INTERNATIONAL STANDARD

ISO 7210

Third edition
2013-01-15

Routine analytical cigarette-smoking machine — Additional test methods for machine verification

Machine à fumer analytique de routine pour cigarettes — Méthodes d'essais complémentaires pour la vérification de la machine

Reference number
ISO 7210:2013(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 7210 was prepared by Technical Committee ISO/TC 126, *Tobacco and tobacco products*, Subcommittee SC 1, *Physical and dimensional tests*.

This third edition cancels and replaces the second edition (ISO 7210:1997), which has been technically revised.

Routine analytical cigarette-smoking machine — Additional test methods for machine verification

1 Scope

This International Standard specifies additional test methods for routine analytical cigarette-smoking machines intended to check the conformity of these machines with ISO 3308:2012, Clause 4.

It only establishes additional test methods for smoking machines and does not deal with actual smoking, which is described in other International Standards.

It is composed of three sections relating to:

— the determination of pressure drop (Clause 4);

— the determination of significant puff profile parameters (Clause 5);

— the verification of restricted smoking (Clause 6).

NOTE There are more possibilities to determine the aforementioned parameters. Systems giving the same results and accuracies can be used. The certificate of compliance with this International Standard may be obtained from machine manufacturer. The frequency to carry out these additional test methods for smoking machines' verification is not part of the scope of this International Standard.

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 3308:2012, *Routine analytical cigarette-smoking machine — Definitions and standard conditions*

ISO 3402, *Tobacco and tobacco products — Atmosphere for conditioning and testing*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
pressure drop
static pressure difference between the two ends of a pneumatic circuit (of a smoking machine) when it is traversed by an air flow under steady conditions in which the measured volumetric flow, under standard conditions, at the output end is 17,5 ml/s.

3.2
puff profile
flow rate measured directly behind the butt end of the cigarette, and depicted graphically as a function of time

Note 1 to entry: For the determination of the puff profile, the cigarette could be replaced by a suitable device with a known pressure drop similar to the pressure drop of the cigarette.

3.3
restricted smoking
condition that exists when the butt end of a cigarette is closed to the atmosphere between successive puffs

3.4
puff duration
interval of time during which the port of a smoking machine is connected to the suction mechanism

3.5
puff volume
volume leaving the butt end of a cigarette and passing through the smoke trap of a smoking machine

3.6
smoulder stream smoke
all smoke which leaves the butt end of the cigarette during the interval of time between successive puffs

3.7
port
aperture of the suction mechanism through which a puff is drawn and to which is attached a smoke trap

3.8
channel
element of a smoking machine consisting of one or more cigarette holders, one trap and a means of drawing a puff through the trap

4 Determination of pressure drop

4.1 Principle

Measurement, under well-specified air flow conditions, of the pressure drop of a smoking machine by means of an appropriate manometer.

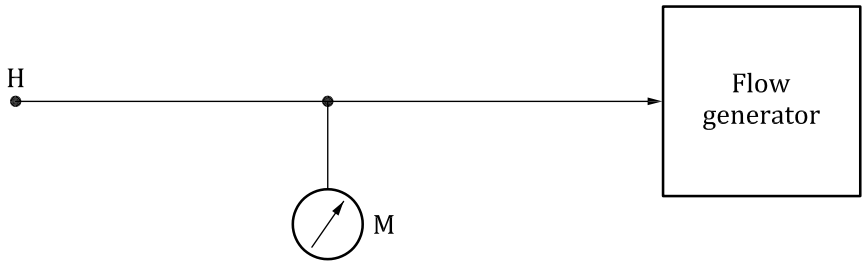
4.2 Apparatus

The whole of the flow path between the butt end of the cigarette and the suction mechanism shall offer the least possible resistance and its pressure drop shall not exceed 300 Pa.

