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

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

2.8 flatwork. A textile article that can be satisfactorily dried and smoothed by being passed through a flatwork ironing machine, e.g. large flatwork (typically a bed sheet) or small flatwork, generally a small item with multi-thickness hems (typically a pillowslip).

2.9 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 which are formed as a segment of a circle, of ferrous construction, such that any material inserted between the roll and bed would pass between them in a continuous motion. A multi-roll machine feeds the material through a succession of rolls and beds (see appendix A).

2.10 heating fluid. Any fluid used as a heat transfer medium.

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

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

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

2.14 working surface. The useable contact surface for the ironing operation.

2.15 working width. The useable width of the working surface.

2.16 wrinkle. A form of fold deformation of the plane surface of the fabric of random nature, typically shallow in form.

3. Apparatus and materials

3.1 Hygrometer, suitable for measuring ambient conditions.

3.2 *Manufacturer's roll circumference measuring equipment.*

3.3 *Vacuum measurement U-tube*, calibrated in centimetres with a water gauge having a capacity of up to 45 cm with necessary hose and fitting to be connected to the roll suction fan intake duct.

3.4 *Tachometer*, to measure the peripheral speed of the ironing machine roll. Hand-held wheel model capable of reading up to 50 m/min, accurate to $\pm 0.2\%$.

3.5 *Test meter*, for voltage and current, accurate to $\pm 0.1\%$.

3.6 *Integrating watt hour meter*, accurate to $\pm 0.1\%$, for measuring electrical power consumption.

3.7 *Thermocouple device*, (an instant reading type is preferred).

3.8 *Steam/water separator*, plate or centrifuge type.

3.9 *Calibrated steam pressure recording instrument*, of appropriate range, with a midpoint of not less than the maximum operating pressure of the ironing machine.

3.10 *Indicating pressure gauge*, correctly calibrated for fitting into steam supply to machine.

3.11 *Condensate measurement tank*, with temperature measurement as described in B.2 for testing steam-heated ironing machines.

3.12 *Recording and integrating flow meter*, for testing fluid-heated ironing machines, accurate to $\pm 0.2\%$.

3.13 *Two temperature recorders or multipoint temperature recorder*, for testing ironing machines with fluid-heating medium to be fitted on machine circuit (see 5.2.3).

3.14 *Two pressure gauges*, for ironing machines with fluid-heating medium (see 5.2.3).

3.15 *Stop watch*, accurate to $\pm 0.1\%$.

3.16 *Pan-type weighing machine*, capacity 20 kg, accurate to $\pm 0.2\%$ and suitable for weighing test articles.

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

3.18 *Comparative smoothness finish standards*, as described in B.1.

3.19 *Moisture meter*, anvil type, suitable for assessing moisture content in fabric. Reading in the percentage range 0 % to 12 % of the bone-dry mass (see 8.1).

3.20 *Impermeable sheets*, polyethylene, for protecting and inhibiting evaporation of damp test articles.

3.21 *Scales*, suitable for determining the mass of the test loads. Typical platform size 1000 mm $\times$ 1000 mm, load capacity 250 kg maximum in 0.5 kg divisions and an accuracy of ± 0.1 kg.

4. Test articles

4.1 *General*. All test articles shall be free from tears, snags or repaired sections, dressing, and shall be scoured, bleached and calendered.

4.2 *Continuous towel test articles*. Lengths of white 100 % cotton fabric in a 10 $\times$ 6 huckaback weave. Each towel shall be 270 $\pm$ 7 mm wide when measured in accordance with

BS 1930 and 42 m long when measured in accordance with BS 1931 and shall comply with the following requirements:

(a) mass per unit area: min. 225 g/m² when measured in accordance with BS 2471;

(b) threads per cm: min. 24 in the warp direction and 22 in the weft direction when measured in accordance with BS 2862;

(c) breaking strength: min. 465 N per 50 mm in the warp direction and 510 N per 50 mm in the weft direction when measured in accordance with BS 2576;

(d) fluidity: min. 3 max. 6 when measured in accordance with BS 2610;

(e) wettability: max. 5 s when measured in accordance with BS 4554.

