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BSI Standards Publication

Unified tests procedures for the tests of EN 3-7:2004+A1:2007

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National foreword

This Published Document is the UK implementation of CEN/TR 15642:2011. It supersedes PD CEN/TR 15642:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/2, Fire extinguishers.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Unified tests procedures for the tests of EN 3-7:2004+A1:2007

Procédures d'essais unifiées pour les essais de l'EN 3-7:2004+A1:2007

Vereinheitlichte Prüverfahren für die Prüfungen nach EN 3-7:2004+A1:2007

This Technical Report was approved by CEN on 17 January 2011. It has been drawn up by the Technical Committee CEN/TC 70.

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Contents

Page

Foreword

This document (CEN/TR 15642:2011) has been prepared by Technical Committee CEN/TC 70 “Manual means of fire fighting equipment”, the secretariat of which is held by AFNOR.

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

This document supersedes CEN/TR 15642: 2008.

This document is divided in Annexes, corresponding to the following tests in EN 3-7:2004+A1:2007.

Annex A: Duration of operation and residual charge

Annex B: Effective range of operating temperature test

Annex C: Operation and emission control mechanism / devices and safety devices tests

Annex D: Control valve

Annex E: Hose and coupling systems tests

Annex F: Resistance to extinguishing medium of extinguishers using water based media

Annex G: Classes A and B fire tests

Annex H: Compaction procedure

Annex I: Class F fire tests

1 Scope

This Technical Report specifies the tests procedures for some of the tests required by EN 3-7:2004+A1:2007; it does not cover all the EN 3-7:2004+A1:2007 tests but only the tests requiring more precision in their execution.

These Unified Tests Procedures are in force for all laboratories performing EN 3-7:2004+A1:2007 tests. Those laboratories should be accredited to EN ISO/IEC 17025 for EN 3-7:2004+A1:2007 tests and their accreditation shall be done by an Accreditation Body, member of the European Accreditation.

This document should be included in the list of applicable documents.

NOTE Since results of many tests may be affected by the human factor, this document should be taken as a helpful tool but will not replace experience and knowledge of people."

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.

EN 3-7:2004+A1:2007 *Portable fire extinguishers — Part 7: Characteristics, performance requirements and test methods*

EN ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)*

ISO 657-1, *Hot-rolled steel sections — Part 1: Equal-leg angles-Dimensions*

ISO 4470, *Sawn timber — Determination of the average moisture content of a lot*

Annex A
Duration of operation and residual charge

A.1 General

This procedure describes the method to measure the duration of operation and the residual charge of an extinguisher after discharge.

A.2 Scope

This procedure applies to all types of portable extinguishers.

A.3 References

EN 3-7:2004+A1: 2007, 3.13, 5, 7.1, 7.2, 7.3, Annex A and Annex K.

A.4 Equipment

— Stopwatch with at least 3 splits.

— Scale.

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

A.5 Tests conditions – Number of tests samples

Number of test samples : Three

— Powder and water based extinguishers samples shall be submitted to the compaction procedure prior to the storage period. Extinguishers with gaseous extinguishing media are not subjected to this compaction.

— Extinguishers for testing shall prior to the test be stored for at least 24 h at (20 ± 5)°C.

— Test shall be carried out within 5 min of its removal from storage.

A.6 Test method

A.6.1 General

Record the actual gross weight of all the extinguishers used in the test.

A.6.2 Duration of operation

A.6.2.1 General

Two technicians are needed to carry out this test: one operates the extinguisher; the other one measures times by stopwatch.

A.6.2.2 Stored pressure extinguishers (all types of media)

— Release the safety device.

— Hold the extinguisher by hand in its normal working position (see label instructions) and keep it immobile for the duration of the test. If there is a hose, hold the nozzle in the other hand in a horizontal position.

— Fully open the control valve and start the stopwatch (t_0).

— Record by split (t_1) on the stopwatch the delay of the beginning of discharge.

— Record by split (t_2) on the stopwatch the end of discharge of the extinguishing medium:

  — For CO_2 extinguisher:

    — The end of discharge can be noticed by a clear visible (from a white to a more transparent colour) and audible (from a deep to a higher hissing sound) modification of the gas jet.

  — Another type of extinguisher :

    — The end of discharge can be noticed at the moment when all the extinguishing agent is discharged. The residual propellant gas is not taken into account.

— Keep the control valve fully open during 1 min after t_2.

— Calculate and record the duration of discharge (t_2-t_1) for each of the three extinguishers.

The diagram to perform the test is as follow (see Figure A.1):

— Calculate and record the average and the spread of each measurement of the duration of discharge.

— remove safety device;

start stopwatch) (t_0) and open the control valve,

Key
1 discharge delay max 4 s
2 duration of operation
3 1 min release of remaining gas then close the valve
4 discharge finishing

Figure A.1

A.6.2.3 Gas cartridge type extinguisher

— Release the safety device.

— If the pressurisation is not achieved by the releasing of the safety device, pressurise the extinguisher according to the instructions of the label.

— Start the stopwatch when the cartridge is opened (t_a).

— Hold the extinguisher by hand in its normal working position (see label instructions) and keep it immobile for the duration of the test. If there is a hose, hold the nozzle in the other hand in a horizontal position.

— Only for extinguisher using a pressurisation device independent of the control valve, after (6 ± 1)s (t_0). (SPLIT on the stopwatch) open the control valve.

— Record by split (t_1) on the stopwatch the delay of the beginning of discharge.

— Record by split (t_2) on the stopwatch the end of discharge of the extinguishing medium.

— The end of discharge can be noticed by the moment when all the extinguishing agent is discharged. The residual propellant gas is not taken into account.

— Keep the control valve fully open during 1 min after t_2.

— Calculate and record the duration of discharge (t_2 - t_1) for each of the three extinguishers.

— Calculate and record the average and the spread of each measurement of the duration of discharge.

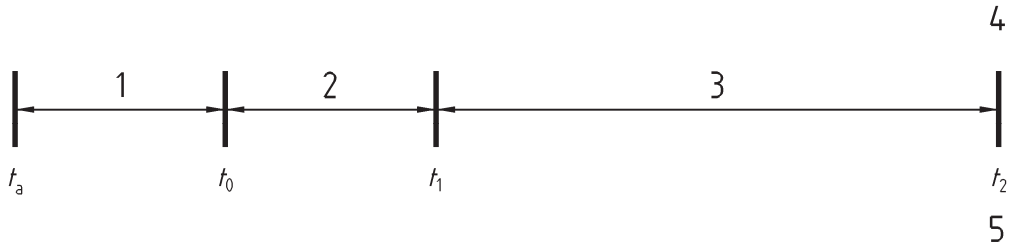
Diagram to perform the test is as follow:

— for extinguishers pressurised by a device independent of the control valve (see Figure A.2):

  — remove safety device;

  — pressurise the extinguisher (if not obtained by removing the safety device) and start the stopwatch (t_a),

  — after (6 ± 1) s , split on the stopwatch (t_0) and open the control valve,



Key
1 pressurisation for 6 s
2 discharge delay max 4 s
3 duration of operation
4 1 min release of remaining gas then close the valve
5 discharge finishing

Figure A.2

— for extinguishers pressurised by activation of the control valve see Figure A.3:

  — remove safety device;

  — open the control valve (pressurisation) and start the stopwatch (t_0).

Key
1 discharge delay max 4 s
2 duration of operation
3 1 min release of remaining gas then close the valve
4 discharge finishing

Figure A.3

A.6.3 Residual charge

A.6.3.1 Powder and water based extinguisher

— Check there is no pressure left in the extinguisher.

— Remove the closure of the extinguisher.

— Record the weight of the residual charge by one of the following method:

- Collect the residual charge of media from the extinguisher and its dip tube, valve and hose (if applicable).

- Measure the weight of the extinguisher containing residual charge (including medium from dip tube and valve and hose if applicable). Then, empty and reweigh the body.

— Calculate and record the percentage related to the nominal charge.

— Check that the original charge of tested extinguishers fulfilled the filling tolerances required in EN 3-7:2004+A1:2007, 6.2. (Take into account the weight of the propellant gas).

A.6.3.2 Gaseous media extinguisher

— Dry externally the extinguisher and record the weight.

— Reweigh the extinguisher after it is completely empty.

— Calculate the residual charge related to the nominal charge.

— Check that the original charge of tested extinguishers fulfilled the filling tolerances required in EN 3-7:2004+A1:2007, 6.2 (Take into account the weight of the propellant gas where applicable.).

