

Periodic inspection, testing and maintenance of transportable gas containers (excluding dissolved acetylene containers) —

**Part 3: Specification for seamless
aluminium alloy containers of water
capacity 0.5 litres and above**

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Committees responsible for this British Standard

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- Aluminium Extruders Association
- Aluminium Federation
- Associated Offices Technical Committee
- British Compressed Gases Association
- British Fire Consortium
- British Fire Protection Systems Association Ltd.
- British Railways Board
- British Soft Drinks Association Ltd.
- Chief and Assistant Chief Fire Officers' Association
- Department of Trade and Industry [Mechanical Engineering and Manufacturing Technology Division (Mmt)]
- Department of Trade and Industry (National Engineering Laboratory)
- Department of Trade and Industry (National Physical Laboratory)
- Department of Transport (Marine Directorate)
- Engineering Equipment and Materials Users' Association
- Fire Extinguishing Trades Association
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- Industrial Safety (Protective Equipment) Manufacturers' Association
- Institute of Refrigeration
- Institution of Chemical Engineers
- Liquefied Petroleum Gas Industry Technical Association (UK)
- Ministry of Defence
- Co-opted members

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Foreword

This Part of BS 5430 has been revised under the authority of the Pressure Vessel Standards Policy Committee. It incorporates changes found to be necessary from experience in the 1980 edition which is withdrawn.

This British Standard is one of a series based upon recommendations in the report (published 1969) of the Home Office Gas Cylinders and Containers Committee for materials, design, construction, testing, filling and maintenance of containers intended for the conveyance, by road, of permanent and liquefiable gases under pressure. Other British Standards in this series include BS 5045 and BS 5355.

This Part of BS 5430 covers the periodic inspection, testing and maintenance of transportable seamless aluminium alloy gas containers having a water capacity of 0.5 L and above. Other Parts of BS 5430 will include:

- *Part 1: Specification for seamless steel containers of water capacity 0.5 litres and above;*
- *Part 2: Specification for welded steel containers of water capacity 0.5 litres up to 150 litres¹⁾;*
- *Part 6: Specification for seamless containers of water capacity under 0.5 litres²⁾.*

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 24, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In course of revision.

²⁾ In preparation.

1 Scope

This Part of BS 5430 specifies requirements for the periodic inspection, testing and maintenance of transportable seamless aluminium alloy gas containers of water capacity 0.5 L and above. It does not apply to dissolved acetylene containers.

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

2 Definitions

For the purposes of this Part of BS 5430, the following definitions apply.

2.1

liquefiable gas

a gas that is liquefiable by pressure at $-10\text{ }^{\circ}\text{C}$ but which is completely vaporized at $17.5\text{ }^{\circ}\text{C}$ at 1 013 mbar³⁾

NOTE Certain toxic substances that are liquid at 1 013 mbar pressure at $0\text{ }^{\circ}\text{C}$ but that are completely vaporized at or below $30\text{ }^{\circ}\text{C}$ at that pressure, are treated as low pressure liquefiable gases and are included under that heading in Table 1.

2.2

high pressure liquefiable gas

a gas that has a critical temperature between $-10\text{ }^{\circ}\text{C}$ and $70\text{ }^{\circ}\text{C}$ inclusive

2.3

low pressure liquefiable gas

a gas that has a critical temperature above $70\text{ }^{\circ}\text{C}$

2.4

permanent gas

a gas that has a critical temperature below $-10\text{ }^{\circ}\text{C}$

2.5

corrosion

a chemical reaction on material that results in the removal of the surface of the material

NOTE It may exist in many forms, e.g. chemical attack where the metal is dissolved by the reagents (such attack will, in general be localized, causing isolated pits).

2.6

inspection

an examination by a competent person, using appropriate equipment but not including hydraulic pressure testing

2.7

competent person

a person who, through training, practical experience and an understanding of the equipment is able to verify compliance with this British Standard

2.8

testing station

suitably equipped premises, staffed by competent persons, to undertake the periodic inspection and testing, of gas containers, in accordance with this British Standard

3 General requirements

3.1 No gas container to which this Part of BS 5430 applies shall be refilled unless it has been inspected and tested in accordance with **4.4.2**, **4.4.3** and **4.7** at the intervals given in Table 1.

