



Test Code Sheet 2213.15 – Dimensional

Issue No.2

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Pages: 1-10

1. PURPOSE

Type AC air gap arrangement verification as described in the Specification for the Prevention of Backflow.

2. TYPE OF TEST(S)

Dimensional

3. REGULATION REQUIREMENTS FOR FITTINGS

Schedule 2

15-(1) ...every water system shall contain an adequate device or devices for preventing backflow of fluid from any appliance, fitting or process from occurring.

4. GENERAL TOLERANCES AND MEASUREMENTS

In the absence of specific tolerances or accuracies the following shall apply.

1. Dimension: up to and including 75 mm $\pm 5\%$; over 75 mm $\pm 2\%$.
2. Flow rate and pressure: $\pm 5\%$ of the value specified.
3. Temperature: cold water $\pm 10\text{ }^{\circ}\text{C}$ of the value specified.
4. Linear measuring instruments shall have a minimum resolution of 0.5 mm.
5. Timing instruments shall have a minimum resolution of 0.1 seconds.
6. All the measuring instruments shall have an error limit of $\pm 2\%$ of the measured value.

5. TEST PROCEDURE

5.1 Tests applicable to the following:-

TYPE AC AIR GAP WITH SINGLE SUBMERGED FEED (INCORPORATING AIR INLET AND OVERFLOW)

up to and including DN 250

Devices for the prevention of contamination by backflow.

(A) TYPE AC AIR GAP WITH SINGLE SUBMERGED FEED (INCORPORATING AIR INLET AND OVERFLOW)

TEST METHOD

i. SCOPE

This procedure specifies the characteristics of type AC air gaps with submerged feed incorporating air inlet and an overflow from a container for inlet or feed pipes of nominal size up to and including DN 250. Air gaps that comply with the requirements of this procedure are devices for protection of potable water installations from pollution fluid risk 3. In addition to factory assembled products this procedure includes requirements for site constructed air gaps.

The products specified are for single feed only and suitable for water temperatures up to and including 65°C and occasional temperatures up to and including 95°C. However, in some instances the maximum operating temperature may be limited to 40°C and should be marked accordingly.

ii. DEFINITIONS

For the purpose of this procedure the following definitions apply.

ii.i Air Gap family 'A' type AC - Air gap with single submerged feed (incorporating air inlet and overflow)

A non-mechanical form of backflow prevention air gap suitable for fluids only, no solids or sludges, placed permanently and vertically between the lowest point of the air inlet orifice in the feed pipe and critical water level at which the container overflows.

ii.ii Spill-over Level

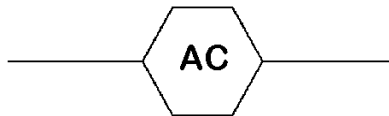
The point at which the water first starts to overflow into the overflow pipe (invert).

ii.iii Critical Water Level

The level (h) above the spill-over level two seconds after the inlet water has ceased to flow.

ii.iv Graphic symbol

Figure 1 Type AC graphic symbol



iii. DESIGNATION

The air gap family 'A' type AC is designated by the following:

- the reference to this standard.
- its Family, its Type.
- the DN of the feed pipe.
- example of the designation:
- air gap Family A Type AC DN15 TSN AC-01.

iv. MATERIALS

iv.i Materials choice

The manufacturer shall state the type of materials chosen in his technical and commercial documents.

The surface condition of materials in contact with water shall be chosen to be the least inclined to scale.

The materials used upstream, and including the atmospheric outlet opening (i.e. the air port inlet), must comply with BS 6920 or other national standard which provides an equivalent level of protection or performance.

The choice of other material is discretionary but shall be suitable for the intended use of the appliance (temperature, corrosion, scale, etc).

There are no special requirements concerning the materials used downstream of the atmospheric outlet opening provided they do not have any harmful effect on the upstream part.

v. DESIGN

v.i General

The protection assembly comprises three parts integral with one another:

- a water inlet device.
- a receiving vessel (container) with overflow.
- a permanently open air port inlet.

The air port inlet shall be above the invert of the overflow.

The smallest dimension of the air inlet port shall not be less than 4 mm and capable of accepting a pin gauge of 4 mm $^{+0.1}_{-0}$ or a no less effective method.

v.ii Water Inlet Device

- v.ii.i Every float-operated valve or other device which controls the inflow of water to a storage cistern shall be securely and rigidly fixed to that cistern.
- v.ii.ii Every feed pipe supplying water to such a valve or other device shall be fixed in its position to prevent it from moving or buckling.
- v.ii.iii No mechanical joint (see Notes 1 and 2) within the cistern on submerged supply pipes or inlet devices are permitted at or below the critical water level (h).

