

INTERNATIONAL STANDARD

IEC 61770

First edition
1998-10

Electric appliances connected to the water mains – Avoidance of backsiphonage and failure of hose-sets

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC APPLIANCES CONNECTED TO THE WATER MAINS – AVOIDANCE OF BACKSIPHONAGE AND FAILURE OF HOSE-SETS

FOREWORD

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International Standard IEC 61770 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

The text of this standard is based on the following documents:

FDIS	Report on voting
61/1480/FDIS	61/1519/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

NOTE – The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- notes: in small roman type.

Words in **bold** in the text are defined in clause 3.

ELECTRIC APPLIANCES CONNECTED TO THE WATER MAINS – AVOIDANCE OF BACKSIPHONAGE AND FAILURE OF HOSE-SETS

1 Scope

This standard specifies requirements for the connection of washing machines, dishwashers and condensation-type tumble dryers to the water mains having a water pressure not exceeding 1 MPa for prevention of backsiphonage of **non-potable water** into the water mains and flooding due to failure of **hose-sets**.

This standard may also be applied to the connection of other appliances as long as the relevant safety standard refers to it but modifications may be necessary.

NOTE 1 – This standard covers the connection of appliances in shops and communal flats, for the use by staff or residents.

NOTE 2 – This standard does not apply to appliances:

- used for dry cleaning;
- for medical purposes;
- intended for industrial purposes.

NOTE 3 – The connection of the appliance to the water mains may be temporary or permanent.

NOTE 4 – When reference is made to the water mains, water supplied from a cistern or similar system is also included.

NOTE 5 – Many countries have requirements concerning the prevention of contamination of potable water as a result of contact with unsuitable materials upstream of a safety device.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitutes provisions of this International Standard. At the time of publication, the edition indicated was valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative document indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60730-2-8:1992, *Automatic electrical controls for household and similar use – Part 2: Particular requirements for electrically operated water valves, including mechanical requirements*

3 Definitions

For the purpose of this standard, the following definitions apply.

3.1

potable water

water which is obtained directly from the potable water mains and remains in a closed system up to the **backflow prevention device**

3.2**non-potable water**

water which leaves the closed system after having passed the **backflow prevention device**

3.3**backflow prevention device**

means to prevent contamination of **potable water** by backflow of **non-potable water**

NOTE – Examples are **airgaps** and **pipe interrupters**.

3.4**airgap**

unobstructed free distance between the water inlet or the end of the feed pipe and the **critical water level**

NOTE – A distance is considered to be unobstructed if the airflow into the feed pipe under vacuum conditions is not restricted by the construction of the appliance.

3.5**pipe interrupter**

device without movable or elastomeric parts, into which air can enter while water is passing through it

3.6**dynamic backflow preventer**

backflow prevention device which prevents backsiphonage by the use of moving parts

3.7**overflow**

means for discharging excess water from the appliance when the normal outlet is obstructed

3.8**maximum water level**

highest level of the **non-potable water** in any part of the appliance when it operates continuously under fault conditions

3.9**critical water level**

level to which the **non-potable water** is reduced from the **maximum water level** 2 s after water inlets have been closed

3.10**hose-set**

assembly consisting of a flexible hose and couplings

NOTE 1 – The **hose-set** is for connecting the appliance upstream of the **backflow prevention device** to the water mains.

NOTE 2 – Couplings may be removable with or without the aid of a tool.

3.11**detachable part**

part which can be removed without the aid of a tool

4 General requirements

4.1 Appliances shall have a **backflow prevention device** located downstream of each water inlet valve.

For appliances incorporating a water softener located upstream of an **airgap** or **pipe interrupter**, a **dynamic backflow preventer** shall be incorporated upstream of the water softener.

Dispensers for adding cleaning, rinsing, softening or similar agents to the water, shall not be located upstream of the **backflow prevention device**.

Pipework containing **potable water** located upstream of a **backflow prevention device** shall not pass through **non-potable water** in the appliance.

Compliance is checked by inspection.

NOTE – For a given point in a hydraulic system, "upstream" indicates the side from which the water flows and "downstream" indicates the side to which the water flows.

4.2 **Backflow prevention devices** shall be incorporated in the appliance and constructed so that

- their functional characteristics cannot be changed, even intentionally,
- they can only be removed with the aid of a tool,
- if omitted, the appliance is rendered inoperable or manifestly incomplete.

Compliance is checked by inspection and by manual tests.

4.3 **Hose-sets** for the connection of appliances to the water mains shall be constructed so that the risk of flooding is obviated as far as possible.

Compliance is checked by the tests of clause 9.

4.4 Metallic parts of the water connection system of the appliance, the deterioration of which may cause the appliance to fail to comply with the requirements of this standard, shall be resistant to erosion, dezincification, oxidation or corrosion.

Compliance is checked by inspection.

NOTE – Resistance to dezincification of brass can be checked in accordance with ISO 6509 ¹⁾.

5 General conditions for the tests

5.1 *When reference is made to normal conditions, the following applies:*

- *the appliance is placed on a horizontal support;*
- *the appliance is connected to a water supply in accordance with the instructions for installation;*
- *the water supply has a static pressure not exceeding 1 MPa and a dynamic pressure not less than 0,6 MPa;*
- *the appliance is supplied at rated voltage;*

¹⁾ ISO 6509: Corrosion of metals and alloys – Determination of dezincification resistance of brass

- *the appliance is tested without textiles or dishes and without cleaning, rinsing or similar agents, doors and lids being closed.*

NOTE – When water pressures are stated, they are pressure differences from atmospheric pressure.