Sufficient lengths to provide a complete test run, including establishing the test speed, of minimum 30 min and to provide a bed coverage of not less than 80 % during the test described in 6.3 are required.

NOTE. A 3 m wide ironing machine will in general require 120 lengths of towel.

4.3 *Small flatwork test articles*. A minimum quantity of 54 pillowslips complying with type PS2 specified in BS 5815, each measuring 0.76 m $\times$ 0.50 m, shall be washed as described in appendix C. Six pillowslips shall be tested as separate items for establishing the ironing machine speed and the remainder shall be used to provide four continuous chains of pillowslips. Each chain shall be formed from 12 pillowslips stitched longitudinally to two lengths of 12 mm wide woven polyester tape, the tapes being set 20 mm in from each side of the pillowslip. The flap of each pillowslip shall be tucked in with the open side towards the tape and the gap between successive pillowslips shall be 150 $\pm$ 10 mm (see figure 1). The pillowslips and tapes shall be stitched with a single line of stitching along the centreline of each tape through the multilayers of fabric.

4.4 *Sheet test articles*. Ten sheets complying with type SH3 specified in BS 5815, each measuring 1.80 m $\times$ 2.75 m, shall be washed as described in appendix C.

5. Preparation

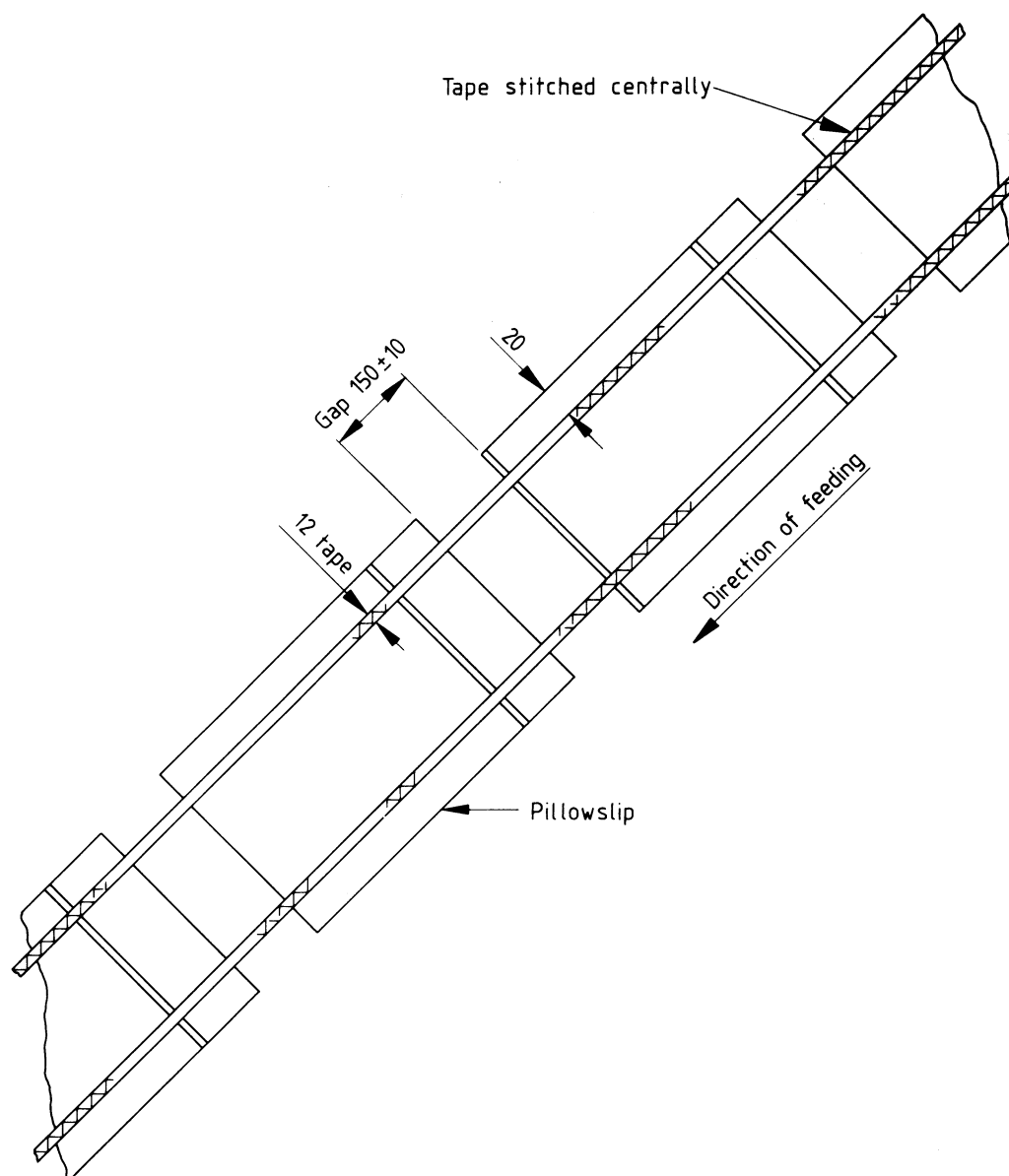
NOTE. Particular attention is drawn to the care necessary in the organization of the test procedures. Adequate provision should be made for the time that will be taken and the procedural rehearsal.