A.7 Requirements – Acceptance criteria

A.7.1 Minimum duration

The duration of operation of each extinguisher shall comply with the requirements of Tables 2 to 7 of EN 3-7:2004+A1:2007 (see Tables A.1 to A.6 hereafter):

Table A.1 — Fire ratings, minimum duration of operation and nominal charges for powder extinguishers

Fire rating	Minimum duration of operation (s)	Nominal permitted charges (kg)
5 A	6	1
8 A	6	1, 2
13 A	9	1, 2, 3, 4
21 A	9	1, 2, 3, 4, 6
27 A	9	1, 2, 3, 4, 6, 9
34 A	12	1, 2, 3, 4, 6, 9
43 A	15	1, 2, 3, 4, 6, 9, 12
55 A	15	1, 2, 3, 4, 6, 9, 12

Table A.2 — Fire ratings, minimum duration of operation and nominal charges for water based extinguishers including foam extinguishers

Fire rating	Minimum duration of operation (s)	Nominal permitted charges (l)
5 A	6	2, 3
8 A	9	2, 3, 6
13 A	9	2, 3, 6, 9
21 A	9	2, 3, 6, 9
27 A	12	2, 3, 6, 9
34 A	15	2, 3, 6, 9
43 A	15	2, 3, 6, 9
55 A	15	2, 3, 6, 9

Table A.3 — Fire ratings, minimum duration of operation and nominal charges for powder extinguishers

Fire rating	Minimum duration of operation (s)	Nominal permitted charges (Kg)
21 B	6	1
34 B	6	1, 2
55 B	9	1, 2, 3
70 B	9	1, 2, 3, 4
89 B	9	1, 2, 3, 4
113 B	12	1, 2, 3, 4, 6
144 B	15	1, 2, 3, 4, 6, 9
183 B	15	1, 2, 3, 4, 6, 9, 12
233 B	15	1, 2, 3, 4, 6, 9, 12

Table A.4 — Fire ratings, minimum duration of operation and nominal charges for water based extinguishers including foam extinguishers

Fire rating	Minimum duration of operation (s)	Nominal permitted charges (l)
34 B	6	2
55 B	9	2, 3
70 B	9	2, 3
89 B	9	2, 3
113 B	12	2, 3, 6
144 B	15	2, 3, 6
183 B	15	2, 3, 6, 9
233 B	15	2, 3, 6, 9

Table A.5 — Fire ratings, minimum duration of operation and nominal charges for CO_2 extinguishers

Fire rating	Minimum duration of operation (s)	Nominal permitted charges (Kg)
21 B	6	2
34 B	6	2
55 B	9	2, 5
70 B	9	2, 5
89 B	9	2, 5
113 B	12	2, 5
144 B	15	2, 5
183 B	15	2, 5
233 B	15	2, 5

Table A.6 — Fire ratings, minimum duration of operation and nominal charges for halons extinguishers

Fire rating	Minimum duration of operation (s)	Nominal permitted charges (Kg)
21 B	6	1
34 B	6	1, 2
55 B	9	1, 2, 4
70 B	9	1, 2, 4, 6
89 B	9	1, 2, 4, 6
113 B	12	1, 2, 4, 6
144 B	15	1, 2, 4, 6
183 B	15	1, 2, 4, 6
233 B	15	1, 2, 4, 6

A.7.2 Spread of measurements

Each duration measured shall be within the average of the three results ± 15 % as required in 7.1.2. of EN 3-7:2004+A1:2007.

A.7.3 Commencement of discharge

All extinguishers shall operate within 4 s of the control valve being opened (t_1-t_0) as required in 7.3 of EN 3-7:2004+A1:2007.

A.7.4 Residual charge

The residual charge of extinguishing medium shall not be more than 10 % of the nominal charge as required in 7.2 of EN 3-7:2004+A1:2007.

Annex B
Effective range of operating temperature test

B.1 General

This procedure describes the method to assess the effective range of operating temperature.

B.2 Scope

This procedure applies to all fire extinguishers.

B.3 References

EN 3-7:2004+A1:2007, Clause 7.4 and Annex B.

B.4 Equipment

— Air temperature conditioning chamber(s) (oven, refrigerator, cooler,…).

— A continuous time and temperature recorder.

All temperature conditioning chambers shall have a stable and uniform temperature with a tolerance of less than ± 2 ºC (empty).

The equipment shall operate between T_{min} and T_{max}.

— Stopwatch with at least 3 splits.

— Weighing scale. with a resolution ≤ ± 2 g,

A liquid bath shall not be used.

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

B.5 Test conditions – number of test samples

Number of test samples : four

— two samples to be conditioned to the requirements of temperature cycle A

— two samples to be conditioned to the requirements of temperature cycle B

Subject one set of two extinguishers to cycle A and the other set of two extinguishers to cycle B:

Table B.1

Duration (h)	Cycle A	Cycle B
24 ± 1	T_{min} ± 2°C	T_{max} ± 2°C
24 ± 1	(+20 ± 5)°C	(+20 ± 5)°C
24 ± 1	T_{max} ± 2°C	T_{min} ± 2°C

— T_{max} and T_{min} claimed by the manufacturer shall be used for the tests.

— Extinguishers shall be able to operate between T_{max} and T_{min};

  — T_{max} for all extinguishers shall be 60 °C or higher,

  — T_{min} excluding water based extinguishers shall be – 20 °C, – 30 °C, or lower,

  — T_{min} for water based extinguishers shall be + 5 °C, 0 °C, – 5 °C, – 10 °C, – 15 °C, – 20 °C, – 25 °C, – 30 °C, or lower. For water based extinguishers without any protection against freezing, T_{min} shall be + 5 °C.

— When tested at Tmax and Tmin temperature limits, in accordance with EN 3-7:2004+A1:2007, Annex B, extinguishers shall conform to the following requirements:

  — the discharge shall commence within 10 s of the opening of the control valve;

  — except for CO_2 extinguishers, the duration of operation shall be not more than twice the value established at a temperature of 20°C. CO_2 extinguishers shall conform to 7.4.3.

  — the minimum duration of operation shall be not less than 6 s.

  — the residual charge shall be not more than 15 % of the nominal charge for extinguishers containing BC type powder, and not more than 10 % of the nominal charge for extinguishers containing other media.

— The maximum duration of operation of CO_2 extinguishers shall be as follows:

  — At T_{max} the maximum duration of operation shall be not more than the value established at a temperature of 20 °C.

  — At T_{min} the maximum duration of operation shall be not more than 2,5 times the value established at 20 °C.

Before placement of the extinguishers into the air temperature conditioning chamber(s), check to ensure the chamber has achieved and is stable at the required temperature.

B.6 Test method

B.6.1 General

Record the actual gross weight of all the extinguishers used in the test.

B.6.2 Duration of operation

B.6.2.1 General

Two technicians are needed to carry out this test: one to operate the extinguisher; the other to measure the times by stopwatch.

B.6.2.2 Stored pressure extinguishers (all types of media)

— Release the safety device.

— Hold the extinguisher by hand in its normal working position (see label instructions) and keep it immobile for the duration of the test. If there is a hose, hold the nozzle in the other hand in a horizontal position.

— Fully open the control valve and start the stopwatch (t_0).

— Record the delay of the beginning of discharge on the stopwatch split (t_1).

— Record the end of discharge of the extinguishing medium on the stopwatch split (t_2):

- For CO_2 extinguisher:

— The end of discharge can be identified by a change in appearance of the gas discharge from a white jet to a transparent jet combined with an increase in noise level of the discharge.

- For other type of extinguisher :

— The end of discharge can be identified as the moment when the extinguishing agent stops discharging from the extinguisher. The discharge of residual propellant gas is not taken into account.

— Keep the control valve fully open during 1 min after t_2.

— Calculate and record the duration of discharge (t_2-t_1) for each of the four extinguishers.

The diagram to perform the test is shown in Figure B.1:

— remove safety device;

start stopwatch) (t_0) and open the control valve,

Key
1 1 discharge delay max 10 s (t_1-t_0)
2 duration of operation (t_2-t_1)
3 1 min release of remaining gas then close the valve (at t_2)
4 discharge finishing

Figure B.1

B.6.2.3 Gas cartridge type extinguisher

— Release the safety device.

— If the pressurisation is not achieved by the releasing of the safety device, pressurise the extinguisher according to the instructions on the label.

— Start the stopwatch when the cartridge is opened (t_a).

— Hold the extinguisher by hand in its normal working position (see label instructions) and keep it immobile for the duration of the test. If there is a hose, hold the nozzle in the other hand in a horizontal position.

— Only for extinguishers using a pressurisation device independent of the control valve, after (6 ± 1) s ($t_0 - t_a$) (SPLIT on the stopwatch) open the control valve.

— Record by split (t_1) on the stopwatch the delay of the beginning of discharge.