5.2 *When reference is made to fault conditions, the appliance is inclined at an angle of 2° to the horizontal in the most unfavourable position. In addition to the normal conditions, the following fault conditions are applied one at a time, as far as is reasonable:*

- *the connection between any dispenser intended for adding cleaning, rinsing, softening or similar agents to the water and other parts of the appliance is blocked, unless the cross-sectional area of the connection exceeds 10 cm² throughout its length with no dimension less than 10 mm;*

NOTE 1 – Dispenser connections are not blocked if they have cross-sections which are varied by user action each time the appliance is used, such as opening a detergent dispenser.

- **overflows** *are blocked if they have*
 - *a circular cross-section not exceeding 5 cm²,*
 - *a non-circular cross-section with one dimension less than 3 mm and an area not exceeding 5 cm²,*
- *all magnetic valves upstream of an **airgap** or **pipe interrupter** which can be open simultaneously during the normal programme of the appliance are held open;*
- *all motors are disconnected from the supply mains and the normal drain outlet is blocked.*

NOTE 2 – The fault conditions are applied together with any consequential fault condition.

5.3 *Unless otherwise specified, the tests are made in the order indicated and*

- *for appliances, **pipe interrupters** and **dynamic backflow preventers**, on a single sample as supplied, which shall withstand all the relevant tests,*
- *for **hose-sets**, on three samples. If one sample fails, the tests are repeated on a further set of three samples, all of which shall withstand the repeated tests.*

Each of the tests of 9.1.9 to 9.1.11 is carried out on three new samples.

5.4 *Tests on **airgaps**, **pipe interrupters** and **dynamic backflow preventers** are made inside the appliance, unless this is impracticable.*

5.5 *When determining the **critical water level** of appliances having more than one water inlet, and a programme permitting simultaneous filling, each water inlet is closed in turn, other water inlets being open.*

5.6 *Unless otherwise specified, the tests are carried out at an ambient temperature of 20 °C ± 5 °C.*

6 Airgaps

6.1 **Airgaps** shall be constructed so that the water can flow freely through the air section and that water downstream of the **airgap** cannot be drawn into the feed pipe.

Compliance is checked by inspection and by the tests of 6.2 and 6.3. The test of annex A may be carried out instead of the test of 6.3.

6.2 *The appliance is operated under fault conditions until the **maximum water level** is reached.*

*The water outlet of the feed pipe shall not come into contact with **non-potable water**.*

6.3 The appliance is operated under fault conditions until the **critical water level** is reached.

The length of the **airgap** shall be at least twice the smallest diameter of the water supply system within the appliance, with a minimum of 20 mm. There shall also be a clear space of 20 mm between the outlet of the feed pipe and other parts in any downward direction.

NOTE – The thickness of any water film and the dimensions of waterdrops are to be taken into account.

7 Pipe interrupters

7.1 Pipe interrupters shall be constructed so that the air-inlet openings remain permanently free and open to the atmosphere. Water which may leak in normal use from an air-inlet opening shall flow into the container of the appliance but shall not reach a sufficient level for the vertical dimensions to be reduced below those specified in 7.3 and 7.4.

Pipe interrupters shall be protected against deliberate obstruction or manipulation which could affect the results of the tests.

The total cross-sectional area of the air-inlet openings shall not be less than the cross-sectional area of the water-inlet opening. The smallest dimension of each air-inlet opening shall be at least 3 mm. The dimensions are measured at right angles to the direction of the airflow.

Compliance is checked by inspection, by measurement and by the tests of 7.2 to 7.4. However if the tests of 7.3 and 7.4 cannot be carried out due to the construction of the appliance, compliance is checked by the test of annex A instead.

7.2 For separate **pipe interrupters**, a vertical tube of glass or other transparent material having approximately the same internal diameter and a length of at least 500 mm, is connected to the outlet of the **pipe interrupter**. The free end of the tube is immersed in water to a depth of at least 25 mm, as shown in figure 1.

A vacuum pump is connected directly to the inlet of the **pipe interrupter** and a negative pressure of $65 \text{ kPa} \pm 15 \text{ kPa}$ is applied for at least 5 s. The distance h between the water level in the tube and the water level in the container is measured.

For **pipe interrupters** which are incorporated in the appliance downstream of a magnetic valve, the test is carried out in the appliance. The vacuum pump is connected directly to the water inlet of the appliance by means of the shortest possible length of tube.

NOTE 1 – If the inlet hose cannot be removed even with the aid of a tool, the vacuum pump is connected to the inlet of the hose.

NOTE 2 – The cross-sectional area of the connection of the vacuum pump is to be sufficient so that the airflow is not restricted.

7.3 The appliance is operated under fault conditions, until the **maximum water level** is reached.

The vertical distance between the **maximum water level** and the lowest rim of the air-inlet opening of the **pipe interrupter** is measured. It shall be at least equal to dimension h , shown in figure 2.

7.4 Immediately after the test of 7.3, the water inlet is closed. The vertical distance between the **critical water level** and the lowest rim of the air inlet opening is measured. It shall be at least equal to $h + 20 \text{ mm}$.