5.1 *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 D.1.

5.2 *Installation of apparatus*

5.2.1 *General*. The ironing machine shall be fitted with the necessary means to measure the total flow of heating medium as specified in 5.2.2 or 5.2.3.

5.2.2 *Steam-heated ironing machines*. The steam usage shall be measured with the condensate measurement tank (3.11). The condensate receiving tank(s) shall be charged 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 and so minimize the escape of flash steam.



All dimensions are in millimetres.

Figure 1. Method of stitching pillowslips to tape

A pressure recording instrument (3.10) shall be fitted in the steam input line immediately adjacent to the ironing machine.

The steam entry shall be fitted with a steam/water separator (3.8) to ensure dry saturated conditions at 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*.

5.2.3 Fluid-heated ironing machines. The temperature recording and pressure indicating equipment (3.13 and 3.14) shall be fitted to flow and return lines. A flow meter (3.12) 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 flow diagram of a fluid-heated ironing machine is given in figure 2.

5.3 Environmental, supply and machine conditions

5.3.1 The circumference of each ironing roll of the ironing machine shall be checked using the method described by the manufacturer (3.2) at three positions, 460 mm from each end and in the middle, and the variation from the circumference indicated by the manufacturer shall be recorded (see D.2(a)).

5.3.2 The linear speed indicator on the ironing machine shall be checked at 25 %, 50 % and 75 % of the rated maximum speed using a tachometer (3.4) on the first roll only, at positions 460 mm from each end, and the average at each speed shall be recorded together with any variation from the speed indicated by the manufacturer (see D.2(b)).

5.3.3 The electrical characteristics, i.e. voltage and current, on each phase of the main motor supply shall be checked (3.5) and recorded (see D.2(c)) to confirm the correct power operation of the machine.

5.3.4 If the ironing machine is designed with a fan suction to the rolls and has test holes provided, the pressure on the

*Dryness fraction of steam is not taken into account in the calculations as the steam/water separator is fitted to the steam supply.

inlet side of the fan unit shall be measured with a vacuum measurement U-tube (3.3) with the machine idling and no contact between the rolls and bed and the value shall be recorded (see D.2(d)).

5.3.5 The ambient temperature and relative humidity shall be measured and recorded (see **D.2(e)**). Two sets of readings of relative humidity shall be taken (**3.1**) at each corner of the ironing machine at a level of 1 m from the floor in a horizontal plane 1 m to 2 m from the machine and the average of each set recorded. The altitude shall be estimated from locally available information and recorded (see **D.2(e)**).