— Record by split (t_2) on the stopwatch the end of discharge of the extinguishing medium.

— The end of discharge can be noticed by the moment when all the extinguishing agent is discharged. The residual propellant gas is not taken into account.

— Keep the control valve fully open during 1 min after t_2.

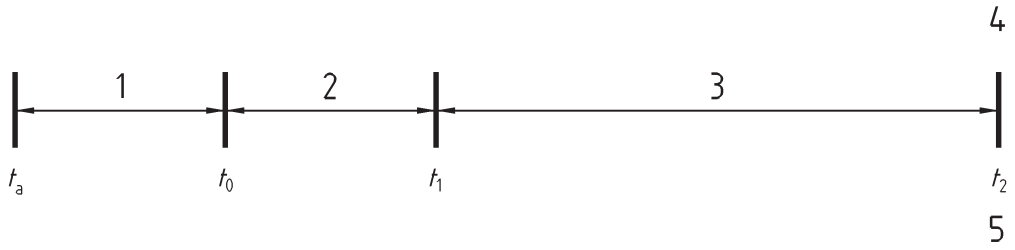
— Calculate and record the duration of discharge (t_2-t_1) for each of the four extinguishers.

The diagram to perform the test is shown in Figure B.2:

— remove safety device;

— pressurise the extinguisher (if not obtained by removing the safety device) and start the stopwatch (t_a),

— after (6 ± 1) s , split on the stopwatch (t_0) and open the control valve,



Key
1 pressurisation for 6 s
2 discharge delay max 10 s
3 duration of operation
4 1 min release of remaining gas then close the valve
5 discharge finishing

Figure B.2

B.6.3 Residual charge

B.6.3.1 Powder and water based extinguisher

— Check there is no pressure left in the extinguisher.

— Remove the closure of the extinguisher.

— Record the weight of the residual charge by one of the following methods:

  — Collect the residual charge of media from the extinguisher, it's dip tube, valve and hose (if applicable).

  — Measure the weight of the extinguisher containing residual charge (including medium from dip tube and valve and hose if applicable). Then, empty and reweigh the body.

— Calculate and record the percentage related to the nominal charge.

— Check the charge mass or volume against the filling tolerances required in EN 3-7:2004+A1:2007, 6.2 (take into account the weight of the propellant gas).

B.6.3.2 Gaseous media extinguisher

— Dry the external surface of the extinguisher and record the weight.

— Reweigh the extinguisher after it has been completely emptied.

— Calculate the residual charge related to the nominal charge.

— Check the charge mass or volume against the filling tolerances required in EN 3-7:2004+A1:2007, 6.2 (take into account the weight of the propellant gas).

B.7 Requirements – acceptance criteria

When tested at the T_{max} and T_{min} temperature limits, extinguishers shall meet the following requirements:

— The discharge shall commence within 10 s of the opening of the control valve

— Except for CO_2 extinguishers (see below), the duration of operation shall be not more than twice the duration established at a temperature of 20 °C.

— The duration of operation shall be not less than 6 s.

— The residual charge shall be not more than 15 % of the nominal charge for extinguishers containing BC type powder, and not more than 10 % of the nominal charge for extinguishers containing other media.

For CO_2 extinguishers, in addition to the above requirements:

— At T_{max} the duration of operation shall be not more than the value established at a temperature of 20 °C.

— At T_{min} the duration of operation shall be not more than 2.5 times the duration established at 20 °C.

Annex C
Operation and emission control mechanism /devices and safety devices tests

C.1 General

This procedure describes the test methods to measure the force/energy required to actuate operation devices or emission control devices and to release safety devices.

Further general and other special requirements on these devices according to EN 3-7:2004+A1:2007 are explained.

In order to measure the actuating forces, an alternative test method referred in footnote [1] may be used.

C.2 Scope

This procedure applies to all types of portable fire extinguisher.

The operation or emission control mechanism/device of which is either

- a finger trigger, or
- a squeeze grip lever, or
- a screw down hand wheel, or
- a strike knob.

It also applies to safety devices.

C.3 References

EN 3-7:2004+A1:2007, 10.1, 10.2, 10.3 and Annex D.

C.4 Equipment

The main pieces of test equipment are:

- a test rig.

[1] Andstén, T., Juutilainen H., Vaari J., Weckman H.: Test method for actuating and safety devices of portable fire extinguishers. Nordtest Project No. 1435-99. VTT Research notes 2002, Technical research centre of Finland, Espoo 1999. Available via the Internet under: <http://www.vtt.fi/inf/pdf/tiedotteet/1999/T2002.pdf.

The test rig shall allow the extinguisher to be fixed firmly to the test rig with its safety or actuating device located and aligned correctly in relation to the force meter. To achieve this, a metal framework with various auxiliary components such as mounting brackets, straps, pulleys, wires, hydraulic actuators etc. may be used.

- a force meter,
- a temperature conditioning chamber,
- a striking test device as described in EN 3-7:2004+A1:2007, Annex D,

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

C.5 Number of test samples – Test conditions

C.5.1 Number of test samples

C.5.1.1 Operation and emission control mechanism/device

C.5.1.1.1 CO_2 fire extinguishers

Number of test samples for force measurement: four to six, of which:

- two samples to be tested at T_{min} ± 2 °C,
- two samples to be tested at T_{max} ± 2 °C, and if applicable,
- two samples to be tested at (40 ± 2) °C,

C.5.1.1.2 Other fire extinguishers

1st device and 2nd device

Number of test samples for the force and/or the energy measurement: four of which:

- two samples to be tested at T_{min} ± 2 °C,
- two samples to be tested at T_{max} ± 2 °C,

NOTE According to the design and/or the technology , an extinguisher can be equipped with two operating devices. For example, one device to open a gas cartridge and a second device to control medium discharge.

C.5.1.2 Safety devices

Number of test samples for all types of fire extinguishers: six of which:

- one sample to be tested at (20 ± 5)°C in order to determine the force to release a safety device,
- three samples to be tested at (T_{min} ± 2) °C:
  - two to determine the force to release a safety device,
  - one to assess the unaided manual attempt of the operating mechanism with the safety device in position (EN 3-7:2004+A1:2007, clause 10.3),

— three samples to be tested at (T_{max} ± 2) °C:

  — two to determine the force to release a safety device,

  — one to assess the unaided manual attempt of the operating mechanism with the safety device in position (EN 3-7:2004+A1:2007, clause 10.3),

C.5.2 Test conditions-Pre-conditioning of test samples

Prior to the tests all samples shall be subjected to the conditioning temperatures (20 ± 5) °C for a minimum period of 24 h. and to the applicable test temperature (T_{min} ± 2 °C, +40 °C ± 2 °C, T_{max} ± 2 °C) for a period of (24 ± 1) h.

The tests shall be conducted within 3 minutes of removal of the sample from the conditioning chamber.

C.6Test method

C.6.1 Principle

Each extinguisher shall be mounted to ensure that the safety or actuating device is aligned and located correctly to the measurement position.

The peak force value shall be recorded.

One extinguisher sample may be used for these tests (e.g. firstly measure the safety device and secondly measure the operation device) if the requirements of the pre-conditioning are fulfilled (see C.5.2 of this procedure).

In order to apply a striking energy to an extinguisher strike knob, the striking test device as specified in Clause C.4 of this procedure, shall be mounted in a suitable position above the strike knob. The hammer release mechanism shall not interfere with the free falling hammer.

C.6.2 Application of the force for the test

The extinguisher shall be fixed firmly to the test rig with the aid of suitable auxiliary devices. The extinguisher and force meter shall be positioned such that the force exerted is in accordance with the manufacturers operating instructions.

The fitting of auxiliary devices to aid measurement are permitted provided the result is unaffected

C.6.3 Devices activated by force (N)

C.6.3.1 Operation and emission control mechanism.

The force shall be applied through the force meter for a period of between 1 s and 3 s.

Application of a force shall continue until:

— The operating lever or finger trigger has been operated to the position where the normal discharge starts or the gas of a propellant cartridge has been released,

— For hand wheel device:

  — The force shall be applied through the force meter, to activate the extinguisher.

  — Application of a force shall continue until the screw down hand wheel has been moved to the position where the normal discharge starts or the gas of a propellant cartridge is released.

When testing a screw down hand wheel device, the force may be determined by measurement of the torque required to rotate the wheel, then calculate the force relative to the maximum radius of the wheel.

When testing actuating devices of fire extinguishers which are pressurized only at the moment of operation, the application of force shall be interrupted for 6 seconds after the gas of the propellant gas cartridge has been released. After the 6 seconds have elapsed measure the actuating force again. The second peak force value shall also be recorded.

Report the highest value.