NOTE It is the responsibility of the testing station to verify compliance with this standard. It is the responsibility of the filler to ensure that containers have been inspected and tested prior to filling.

3.2 The owner, user or filler of gas containers shall not be relieved from the obligation to ensure at all times that his containers are not damaged or corroded and shall refer all those suspected of damage or corrosion for further inspection and testing before the prescribed interval has elapsed.

3.3 The requirement for inspection and testing shall be satisfied if a container is inspected and tested on its first receipt by a filler after the specified interval has elapsed.

NOTE There is no general requirement for the user to return a gas container before the contents have been used even though the test interval may have lapsed. However, in the case of containers used for emergency purposes where long periods may elapse before use, e.g. fire extinguishers, resuscitation and self-contained breathing apparatus, it is the responsibility of the owner and user to empty the container and submit it for inspection and testing within the specified interval.

3.4 Containers due for inspection and testing shall be identified from the date of manufacture, or from the date of the last periodic test, stamped on the container. The date shall indicate a month and a year, or a quarter and a year [see **4.11 b**].

A container shall fall due for inspection and test on its first receipt by a filler after the expiry of the interval in Table 1, taken from the end of the interval stamped on the container. For example, if the container were tested in March 1984 and stamped by year and quarter it would, if subject to a five year test interval fall due for retest at its first receipt by a filler after 31 March 1989.

NOTE As an aid to recognition, coloured discs may be used, located between the valve and the neck of the gas container. Details of a suggested scheme are given in Table 2.

3.5 The equipment and methods used for inspection and testing of containers shall comply with this British Standard.

NOTE It is emphasized that the inspection is of prime importance for the identification of defects liable to render the container unsafe.

³⁾ 1 bar = 10^5 N/m^2 = 100 kPa.

Table 1 — Intervals between periodic inspections and hydraulic tests

Duty of gas container ^a	Interval between each:		
	External inspection in accordance with 4.4.2	Internal inspection in accordance with 4.4.3	Hydraulic test in accordance with 4.7
Permanent gases, e.g. oxygen, argon, nitrogen, hydrogen, air, helium, xenon, krypton, neon, boron trifluoride	year 5 or 10 (see note 1)	year	year
All gases used in self-contained underwater breathing dress apparatus	2	2	4
All gases used in self-contained breathing apparatus ^b	5	5	5
Corrosive low pressure liquefiable gases, e.g. boron trichloride, carbonylchloride, chlorine, chlorine trifluoride, hydrogen cyanide, hydrogen sulphide, nitrogen tetroxide, nitrosyl chloride, sulphur dioxide	5	5	5
Non-corrosive high pressure liquefiable gases, e.g. ethane, ethylene, nitrous oxide, sulphur hexafluoride, chlorotrifluoromethane (R13), bromotrifluoromethane (R13B1)	5	5	10
Town gas, coal gas, other manufactured fuel gases, methane, natural gas, carbon monoxide, fluorine	3 or 5 (see note 1)		3 or 10 (see note 1)
Gas mixtures	See note 2		
Non-corrosive low pressure liquefiable gases, e.g. ammonia, butadiene, butane, dimethylether, ethylamine, ethyl chloride, ethylene oxide, refrigerant (halocarbon) gases, methylamine, dimethylamine, trimethylamine, propane, cyclopropane, propylene, vinyl chloride	5	10	10
Carbon dioxide (excluding fire extinguishing purposes)	5	5	5
Gases used for fire extinguishing purposes, e.g. carbon dioxide and refrigerant gases such as bromochlorodifluoromethane (R12B1), bromotrifluoromethane (R13B1) (with or without permanent gases for pressure padding purposes)	10 or 20 (see note 3)		
NOTE 1 The extended period may only be used if the dewpoint of the gas is not higher than – 46 °C at 1 013 mbar. Application has to be made in writing to the Health and Safety Executive; the relaxation will be granted only to industrial concerns that have been approved in writing.			
NOTE 2 Intervals between inspections and tests are to be those specified for the gas component having the shortest interval. This may be relaxed under the provisions of note 1.			
NOTE 3 Provided each container is submitted to a full external inspection every 12 months from the date it is introduced into service, the interval before the first periodic inspection and test may be extended to 20 years. This full external inspection involves checking for mechanical damage, excessive corrosion and loss of content. It is to be undertaken by a competent person and the results recorded. Any container showing signs of mechanical damage (see Table 6), excessive corrosion (see Table 8) or loss of gross mass exceeding 3 % or loss of padding pressure exceeding 20 % is to be withdrawn from service and submitted to a full periodic inspection and test. Any container that is discharged between 10 years and 20 years of being introduced into service has to be submitted to a full periodic inspection and test before being refilled for further service. The interval between the first and second periodic inspections and test is not to exceed 10 years and that between subsequent retests not more than 5 years.			
^a Certain gases are not permitted to be conveyed in aluminium alloy containers (see BS 5045-3).			
^b See 3.2.			