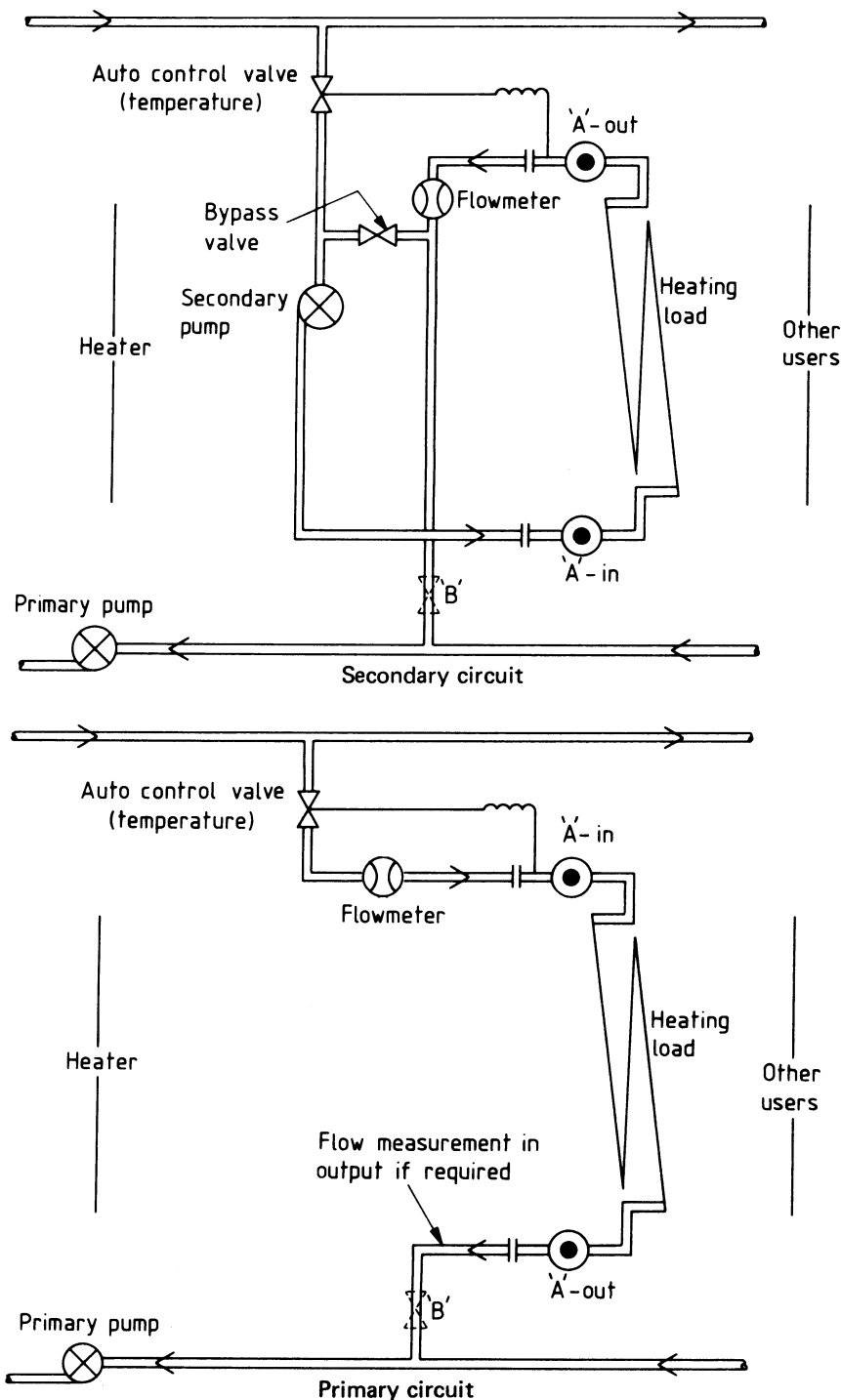
NOTE. If the environmental conditions are outside the following limits, the test results may not be valid for comparative purposes:

temperature: 15 °C to 27 °C;
relative humidity: 50 % to 75 %;
altitude: sea level to 1000 m.

5.3.6 Immediately prior to the test, the heated ironing machine bed shall be waxed by passing the manufacturer's recommended waxing cloth through the machine three times so that the whole width of the bed is lubricated.

5.3.7 The following supply conditions shall be recorded:

(a) input steam pressure (see D.2(g));



NOTE. A indicates the point for temperature and pressure measurement.
 @ indicates the point for flow measurement by flow meter.
 B indicates the alternative position for the auto. control valve (dependent on manufacturers).

Figure 2. Schematic flow diagram of fluid-heated ironing machine