C.6.3.2 safety device

The force shall be applied through the force meter, remove the safety device between 1 s to 3 s of application.

Application of a force is to continue until the safety device has been released,

Report the highest value.

C.6.3.3 Resistance of safety device.

With the safety device in it's correct position, the force shall be applied to the operating lever or finger trigger through the force meter for a period of 5 seconds.

For a finger trigger device the force shall be equal to 200 N.

For a squeeze grip lever the force shall be equal to 400 N.

For a hand wheel device the applied force shall be equal to 200 N.

Subsequently check that the operating device continues to function correctly and report any damage or deformation.

C.6.4 Devices activated by energy (joule).

C.6.4.1 General

The maximum energy required to operate the strike knob shall be applied.

C.6.4.2 strike knob device

Allow the 4 kg weight to fall freely from a height of 50 mm (2 joules) onto the strike knob.

C.6.4.3 safety device

Allow the 4 kg weight to fall freely from a height of 100 mm (4 joules) onto the strike knob.

C.7 Requirements – Acceptance criteria

C.7.1 Operation and emission control mechanism/device

C.7.1.1 General

With the exception of the safety device, no other component shall require mounting, removal or modification:

- before operating the extinguisher;
- to operate the extinguisher;
- during use.

C.7.1.2 Activation of a fire extinguisher

The activation of the extinguisher shall not depend on the repetition of a given action on the same device.

C.7.1.3 Force or energy required to activate operating devices

C.7.1.3.1 CO_2 fire extinguishers

Force to activate operating device:

— ≤ 200 N (at T_{min}, and at 40 °C),

— ≤ 300 N (at T_{max}),

If at Tmax force is ≤200 N, the test at 40 °C does not need to be performed.

C.7.1.3.2 Other fire extinguishers

Force to activate a finger trigger device:

— ≤ 100 N (at Tmin, and at Tmax),

Force to squeeze a grip lever device:

— ≤ 200 N (at Tmin, and at Tmax),

Force to screw down a hand wheel device:

— ≤ 100 N (at Tmin, and at Tmax),

Energy to operate a strike knob device:

— ≤ 2 J (at Tmin and at Tmax),

C.7.2 Safety devices

C.7.2.1 General

The operating mechanism of a fire extinguisher shall be provided with a safety device to prevent inadvertent operation.

C.7.2.2 Force to release safety devices

Force to release (pull or push) safety devices:

— between 20 N and 100 N (at T_{min}, at 20 °C and at T_{max},)

C.7.2.3 Means to indicate any removal of a safety device

The safety device shall be provided with means to show whether the extinguisher may have been operated. This may be in a form of a wire and seal or a mechanism which prevents re-insertion of the safety device. It shall be possible to see if the safety device has been removed.

C.7.2.4 Mechanical resistance

With the safety device in position apply a force or impact equal to twice the relevant value (see EN 3-7:2004+A1:2007, Table 9) to initiate discharge. There shall be no deformation or breakage of any part of the mechanism that may prevent any discharge from the extinguisher.

Annex D
Control valve

D.1 General

This procedure describes the method to perform the test of the control valve.

D.2 Scope

This procedure applies to all types of portable extinguishers.

D.3 References

EN 3-7:2004+A1:2007, 10.6 ‘Control valve’ and Annex F.

D.4 Equipment

— stop-watch

— pressure gauge or test port with measuring pressure transducer

— weighing scale

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

D.5 Tests conditions – Number of tests samples

Number of samples: two samples

Powder extinguishers samples shall prior to the storage period be submitted to the compaction procedure. Extinguishers with gaseous extinguishing media and water based extinguishers are not subjected to this compaction.

The test is carried out at ambient temperature (20 ± 10) °C.

Extinguishers for testing shall prior to the test be stored for at least 24 h at (20 ± 5) °C.

D.6 Test method

D.6.1 General

Operations shall be carried out manually. The closure(s) of the valve shall be made by pulling away the hand or finger suddenly. Thus the valve turns off automatically.

D.6.2 1 kg and 2 kg powder stored pressure extinguishers

Connect the pressure measuring equipment to the extinguisher prior to start the test and keep it connected throughout the test.

Procedure (see Figure D.1):

Open the valve for 1 s to 1,5 s ($t_2 – t_1$)

At t_2 within 10 s measure the pressure P_2.

Wait 2 min ($t_3 – t_2$) and measure P_3.

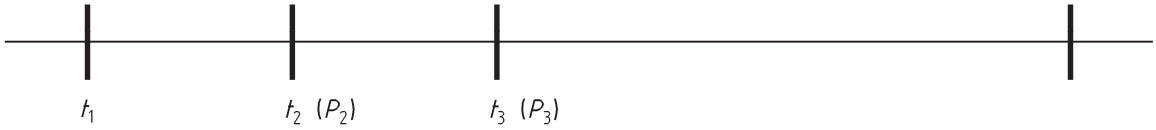


Figure D.1

D.6.3 1 kg and 2 kg powder cartridge operated extinguishers

Connect the pressure measuring equipment to the extinguisher prior to start the test and keep it connected throughout the test.

Procedure (see Figure D.2):

Open the gas cartridge and wait for 3 min ($t_1 – t_0$).

Open the valve for 1 s to 1,5 s ($t_2 – t_1$).

At t_2 within 10 s measure the pressure P_2.

Wait 2 min ($t_3 – t_2$) and measure P_3.

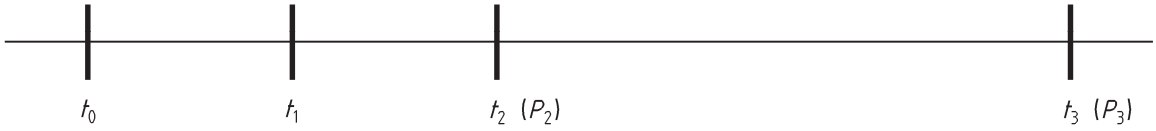


Figure D.2

D.6.4 All stored pressure extinguishers excluding 1 and 2 kg powder and CO_2 extinguishers

Connect the pressure measuring equipment to the extinguisher prior to start the test and keep it connected throughout the test.

Calculate X1 as 5 % and X2 as 15 % of the average of discharge duration specified in EN 3-7:2004+A1:2007, 7.1.

Procedure (see Figure D.3):

At t_1 measure the initial pressure P_1.

Open the valve for a time between X1 and X2 ($t_2 – t_1$).

At t_2 within 10 s measure the pressure P_2.

Wait 5 min ($t_3 – t_2$) and measure P_3.

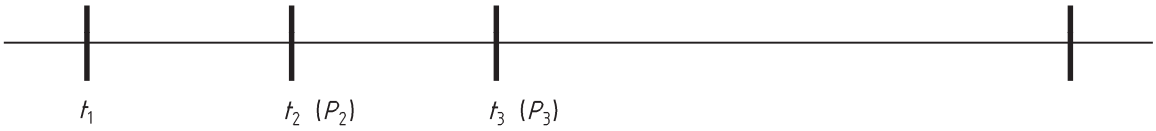


Figure D.3

D.6.5 All cartridge operated extinguishers excluding 1 and 2 kg powder

Connect the pressure measuring equipment to the extinguisher prior to start the test and keep it connected throughout the test.

Calculate X1 as 5 % and X2 as 15 % of the average of discharge duration specified in EN 3–7:2004+A1:2007; 7.1.

Procedure (see Figure D.4):

Open the gas cartridge and wait for 3 min ($t_1 – t_0$).

At t_1 measure the pressure P_1.

Open the valve for a time between X1 and X2 ($t_2 – t_1$)

At t_2 within 10 s measure the pressure P_2.

Wait 5 min ($t_3 – t_2$) and measure P_3.

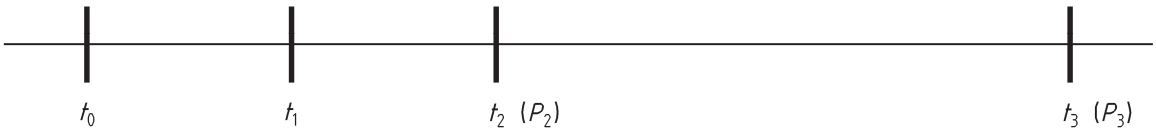


Figure D.4

D.6.6 CO_2 extinguishers

Calculate X1 as 5 % and X2 as 15 % of the average of discharge duration specified in EN 3-7:2003+A1:2007; 7.1.

Procedure (see Figure D.5):

Open the valve for a time between X1 and X2 ($t_2 - t_1$).

At t_2 within 10 s measure the weight M_2.

Wait 5 min ($t_3 - t_2$).and measure M_3.