NOTE 1: Mechanical joints are joints which when undone open a direct pathway between the wholesome water (incoming supply) and the water stored within the flushing cistern. These include joints that are 'adjustable' or can be 'dismantled'; rely on elastomeric, or other material, to provide a water-tight seal; or where the coupling of two components being dependent upon mechanically applied forces, with or without the use of secondary seal.

NOTE 2: For the purposes of this specification the following are not considered *mechanical joints*. Nuts or jointing mechanism on the diaphragm housing assembly of the inlet device. Joints where the joining surface are permanently fused together e.g. by a chemical process or the application of heat.

v.iii Overflow Arrangements

- v.iii.i The overflow shall be capable of draining off the maximum inlet flow.
- v.iii.ii Shall not be less than 19 mm internal diameter.
- v.iii.iii Overflow arrangements must include an air break prior to a connection to drain. An air break to drain must conform to Test Code Sheet 2212.10 or BS EN 1717.

NOTE 3: The length of the overflow before the air break to drain must not be of such a length that it will cause air gap 'AC' to be violated. All air gaps to drain arrangements shall be visible.

NOTE 4: Clauses v.iii.ii and v.iii.iii do not apply to a WC suite where the overflow discharges internal to the WC bowl providing the overflow is not less than 19 mm internal diameter at the point water enters the overflow to be discharged; and the critical water level (h) has been verified by test.

6. ACCEPTANCE CRITERIA

6.1 DISTANCE OF AIR GAP (SEE FIGURE 2)

The clearance 'A' measured between the lowest external point of the permanently open air port inlet and the critical water level shall be at least equal to twice the internal diameter of the inlet pipe and never less than 20 mm.

6.1.1 Establishing critical water level 'h'

Dimension 'h' is determined by measurement of the depth of water above the spillover level of the overflow two seconds after the inflows equal to $Q = 0.14D^2$ in litres per minute has stopped, or a dynamic pressure of 10 bar has stopped if the flow rate Q cannot be achieved, where 'D' is the bore inlet and with all outlets closed, based on a velocity of 3 m/s.

Note 5: Diameter 'D' (mm) is the maximum internal diameter found within the last metre of the supply pipe or the DN of the inlet connection.

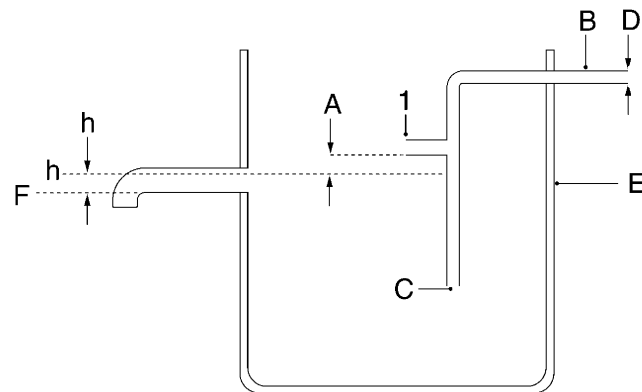
6.1.2 Acceptance criteria

$A \geq 2D$ but not less than 20 mm.

6.2 OVERFLOW

The overflow shall be so designed as to be capable of providing an appropriate air gap between the lowest point of the air port inlet and the critical water level, from a maximum water level caused by an inflow.

Figure 2 Air gap vacuum test



Legend:

A = Air Gap

B = Feed Pipe

C = Feed Orifice

D = Internal Diameter of Feed Pipe

E = Receiving Vessel

F = Spill-over Level

h = Critical Water Level (h)

1 = Air Inlet

6.2.1 Acceptance criteria

The overflow is not less than 19 mm internal diameter.

For internally discharging WC suite overflows (see Note 4) using a 2 mm deep 19 mm diameter plug, or a no less effective method, the overflow is not less than 19 mm at the point where water enters the overflow.

6.3 EFFICIENCY OF AIR PORT INLET

6.3.1 Verify the air port is capable of accepting a pin gauge of 4 mm $^{+0.1}_{-0}$, or a no less effective method, through its whole length.

6.3.2 Remove or render inoperative any additional backflow prevention devices upstream or within the arrangement.

Foul the inlet valve seat/diaphragm with a 0.75 mm nominal diameter wire, or otherwise no less effective method, which ensures the waterway through the seat remains open throughout the test.

Apply the vacuum test (see Annex A).

6.3.3 Where documented tests have been performed and meet the acceptance criteria of TCS 2212.20, or an identical test (e.g. BS 1212-3:1990), the vacuum test in 7.3.2 is deemed to have been satisfied.