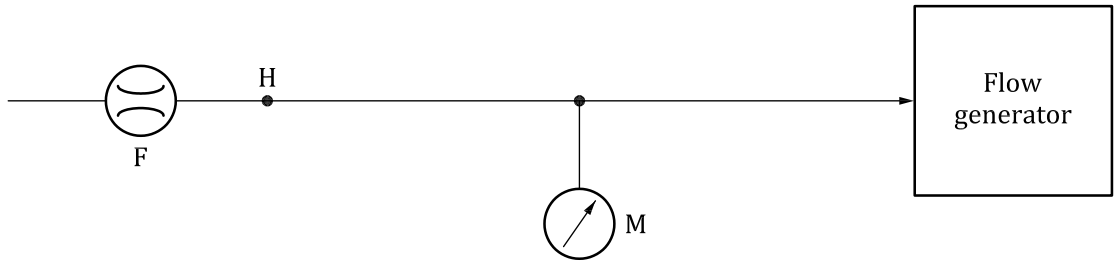
The test apparatus shall be capable of:

— sucking a constant flow of air which is unaffected by the pressure drop of the system under test;

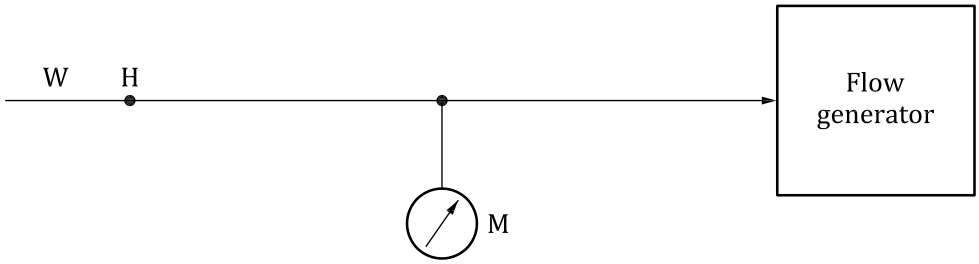
— measuring the pressure drop with known and sufficient accuracy.



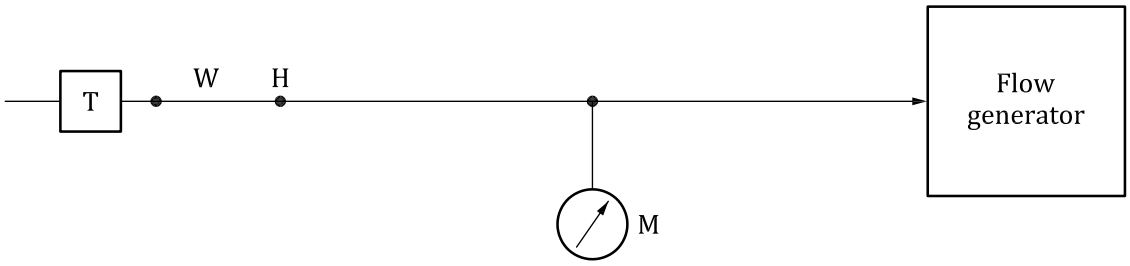
a) Zero setting manometer



b) Air flow setting



c) Determination pressure drop PD 1



d) Determination pressure drop PD 2

Key

H test head point
F flowmeter
W wide-bore tubing
T smoking machine under test
M manometer

Figure 1 — Pneumatic circuit of a typical apparatus

NOTE Arrows indicate the direction of air flow.

4.3 Test atmosphere

All measurements shall be carried out under standard ambient conditions of temperature and relative humidity as specified in ISO 3402.

4.4 Procedure

4.4.1 General

The flow of air through the smoking machine shall always be in the same direction as during the puffing cycle, i.e. from the cigarette to the suction source. The air used for measurement shall be from the test atmosphere.

4.4.2 Testing

4.4.2.1 Connect the manometer M as indicated in Figure 1a) and set it to zero.

4.4.2.2 Connect the flowmeter F as indicated in Figure 1b) and establish an air flow of 17,5 ml/s ± 0,5 ml/s.

4.4.2.3 Disconnect the flowmeter F and if needed in regards to 4.4.2.4 attach a suitable length of wide-bore tubing W to the test head point H as indicated in Figure 1c). Read the pressure, if any, on the manometer M. Record the value as PD 1.