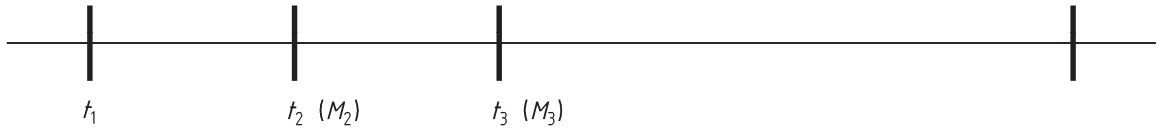


Figure D.5

D.7 Requirements – Acceptance criteria

D.7.1 For 1 kg and 2 kg powder extinguishers P3 shall not be less than 80 % of P2**.**

D.7.2 For all extinguishers excluding 1 kg and 2 kg powder and CO_2 extinguishers P3 shall not be less than 80 % of P2 or P3 shall not be less than 50 % of P1.

D.7.3 For CO_2 extinguishers M3 shall not be less than 80 % of M2 .

Annex E
Hose and coupling systems tests

E.1 General

This procedure describes the method to measure the resistance to pressure of hoses and coupling systems.

E.2 Scope

This procedure applies to all hoses and their coupling systems.

E.3 References

EN 3-7:2004+A1:2007, 10.5 and Annex E.

E.4 Equipements

— Stopwatch

— Hydraulic pressure supply

— Air temperature conditioning chamber(s) (oven, refrigerator, cooler,…)

— Liquid buffer tank (accumulator), with a sufficient volume to maintain the hydraulic fluid at the test temperature

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

E.5 Test conditions – Number of test samples

Number of test samples: five

— one sample is tested at (20 ± 5) °C

— two samples are tested at (T_{max} ± 2) °C

— two samples are tested at (T_{min} ± 2) °C

All test samples shall be conditioned at the corresponding test temperature for a period of between 12 h and 24 h prior to the test.

Samples to be tested at T_{max} and at T_{min} shall be connected to the liquid buffer tank during the exposure to the test temperature. Samples and the liquid buffer tank shall be filled up with test liquid. The open end of the samples shall be blocked by a suitable means. They shall be submitted to pressure test within 2 minutes if removed from the conditioning chamber.

Test liquid shall be suitable for the test temperature.

Minimum burst pressure:

— For all types except CO_2 fire extinguisher:

  — 3 times P(T_{max}), when tested at (20 ± 5) °C

  — twice P(T_{max}), when tested at (T_{max} ± 2) °C and at (T_{min} ± 2) °C

— For CO_2 extinguisher:

  — 1.5 times P(T_{max}), when tested at 20°C ± 5 °C

  — 1.25 times P(T_{max}), when tested at (T_{max} ± 2) °C and at (T_{min} ± 2) °C

E.6 Test method

E.6.1 Test at (20 ± 5)°C

After the conditioning period:

  — connect the sample to hydraulic pressure supply,

  — fill up the sample with test liquid (water or equivalent) and vent the air,

  — block the open end by a suitable means,

  — increase the pressure to the minimum required burst pressure in a time of not less than 30 seconds with a maximum pressure increase of 2 bar/s [5 bar/s for CO_2 hose],

  — maintain the pressure for a further 30 seconds,

  — increase the pressure at the same rate until burst occurs,

  — record the actual burst pressure.

E.6.2 Test at (T_{max} ± 2)°C and at (T_{min} ± 2)°C

After the conditioning period:

  — connect the liquid buffer tank to the hydraulic pressure supply,

  — increase the pressure to the minimum required burst pressure in a time of not less than 30 seconds with a maximum pressure increase of 2 bar/s [5 bar/s for CO_2 hose]

  — maintain the pressure for a further 30 seconds,

  — increase the pressure at the same rate until burst occurs,

  — record the actual burst pressure.

E.7 Requirement – Acceptance criteria

All five tested samples shall withstand the minimum required pressure during the observation period of 30s.

Annex F
Resistance to extinguishing medium of extinguishers using water based media

F.1 General

This procedure describes the method to perform the test of resistance to extinguishing medium of extinguishers using water based media.

F.2 Scope

This procedure is applicable to water based extinguishers.

F.3 References

EN 3-7:2004+A1:2007, 14.2 and H.2.

F.4 Equipment

— Air temperature conditioning chamber(s) (oven, refrigerator, cooler,…).

— A continuous time and temperature recorder.

— An equipment to cut the extinguisher's body.

All the equipment shall be able to have a stability and uniformity in the defined testing volume with a tolerance less than ± 2 ºC (empty).

The equipment(s) shall work between T_{min} and T_{max}.

Liquid bath shall not be used.

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

F.5 Test conditions – Number of tests samples

Extinguishers for testing shall prior to the test be stored for at least 24 h at (20 ± 5) °C.

Number of test samples:

— two complete extinguishers + 1 complete extinguisher for reference for the extinguishing media sampling.

F.6 Test method

Two glass containers of the media shall be taken from the reference extinguisher (without operating it).

Two extinguishers in the upright position and one glass container shall be subjected 8 times to the temperature cycling given in table F1 below.

The second glass container shall be stored at (20 ± 5) °C during the whole cycling duration.

Table F1

STAGE	DURATION (h)	TEMPERATURE (ºC)
1	24 ± 1	Tmin ± 2[a]
2	≥ 24	+20 ± 5
3	24 ± 1	Tmax ± 2[b]
4	≥ 24	+20 ± 5

[a] For water based extinguishers with protection against freezing Tmin shall be +5 ºC, 0 ºC, -5 ºC, -10 ºC, -15 ºC, -20 ºC, -25 ºC, -30 ºC, or lower.

For water based extinguishers without any protection against freezing Tmin shall be +5 ºC.

[b] $Tmax_x$ for all extinguishers shall be +60 ºC or higher.

The duration of any complete cycle shall not exceed 120 h.

Before putting the extinguishers into the conditioning chamber, it shall be checked that the required temperature is achieved and stabilised.

When the 8 cycles are finished the operator shall pour every extinguisher into a clean container without operating it (stored pressure extinguishers shall be depressurised before pouring).

The body of each extinguisher will be cut into two sections by the operator.

The operator shall examine the internal surface of the bodies.

The operator shall also examine colour changes in the extinguishing media in comparison with the reference sample, which was submitted to the thermal cycles.

The operator shall then record the results.

F.7 Requirements – Acceptance criteria

1) The internal surface of the body or the surface of any metallic part inside the extinguisher shall show no visible sign of corrosion.

2) There shall be no detachment, cracking or bubbling of any protective coating.

3) The colour of the extinguishing agent inside the glass container subjected to the temperature cycling shall be similar to the colour of the extinguishing media removed from the extinguishers.

If all the checked points are satisfactory for both extinguishers, then the test shall be reported as passed.

Annex G
Classes A and B fire tests

G.1General

This procedure describes the method to perform the Class A and/or B fire tests of portable fire extinguishers.

G.2Scope

This procedure applies to extinguishers intended to be used on Class A and/or B fires .

G.3References

EN 3-7:2004+A1:2007,15.1; 15.2; 15.3 and Annex I.

ISO 657-1.

ISO 4470.

G.4Equipment

— Stopwatch

— Thermometer

— Tape measure

— Metal frames 255 mm high, 900 mm wide with a length equal to that of the A test fires constructed with right angle steel section (50 x 50) mm.

— Test chamber with a minimum internal height of 8 m and an area around the Class A frame with a minimum distance of 3 m to the test house wall.

— Oxygen concentration measuring device.

— Air speed measuring device.

— Metal lighting trays with a width of 600 mm, a depth of 100 mm and lengths of 100 mm of the fire sizes.

— A range of welded sheet steel circular trays with dimensions as given in table I.3 of EN 3-7:2004+A1:2007.

— Wood moisture content measuring device.

The measuring equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

G.5Test conditions – Number of test samples

G.5.1 General Tests Conditions

Number of test samples: three specimens per series (see also EN 3-7:2004+A1:2007 6.3 for the number of series).

Test samples shall be stored for at least 24 h at a temperature of (20 ± 5) °C before the test and shall be maintained within this temperature range until tested.

Furthermore, powder extinguishers shall be subjected to the compaction procedure (see Annex H), immediately before submission to the fire test.

Cartridge type extinguishers shall be pressurised within the last 30 seconds of the pre-combustion period.

To carry out these tests, the operator shall be dressed in clothing suitable for the purpose. The use of a helmet, gloves, suitable non-reflective visor and breathing apparatus shall be permitted. The operator shall not wear an aluminium-faced suit.

G.5.2 Class A fire test

G.5.2.1 Characteristics of test fires

Class A test fires shall consist of a crib of wooden sticks supported on a metal frame 250 mm high, 900 mm wide and of a length equal to that of the test fire (see Figure G.1). The metal frame shall be constructed from angle sections (L x W) (50 x 50) mm as specified in ISO 657-1.