Table 2 — Recommended test date discs for containers

Year of withdrawal	Colour and shape of test date disc on containers to be tested during the year indicated in column 1	
	Shape	Colour
1987	Circular	Green
1988	Circular	Black
1989	Circular	Aluminium
1990	Hexagonal	Red
1991	Hexagonal	Blue
1992	Hexagonal	Yellow
1993	Hexagonal	Green
1994	Hexagonal	Black
1995	Circular	Red
1996	Circular	Blue
1997	Circular	Yellow
1998	Circular	Green
1999	Circular	Black
2000	Circular	Aluminium
2001	Hexagonal	Red
2002	Hexagonal	Blue
2003	Hexagonal	Yellow
2004	Hexagonal	Green
2005	Hexagonal	Black
2006	Hexagonal	Aluminium
2007	Square	Red
2008	Square	Blue
2009	Square	Yellow
2010	Square	Green
2011	Square	Black
2012	Square	Aluminium
2013	Circular	Red

NOTE 1 The sequence of colour and shape of test date discs is repeated on an 18 year cycle.

NOTE 2 Carbon dioxide cylinders should not be fitted with hexagonal aluminium discs in 1990 for withdrawal to be inspected and tested in 1995. This provides total compatibility of BS 5430-1:1977, BS 5430-2:1973 and BS 5430-3:1980 with the 18 year cycle.

NOTE 3 Identification by this method should not interfere with the engagement of the valve to the container.

4 Periodic inspection and hydraulic pressure testing

4.1 Segregation

Containers shall be segregated according to the type of periodic inspection and testing as detailed in Table 1 by scrutinizing their markings as follows.

- Containers due for periodic inspection and hydraulic pressure testing shall comply in full with clause 4.
- Containers due for periodic inspection only shall comply with clause 4 with the exception of 4.7 and 4.8.
- Containers whose stamp markings do not identify the relevant manufacturing standard or test requirements, shall be set aside and the owner informed accordingly.

Containers due for refilling which are received from ships, shall be inspected and if necessary tested, as appropriate, in order that the filler can be advised whether they are suitable for refilling. If they are so suitable they shall be returned to the ship when refilled; if they are not suitable for refilling the ship shall be informed accordingly.

4.2 Preparation

4.2.1 Each container shall be depressurized to atmospheric pressure, the contents shall be discharged in a safe manner.

If the container does not become depressurized when the container valve is opened, the container shall be set aside and the valve shall be checked in accordance with D.1.

4.2.2 When an internal inspection, with or without a hydraulic test, is to be carried out, the valve shall be removed from the container for inspection and maintenance in accordance with 4.9.