4.4.2.4 Attach the free end of the wide-bore tubing W to the point in the smoking machine from which the puffing source was disconnected as indicated in Figure 1d). Read the pressure on manometer M. Record the value as PD 2.

4.4.2.5 Calculate the pressure drop (PD 2 – PD 1).

4.4.2.6 Repeat the operation for each channel of the smoking machine.

4.5 Expression of results

The following values shall be recorded:

— the pressure drop for each channel, in pascals;

— the test atmosphere used.

5 Determination of significant puff profile parameters

5.1 Principle

Continuous measurement of the flow rate of air of a puff through a pressure drop device of 1 000 Pa ± 50 Pa (see ISO 3308:2012, 4.3).

5.2 Apparatus

The apparatus shall comprise the elements shown in the principle diagram (Figure 2), i.e. the diagram of elements required for the two alternative measuring systems, A and B, with two different levels of sophistication.

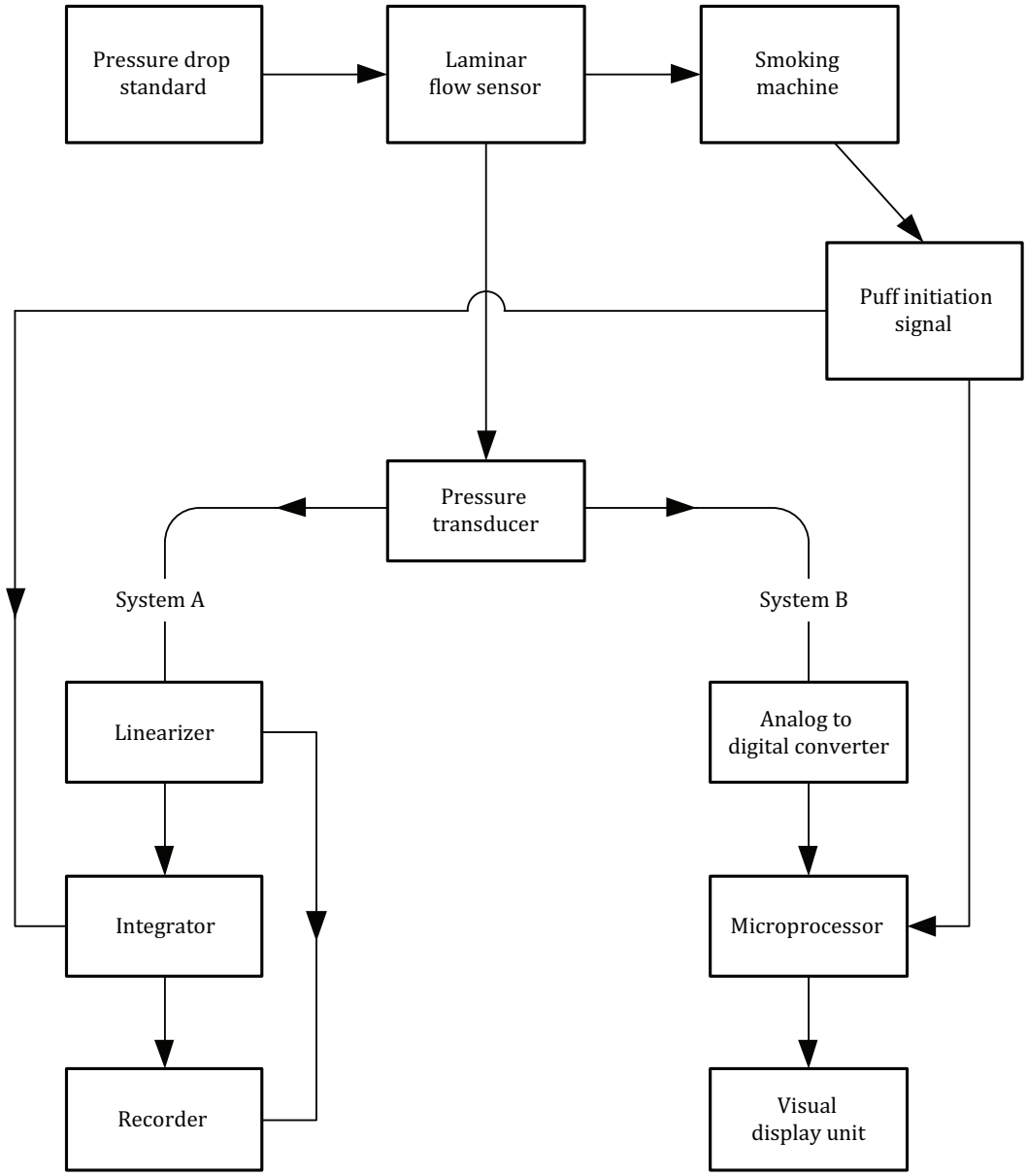


Figure 2 — Principle diagram

5.2.1 System A

The signal delivered by the pressure transducer is linearized by appropriate circuits and transmitted to an integrator and a recording apparatus.

The system can record a picture of the puff profile and measure its volume.

5.2.2 System B

This system uses digital conversion and a computer to produce the same information as it is given by system A.

5.2.3 Requirements for both systems

The device shall not increase the pressure drop of the system above the limit of 300 Pa and the overall gain and response of the system shall be sufficient to visualize the puff profile and determine its significant parameters.

A sufficient result will be achieved by the use of elements that fulfil the following conditions:

— laminar flow element having a nominal pressure drop of 100 Pa ± 10 Pa at a flow of 17,5 ml/s;

— pressure transducer with a suitable range, an accuracy of ± 5 Pa or better and a minimal response frequency of 1 kHz.

The above apparatus provides the means to obtain flow rate and time profiles for puffing as shown in ISO 3308:2012, Annex C.