Each test fire is designated by a number (which indicates the fire size) followed by the letter A. The designating number of the test fire represents the following two parameters as shown in Table G.1:

— the length of the test fire in decimetres, i.e. the length of the wooden sticks arranged in the longitudinal direction of the test fire;

— the number of 500 mm wooden sticks for each layer arranged in the transverse direction of the test fire.

NOTE 1 Each test fire is designated by a number in a series in which each term is equal to the sum of the two preceding terms, i.e. this series is equivalent to a geometrical progression having a common ratio of about 1,62. The additional fires 27A and 43A represent the product of the preceding term and $\sqrt{1{,}62}$.

Table G.1 — Characteristics of class A test fires

Designation of test fire	Number of 500 mm wooden sticks in each transverse layer	Length of test fire (m)
5A	5	0,5
8A	8	0,8
13A	13	1.3
21A	21	2,1
27A	27	2,7
34A	34	3,4
43A	43	4,3
55A	55	5,5

Test fires greater than 27A shall be constructed using fires of smaller sizes (fires, frames and trays) see Table G.2. The ends of the longitudinal sticks shall touch.

Table G.2 — Construction of class A test fires

Fire size	Fire construction
5A	5A
8A	8A
13A	13A
21A	21A
27A	27A
34A	21A + 13A
43A	8A + 27A + 8A
55A	21A + 13A+21A

To provide adequate support for the wooden sticks for fires larger than 13A, metal cross members shall be added to the frame positioned as for 8A and 13A fires.

For example a 21A frame shall have cross members positioned 800 mm from each end.

The wooden sticks shall be of *Pinus silvestris* containing 10 % to 15 % of moisture by mass when determined in accordance with EN3-7+A1, annex J. They shall be sawn and of square section of side (39 ± 2) mm. The density of the wood shall be 0,40 kg/dm3 to 0,65 kg/dm3.

The wooden sticks shall be stacked in fourteen layers on the metal frame, as shown in Figures G.1 and G.2.

Dimensions in millimetres

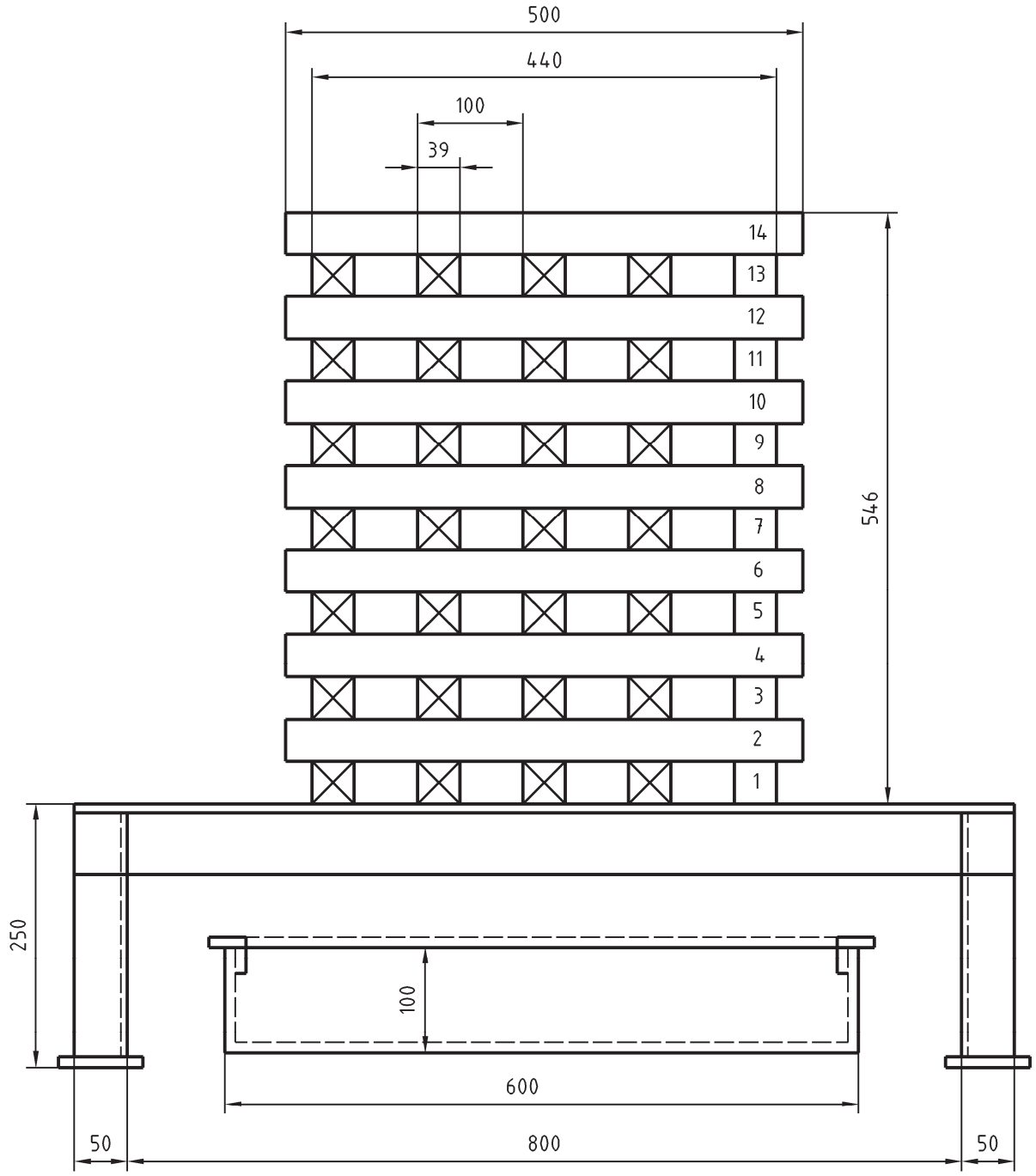


Figure G.1 – Example of class A fire (13 A fire) – Front view (identical for all fires)

Dimensions in millimetres

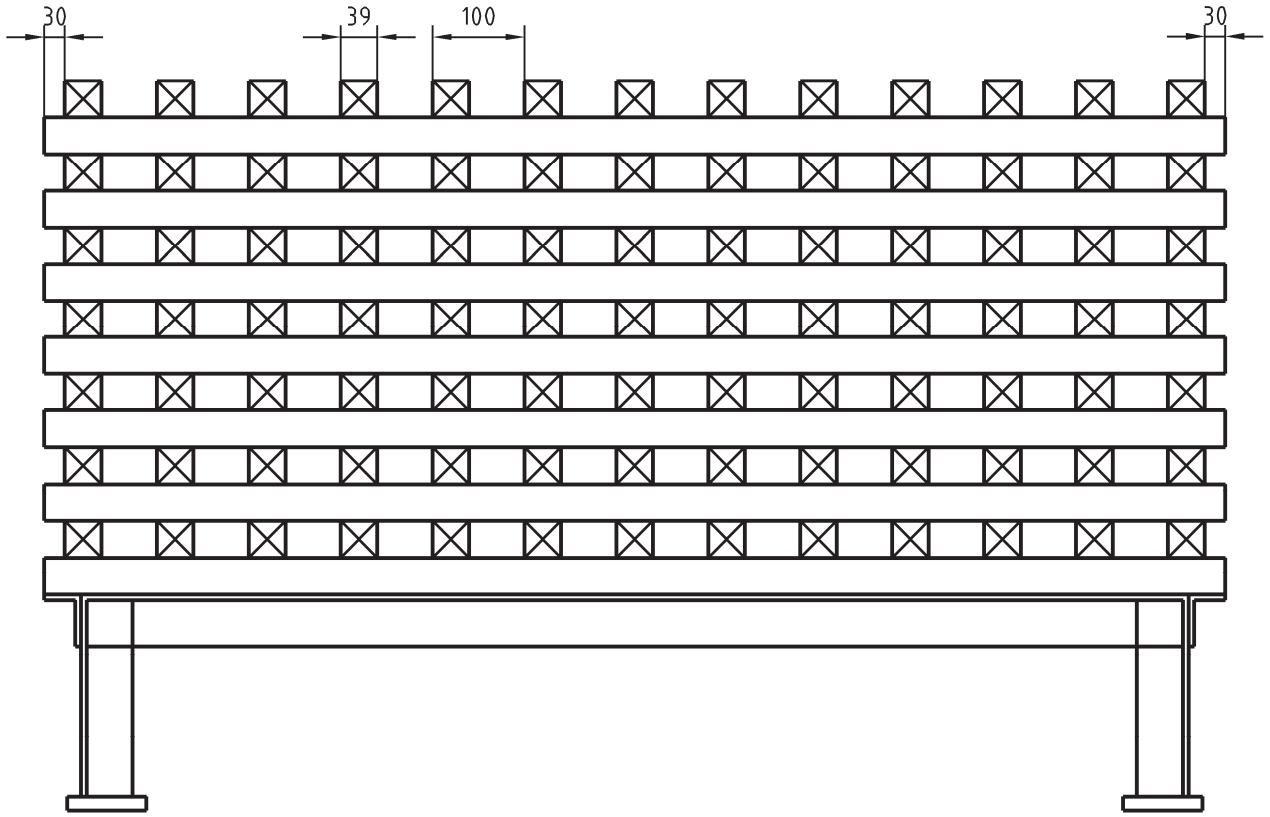


Figure G.2 – Example of class A fire (13 A fire) –side view (variable according to size of fire)

The sticks in each layer shall be spaced at regular intervals with gaps of 6 cm between the sticks.