4.2.3 Where the container has contained a toxic gas, the container shall be purged with an inert gas, air or steam, as appropriate. The container temperature shall not exceed 150 °C. Where the container has contained a flammable, non-toxic gas, the contents shall be either purged or evacuated such that the percentage of flammable gas remaining is less than the lower flammability limit of the particular gas.

4.2.4 Each container shall have all damaged plastic coating, damaged protective coating, loose paint, corrosion products, tar, oil or other foreign matter removed from its external surface by an appropriate method, e.g. wire brushing, steam cleaning (see **4.2.3** for temperature limit), water jet abrasive cleaning, chemical cleaning. Alkaline solutions and paint strippers which are harmful to aluminium and its alloys shall not be used. Care shall be taken to avoid damaging the container and its marking or removing an excessive amount of container material.

NOTE Where chemical cleaning is used advice from the container manufacturer should be sought for suitable immersion times and temperatures.

4.2.5 Containers to which a fused nylon, polyethylene or similar coating has been applied shall be set aside, the coating removed, and a hardness check shall be carried out on the parallel wall.

Containers with a hardness value of less than as follows shall be rejected and made unserviceable in accordance with clause 5:

- a) 48 HRB when tested in accordance with BS 891; or
- b) 90 HB when tested in accordance with BS 240; or
- c) 95 HV when tested in accordance with BS 427.

Containers with a hardness equal to or greater than 48 HRB, 90 HB or 90 HV shall be subjected to a hydraulic test (see **4.7**).

Plastics coatings shall not be reapplied.

NOTE Containers may be painted or damaged paintwork repaired in accordance with **4.12**.

4.2.6 The container neck threads shall be cleaned to remove particles of jointing material or other foreign matter.

4.2.7 Moisture, loose, damaged or opaque protective coating, corrosion products and other foreign matter shall be removed from the interior of the container.

4.2.8 Where a container is to be used for a gas which may be ingested, care shall be taken to ensure that the cleaning method is such that the container is free from any residual toxicity and loose material before its return to service.

4.3 Checking markings

The markings on each container shall be checked for compliance with statutory or other requirements and shall be re-established as necessary.

NOTE For inadequate markings see Table 7.

4.4 Inspection

4.4.1 General

Each container shall be inspected externally and/or internally, in accordance with Table 1, for any sign of corrosion or other defect.

NOTE 1 Non-destructive techniques may be used for detecting cracks or other defects and in assessing wall thickness.

NOTE 2 Each container may be lightly struck on the body with a suitable object. A muffled ring may indicate corrosion or a defect in the metal which should be subject to further examination.

NOTE 3 No requirements for rejection limits are specified in this standard but it is strongly recommended that the guidance given in Appendix A should be followed.

4.4.2 External inspection

Each container shall be inspected externally for the following:

- a) dents, cuts, gouges, bulges, cracks, or wear at the knuckle end of the base;
- b) corrosion;
- c) other defects, such as misaligned neck ring or collar, damaged shroud or other fittings, illegible or unauthorized markings, fire damage, electric arc or torch burn, unauthorized additions or modifications.

4.4.3 Internal inspection

Each container shall be inspected internally using a light source of sufficient intensity to identify any of the defects given in **4.4.2 a)** and **b)**.

Any container showing signs of corrosion shall be cleaned internally by an appropriate method, e.g. water jet abrasive cleaning, flailing, steam jet, hot water jet, rumbling, chemical cleaning (see **4.2.3**).

NOTE A fine white deposit may be formed on the inside of a container with certain gases. Provided that the layer is slight and there is no localized pitting, it will not be necessary to clean the inside of the container before reissue.

Containers used in breathing apparatus shall be cleaned internally to comply with **4.2.7** and **4.2.8**. After cleaning, the containers shall be inspected again.

4.5 Check tare for liquefiable gas containers

The tare of the containers shall be obtained by weighing on a machine regularly checked for accuracy.

The tare shall include the mass of the container, valve(s) and all permanent fittings. Where it can be clearly established that there is a disparity between the actual and stamped tare of containers used for liquefiable gases which is due to a change of valve(s) and all permanent fittings, the original tare shall be obliterated and the correct tare shall be marked on the container.