6.3.4 Acceptance criteria

The air port is ≥ 4 mm; and

There is no visible evidence of backflow of water.

7. COMING INTO EFFECT

This test code sheet will come into effect on 6 May 2027, being one year after its publication on gov.uk.

ANNEX A (INFORMATIVE)

Vacuum test

A1. APPARATUS

A1.1 General

The test apparatus shall be arranged and constructed (see Figure A1) so that the absolute pressure measured near the device under test on its supply side remains less than 50 kPa (-50 kPa gauge pressure) for at least 5 seconds.

NOTE A1: These conditions indicate the existence of choking air flow. Details of the components are given in A1.3 to A1.5

A1.2 Vacuum vessel and connecting pipework, of sufficient strength to support a total vacuum safely. The vacuum vessel shall be provided with a drain cock to remove any water drawn into the vessel during the test.

NOTE A2: Recommended capacities of the vacuum vessel are given in Table A1.

A1.3 Vacuum device, capable of reducing the absolute pressure within the vacuum vessel to 20 kPa (-80 kPa gauge pressure).

A1.4 Pipes and fittings, of nominal size not less than the bore of the orifice at the lowest part of the inlet or feed part of the device under test. If the air gap is not visible, the connecting pipework shall be of transparent material.

Any valve fitted in the test pipe shall be a full-way valve offering an unimpeded flow path.

The pipe length between the vacuum gauge to the device on test shall have a length of 5 DN to 10 DN.

Connections to the vacuum vessel shall not unduly impede the fluid flow and shall have a low loss profile.

A1.5 Vacuum gauges, shall have an appropriate range i.e. 100 kPa to 0 kPa and an accuracy of 1 % test pressure. The gauge connection shall be made in such a way that it does not disturb the flow in the pipework.

A2 PROCEDURE

A2.1 Connect the fitting to be tested to the test apparatus.

A2.2 With all valves upstream of the air gap including the test valve fully open, establish and maintain the critical water level. The critical level shall be maintained during the test by supply from a separate source at the same flow rate as the maximum specified

by the manufacturer. The discharge shall be submerged to prevent disturbance of the water surface.

A2.3 Close the full-way valve.

A2.4 Evacuate the vacuum vessel to an absolute pressure of 20 kPa (-80 kPa gauge pressure as indicated by vacuum gauge A (see Figure A1).

A2.5 Open the full-way valve within a period of 2 s.

A2.6 Read the vacuum gauge B. Check that the absolute pressure does not exceed 50 kPa (-50 kPa gauge pressure) for a period of at least 5 s after the full way valve is fully open.

A2.7 If the absolute pressure does not remain below 50 kPa (-50 kPa gauge pressure) for at least 5 s reduce the flow resistance of the connecting pipework by increasing the bore of the pipe between the vacuum gauge B and the vacuum vessel and/or by reducing its length.

A2.8 Observe the air gap if visible, or a transparent tube for evidence of backflow of water.

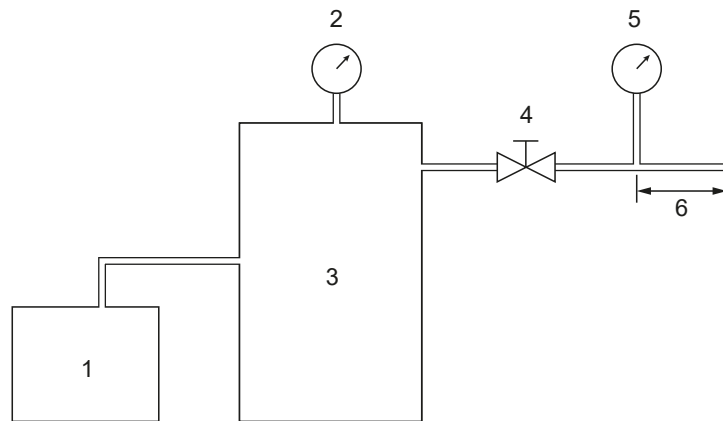
A3 OPERATING CRITERIA

A3.1 If the conditions of choking flow are met (see A1.1) the test is deemed to be valid.

Table A1: Recommended vacuum vessel capacities

Bore of orifice at lowest part of inlet or feedpipe (mm)	Recommended minimum capacity of vacuum vessel (m ³)
<22	1.5
>22 <54	4
>54 <76.1	10
>76.1 <108	20
>108 <159	35

Figure A1: Arrangement of apparatus for vacuum test



Drawing is diagrammatic only

Key.

1 Vacuum pump

2 Vacuum gauge A

3 Vacuum vessel

4 Full-way valve

5 Vacuum gauge B

6 Length 5 DN to 10 DN