The sticks laid transversely (layers 2, 4, 6, 8, 10, 12 and 14) shall have a fixed length of (500 ± 10) mm.

The sticks laid longitudinally (layers 1, 3, 5, 7, 9, 11 and 13) shall have fixed lengths which vary according to the test fire as given in Table 1, with a tolerance of ± 10 mm.

NOTE 2 When the test fire is constructed using smaller fires, the tolerance applies to the length of the individual sticks.

A fire size beyond 55A shall not be used (see Table G.1).

G.5.2.2 Test conditions

The test fire shall be located indoors in a test chamber and shall be sheltered from draughts. The ambient temperature shall be between 0 °C and 30 °C.

The test chamber shall have the following characteristics:

— minimum height of the house (internal): 8 m;

— area: Around the class A frame there shall be a minimum distance of 3 m to the test house wall. (For example: In the case of a 55A, the room shall have a minimum length of 11,5 m and a minimum breadth of 6,5 m);

— air and surrounding conditions: minimum 0_2 concentration throughout the test at a height of between 0,8 m and 1,5 m shall be 19 %. The measuring device shall be attached to the operator;

— the maximum air speed before ignition shall be 0,2 m/s measured above the centre of the frame at a height of 0,2 m for horizontal airspeed and at a height of 1 m above the uppermost stick in the crib. The measurement has to be taken before the crib is ignited. During the test and for 3 min after the test no characteristics of ventilation or airflow are allowed to change. The test starts by measurement of the air speed.

A metal lighting tray with a width of 600 mm and a depth of 100 mm shall be used. The length of the tray shall be 100 mm greater than the fire size. The tray shall be reinforced to limit deformation

In the case of multiple frames being used to construct the fire, it shall be permissible for the overall length to be increased by 200 mm to 300 mm.

The lighting tray shall be placed symmetrically beneath the crib forming the test fire.

Water shall be added to the tray to a depth of 30 mm. Heptane of a quality identical to that used for the Class B fires shall then be added, the quantity being sufficient to give a burning time of 2 min 30 s.

The depth of the water and heptane shall be sufficient to ensure the whole surface of the fuel burns for the complete 2 minutes pre burning period.

G.5.3 Class B fire tests

G.5.3.1 Characteristics of test fires

Class B test fires shall be made in a range of welded sheet steel circular trays, the dimensions of which are given in Table G.3. The base shall be the same nominal thickness as the walls and the thickness tolerance of the base and wall material shall conform to the relevant national standard. Stiffening bars or sections may be welded to the underside of the base with a minimum distance of 200 mm between substantially parallel stiffeners. All tolerances specified relate to the tray at its time of manufacture.

The trays shall contain water, overlaid with a layer of fuel in the following proportion: 1/3 water, 2/3 fuel. The total volume of liquid in the tray shall be as specified in Table G.3, which will give a depth of water of minimum 10 mm, and a depth of fuel approximately 20 mm.

The test fires are designated by a number (which indicates the fire size) followed by the letter B. The number represents the volume of liquid, in litres, contained in the tray.

NOTE Each test fire is designated by a number in a series in which term is equal to the sum of the two preceding terms, i.e. this is equivalent to a geometrical progression having a common ratio of about 1,62. The additional fires 70B, 113B, and 183B represent the product of the preceding term and $\sqrt{1{,}62}$.

The surface area of the tray in square decimetres is equal to the product of the test fire size and π.

A fire size beyond 233B shall not be used (see Table G.3).

Table.G.3 — Construction of class B test fires

Designation of test fire	Volume of liquid (1/3 water + 2/3 fuel) (l)	Dimensions of tray				
		Internal diameter at rim (mm)	Depth (mm)	Thickness of walls (m)	Approximate area of fire ($m^{2)}$	Minimum duration of operation (s)
21B	21	920 ± 10	150 ±5	2,0	0,66	6
34B	34	1 170 ±10	150 ±5	2,5	1,07	6
55 B	55	1 480 ±15	150 ± 5	2,5	1,73	9
70B	70	1 670 ±15	150 ±5	2,5	2,20	9
89B	89	1 890 ± 20	200 ±5	2,5	2,80	9
113B	113	2 130 ±20	200 ±5	2,5	3,55	12
144B	144	2 400 ±25	200 ±5	2,5	4,52	15
183B	183	2 710 ± 25	200 ±5	2,5	5,75	15
233B	233	3 000 ±30	200 ±5	2,5	7,32	15

The minimum height from the surface of the fuel to the rim of the tray shall be 100 mm for fires up and including 70B and 140 mm for fires of larger sizes.

The height from the ground to the rim of the tray shall not exceed 350 mm. The construction of the tray shall prevent the flow of air under the tray, or sand or earth shall be built around the tray up to but not above the level of the base.

After each test, a minimum of 5 mm of fuel shall remain.

For powder extinguishers, at least one fire in each series shall be successfully extinguished on a fresh water/fuel filling for the rating to be accepted.

For successive tests with CO_2 type extinguishers only, fuel may be added to the existing test fire.

For water based extinguishers, fresh fuel and water shall be used for each test.

G.5.3.2 Test conditions

The ambient temperature shall be between 0 °C and 30 °C.

Class B Fire tests can be carried out indoors or outdoors.

For indoor fire tests the conditions shall be:

- the height of the test chamber (internal) shall be equal to or greater than 5 times the diameter of the test fire tray;
- the area of the test chamber in square metres (m^2) shall be equal to or greater that the test fire designation;
- each side of the test chamber shall be equal to or greater than 4 times the diameter of the test tray with a minimum length of 7.5 m (see Table G.4);
- air and surrounding conditions shall be as defined for Class A fires.

Table G.4 — Minimum dimensions of test chambers

Fire test B	Minimum height (tray x 5) (m)	Minimum side length (tray x 4) and 7,5 m whichever is the greatest (m)	Minimum ground area (m^2)
233	15,2	12,2	233
183	13,5	10,8	183
144	12,0	9,6	144
113	10,6	8,5	113
89	9,4	7,5	89
70	8,3	7,5	70
55	7,4	7,5	56
34	5,8	7,5	56
21	4,6	7,5	56

For outdoor fire tests the wind speed during the test shall not be greater than 3m/s.

The fuel for the class B test fires shall be industrial heptane, which shall have the following characteristics:

- distillation curve: 84 °C to 105 °C;
- difference between initial and final points of distillation: ≤ 10 °C;
- aromatic content (V/V): ≤ 1 %;
- density at 15 °C: 0,680 to 0,720.

G.6Test method

G.6.1 Test procedure for Class A fire tests

The heptane shall be ignited.

After the 2 minutes pre burning period the tray shall be removed carefully to prevent the spillage of burning heptane.

The crib shall then be permitted to burn for a further 6 min, making a total pre-test time of 8 min, at which point the test fire can be considered to be established and extinction shall be commenced.

The operator shall then bring the extinguisher into use, and direct the jet onto the test fire while moving round it at his own discretion in order to obtain the best result. The entire contents of the extinguisher may be discharged either continuously or in successive bursts.

The maximum extinguishing time shall not exceed 5 min for fires up to and including 21A and 7 min for fires of a greater size. The operator shall indicate when the extinguisher is fully discharged or when the fire is extinguished within the permitted time.

In both cases the fire shall be observed for 3 min from that point. A new period of 3 min starts in the case of a re-operation within the permitted time.

For the test to be deemed successful, all flames shall be extinguished and there shall be no recurrence of flames during the 3 min observation period.

G.6.2 Test procedure for Class B fire tests

The heptane shall be ignited and then be permitted to burn for 1 min, at which point the test fire can be considered to be established and extinction shall commence within 10 s.