Table 3 — Limits for oversize taper screw threads in container necks

Nominal size of container neck thread		Element	Diameter of thread at container mouth				Minimum of effective threads
			Maximum	Minimum	Maximum	Minimum	
in	mm		in	in	mm	mm	
0.6 + 0.0156	15.24 + 0.396	Major diameter	0.7822	0.7712	19.868	19.588	9
		Effective diameter	0.7305	0.7255	18.555	18.428	
		Minor diameter	0.6878	0.6798	17.470	17.267	
0.6 + 0.0312	15.24 + 0.792	Major diameter	0.7978	0.7868	20.264	19.985	9
		Effective diameter	0.7461	0.7411	18.951	18.824	
		Minor diameter	0.7034	0.6954	17.866	17.663	
0.6 + 0.0625	15.24 + 1.588	Major diameter	0.8291	0.8181	21.059	20.780	9
		Effective diameter	0.7774	0.7724	19.746	19.619	
		Minor diameter	0.7347	0.7267	18.661	18.458	
0.715 + 0.0156	18.161 + 0.396	Major diameter	0.8193	0.8086	20.810	20.538	9
		Effective diameter	0.7681	0.7628	19.510	19.375	
		Minor diameter	0.7250	0.7170	18.415	18.212	
0.715 + 0.0312	18.161 + 0.792	Major diameter	0.8349	0.8242	21.206	20.935	9
		Effective diameter	0.7837	0.7784	19.906	19.771	
		Minor diameter	0.7406	0.7326	18.811	18.608	
0.715 + 0.0625	18.161 + 1.588	Major diameter	0.8662	0.8555	22.001	21.730	9
		Effective diameter	0.8150	0.8097	20.701	20.566	
		Minor diameter	0.7719	0.7639	19.606	19.403	
1.0 + 0.0156	25.4 + 0.396	Major diameter	1.1203	1.1096	28.456	28.184	11
		Effective diameter	1.0691	1.0638	27.155	27.020	
		Minor diameter	1.0260	1.0180	26.060	25.857	
1.0 + 0.0312	25.4 + 0.792	Major diameter	1.1359	1.1252	28.852	28.580	11
		Effective diameter	1.0847	1.0794	27.551	27.417	
		Minor diameter	1.0416	1.0336	26.457	26.253	
1.0 + 0.0625	25.4 + 1.588	Major diameter	1.1672	1.1565	29.647	29.375	11
		Effective diameter	1.1160	1.1107	28.346	28.212	
		Minor diameter	1.0729	1.0649	27.252	27.048	
1.25 + 0.0156	31.75 + 0.396	Major diameter	1.4046	1.3906	35.677	35.321	11
		Effective diameter	1.3393	1.3323	34.018	33.840	
		Minor diameter	1.2845	1.2740	32.626	32.360	
1.25 + 0.0312	31.75 + 0.792	Major diameter	1.4202	1.4062	36.073	35.717	11
		Effective diameter	1.3549	1.3479	34.414	34.237	
		Minor diameter	1.3001	1.2896	33.023	32.756	
1.25 + 0.0625	31.75 + 1.588	Major diameter	1.4515	1.4375	36.868	36.512	11
		Effective diameter	1.3862	1.3792	35.209	35.032	
		Minor diameter	1.3314	1.3209	33.818	33.551	

4.6 Inspection of container neck threads

4.6.1 Internal neck threads

The internal neck threads of the container shall be inspected and gauged to ensure that they are of full form, clean and provide the required number of effective threads as shown in Table 3 or in the relevant standard. Where there is doubt additional gauging shall be employed to ensure safe continuance of service.

4.6.2 Remachining of taper threads

Where necessary and where the design of the neck permits, taper threads shall be remachined to provide the appropriate number of effective threads. In the case of remachining by tapping, particular attention shall be paid to the finish and the tolerances of the new thread, see Table 3, to ensure the absence of leak paths due to excessive flute marks.