NOTE Measurement of puff volume, by either system A or system B, can only be a secondary measurement following calibration by reference to a primary device such as a soap film burette as described in ISO 3308.

5.2.4 Expression of results

The following results need to be reported:

— total drawn puff volume expressed in millilitres;

— maximum flow rate expressed in millilitres per second;

— time between starting and reaching the maximum flow rate expressed in seconds;

— volume drawn after the time the puffing source ceases to apply suction expressed in millilitres;

— total puff duration time in seconds.

The target values for the above parameters are given in ISO 3308:2012, Annex C.

6 Verification of restricted smoking

6.1 Principle

Measurement of the volume of the smoulder stream smoke between two puffs for machines of discontinuous function or between two suction strokes for machines of continuous function.

NOTE For smoking machines with permanent connection of the port to the suction device, this test is not necessary.

6.2 Apparatus

Apparatus permitting an assembly as shown in Figure 3, so that:

— the length of a soap film bubble flowmeter does not exceed 12 cm;

— there is close contact between the smoke port or the cigarette holder, the soap film bubble flowmeter and the cigarette.

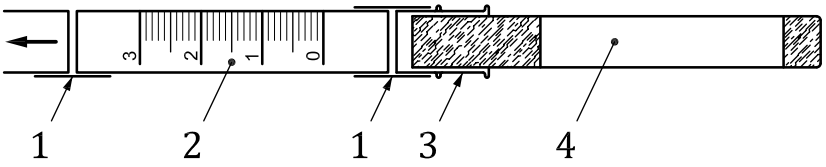
6.3 Procedure

Smoke a cigarette up to its first half without using the test unit. Introduce and adjust a soap bubble in the soap film bubble flowmeter as described in the suppliers manual. Connect the test unit to the smoke port or cigarette holder and insert the cigarette to it. Carry out the test during smouldering of

the second half of the total length of the cigarette. On linear machines the test should be performed for at least 1 min. On rotary machines it should be performed over a full rotation.

6.4 Expression of results

Note the flow rate of the smoulder stream smoke, in millilitres per minute for each channel of the smoking machine. The result shall not exceed 1 ml/min.



Key

1 rubber connection
2 soap film bubble flowmeter
3 cigarette holder or glass tube
4 cigarette

Figure 3 — Diagram of test apparatus for restricted smoking

ICS 65.160

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