The operator shall then bring the extinguisher into use, and direct the jet onto the test fire while moving round at his own discretion in order to obtain the best result. The entire contents of the extinguisher may be discharged either continuously or in successive bursts.

The operator shall not step into the tray

The operator shall indicate when the extinguisher is fully discharged or when the fire is extinguished.

G.6.3 General acceptance criteria

A portable fire extinguisher shall be deemed to satisfy the relevant fire performance requirements when two test fires of a series of three are extinguished. A test series is complete after three fires, or when the first two fires have both been extinguished or have both not been extinguished. Each test series shall be completed before the next is commenced. There is no restriction on the number of series that may be carried out on the same type of portable fire extinguisher without modifications, but a series shall consist of consecutive fires and results shall not be ignored.

If only one test fire from a series of three is extinguished, this successful result may be used once only as the initial result in the next set of fire tests on this extinguisher model at a lower fire test rating.

Annex H
Compaction procedure

H.1 General

This procedure describes the method to perform the compaction when required.

H.2 Scope

This procedure is applicable to:

a) The powder extinguishers for testing, before the 24 h storage period at (20 ± 5)°C prior to the following tests:

   — the duration of operation tests;

   — the control valve tests;

   — the fire performance tests.

b) The water based extinguishers for testing, before the 24 h storage period at (20 ± 5) °C prior to:

   — the duration of operation tests.

H.3 References

EN 3-7:2004+A1:2007,Clause 5 and Annex K.

H.4 Equipment

The compaction machine shall be designed to accept only one extinguisher at a time, which shall be raised by a rod and guided by castors. The plate supporting the extinguisher shall be steel, (300 ± 5) mm square and (60 ± 1) mm thick. Compaction machine shall be mounted to prevent movement and absorption of energy due to the impact.

The compaction machine shall conform to the following:

— the rod shall be adjustable to adjust to the extinguisher base;

— the rod shall be able to move freely;

— the extinguisher shall be guided without constraint in the guide castors;

— the impact shall take place on the steel plate and not on the rod;

— the cam to be used is shown in EN 3-7:2004+A1:2007, Figure K.1 and shall rotate at uniform angular speed;

— equipped with a counter, which automatically stops at 500 cycles.

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

H.5 Tests conditions – Number of tests samples

Number of test samples:

- three specimens of powder extinguishers for the duration of operation tests;
- two specimens of powder extinguishers for the control valve tests;
- all specimens of powder extinguishers for the fire performance tests;
- three specimens of water based extinguishers for the duration of operation tests.

Compaction procedure is carried out at ambient temperature (20 ± 5) °C.

H.6 Test method

The extinguisher, in the condition in which it is used, and conditioned (20 ± 5) °C shall be subjected to the compaction procedure.

The extinguisher shall be held in the vertical position in the compaction machine and dropped vertically 500 times, from a height of (15 ± 1) mm, at a frequency of 1 Hz ± 10 %, onto the rigid horizontal steel plate.

The extinguisher shall not be shaken nor inverted after the compaction and prior to the test.

H.7 Requirements – Acceptance criteria

The compaction procedure is a pre-conditioning procedure. The requirements are specified in the subsequent tests (see H.2).

Personal from the laboratory shall take care that the operability of the extinguisher is not affected by the compaction. If operability of the extinguisher is affected this shall be reported.

Annex I
Class F fire tests

I.1 General

This procedure describes the method to conduct the class F fire rating of a portable extinguisher.

I.2 Scope

This procedure applies to water based extinguishers for use on cooking oil fires.

I.3 References

EN 3-7:2004+A1:2007, Clause 15.4 and Annex L.

I.4 Equipment

— Stopwatch

— Thermometer

— Thermocouple

— Suitable heating source (s)

— Series of fire tray (5F, 25F, 40F, 75F)

— Camcorder

The measurement equipment shall fulfil the applicable requirements of EN ISO/IEC 17025 regarding calibration.

I.5 Test conditions-Number of test samples

Number of test samples: three specimens of water based extinguisher per series

Tests conditions:

— Test samples shall be stored for at least 24 h. at a temperature of (20 ± 5) °C before the test and shall be maintained within this temperature range until tested.

— The ambient temperature of the test facility prior to ignition shall be between 0 °C and 30 °C.

— Suitable personal protective equipment shall be used in accordance with local regulation. The use of a helmet, gloves and non-reflective visor shall be permitted. The operator shall not wear an aluminium-faced suit.

— In order to monitor the oil temperature during testing, a thermocouple shall be located (25 ± 5) mm below the oil surface, and not closer than 75 mm to the test fire tray's wall.

— The fuel shall be pure edible vegetable oil with an auto-ignition temperature range between 330 °C and 380 °C.

— Tests shall be performed indoors. The test building shall have the following characteristics:

  — minimum ceiling height (internal): 8 m,

  — area: around the tray there shall be a minimum distance of 3 m to the test house wall, for example in case of a 75F, the room shall have a minimum length of 7 m and a minimum breadth of 6,5 m.

  — air, surrounding conditions and maximum air speed shall be as defined for class A fires (see Annex G for class A fire test).

— Class F fire rating:

  — Fire rating, minimum duration of operation and nominal charges.

Rating	**Volume of cooking oil in test fire (l)**	**Construction of test apparatus (EN 3-7:2004+A1:2007, L.5.2.1, and figures L.2 and L.3) (mm)**	**Nominal permitted charges (l)**	**Minimum duration of operation (s)**
5F	5 (+1, -0)	See figure L.2, diameter:300	2, 3	6
25F	25 (+1, -0)	See figure L.3: X=578, Y=289	2, 3, 6	9
40F	40 (+1, -0)	See figure L.3: X=600, Y=450	2, 3, 6, 9	12
75F	75 (+1, -0)	See figure L.3: X=1000, Y=500	2, 3, 6, 9	15

I.6 Test method

— Heat the oil in the fire test tray using a suitable heating arrangement until non-piloted auto-ignition occurs.

Note Care should be taken to avoid the fuel vapours being ignited by the heat source before auto-ignition occurs.

— Auto-ignition shall occur in a maximum time of 3,5 hours from the start of heating the apparatus.

— In order to ensure a uniform temperature of the fuel (oil bath) before extinguishing period, auto-ignition **shall not** occur before a minimum pre-heating time as follow:

  — Fire test 5F : minimum pre-heating time:0,75h,

  — Fire test 25F : minimum pre-heating time:1h,

  — Fire test 40F : minimum pre-heating time:1,5h,

  — Fire test 75F : minimum pre-heating time:2h

— When auto-ignition occurs, turn off the heat source and allow to burn freely for $120\,^{+10}_{0}$ seconds before commencement of fire fighting.

— Cartridge gas type extinguishers shall be pressurised during pre burning period.

— The operator shall discharge the entire contents without interruption from a minimum distance as recommended by the manufacturer on the label after the pre-burn time.

— The attack shall take place from only one direction or side of the fire tray.

— Vertical measuring sticks of non-combustible material shall be located next to the fire tray in order to estimate any enlargement of flames. The sticks shall be marked to indicate flame height.

I.7 Requirement-acceptance criteria

Portable fire extinguishers shall conform to the following requirements:

— burning material shall not be ejected,

— the fire shall be extinguished and there shall be no re-ignition of the test fire, or any overflow of fuel during a 20 min period following the complete discharge of the extinguisher,

— fuel shall remain in the tray at the end of the test to prove that extinguishment has occurred by application of the extinguishing medium and not by fuel starvation,

— auto-ignition shall occur within 330 °C and 380 °C ,

— application of the extinguishing medium shall not cause enlargement of the flames over 2 m in height. Flame peaks more than 2 m, in less than 2 second in duration are acceptable. Video recording of the fire tests shall be made to verify compliance with these requirements.

For each fire test the following data shall be recorded:

— ambient temperature at the start of each test,

— time to reach auto-ignition temperature,

— auto-ignition temperature,

— complete uninterrupted discharge achieved/ yes/no,,

— fire extinguished / yes/no,

— burning material ejected /yes/no ,

— re-ignition within 20 min / yes/no ,

— fuel left after extinction / yes/no ,

— enlargement of flames observed / yes/no.

A portable fire extinguisher shall be deemed to satisfy the relevant fire performance requirements when two test fires of a series of three are extinguished. A test series is complete after three fires, or when the first two fires have both been extinguished or have both not been extinguished. Each test series shall be completed before the next is commenced. There is no restriction on the number of series that may be carried out on the same type of portable fire extinguisher without modifications, but a series shall consist of consecutive fires and results shall not be ignored. If only one test fire from a series of three is extinguished, this successful result may be used once only as the initial result in the next series of fire tests on this extinguisher model at a lower fire test rating.

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