
British Standard

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

Part 1. Specification for seamless steel containers of water capacity 0.5 litres and above

Contrôle périodique, essais et maintenance des bouteilles à gaz transportables (à l'exclusion des bouteilles à acétylène dissous)

Partie 1. Bouteilles en acier sans soudure de contenance en eau égale ou supérieure à 0,5 litres —
Spécifications

Regelmäßige Überwachung, Prüfung und Wartung von Gastransportbehälter (ausgenommen Behälter für gelöstes Azetylen)

Teil 1. Behälter aus nahtlosem Stahl mit einem Fassungsvermögen von mindestens 0,5 Litern

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 It incorporates changes found to be necessary from experience in the 1977 edition which is withdrawn.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 the series include BS 5045 and BS 5355.

This Part of BS 5430 covers the periodic inspection, testing and maintenance of transportable seamless steel gas containers having a water capacity of 0.5 litre and above.

Other Parts of BS 5430 will include:

Part 2. Specification for periodic inspection, testing and maintenance of welded steel containers of water capacity 0.5 litre up to 150 litres*;

Part 3. Specification for periodic inspection, testing and maintenance of seamless aluminium alloy containers of water capacity 0.5 litre and above*;

Part 6. Specification for periodic inspection, testing and maintenance of seamless gas containers up to 0.5 litre water capacity†.

A proposal for Pressure Systems and Transportable Gas Container Regulations currently under consideration makes reference to British Standards in this series.

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

*In course of revision.

†In preparation.

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Specification

1 Scope

This Part of BS 5430 specifies requirements for the periodic inspection, testing and maintenance of transportable seamless steel gas containers of water capacity 0.5 litre and above. It does not apply to dissolved acetylene containers but is applicable to containers manufactured to the Health and Safety Executive specification LASS 1 as shown in that standard.

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°C but which is completely vaporized at 17.5°C at 1013 mbar*.

NOTE. Certain toxic substances that are liquid at 1013 mbar pressure at 0°C but that are completely vaporized at or below 30°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°C and 70°C inclusive.

2.3 low pressure liquefiable gas. A gas that has a critical temperature above 70°C .

2.4 permanent gas. A gas that has a critical temperature below -10°C .

2.5 corrosion. A chemical reaction on material that results in the removal of the surface of the material.

NOTE. Corrosion may exist in many forms, such as:

- (a) chemical attack where the metal is dissolved by the reagents and which may be general over the complete surface, localized (causing pitting), or a combination of the two;
- (b) rusting caused by the combined action of moisture and air.

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 4.4.1, 4.4.2 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 or 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 standard.

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

*1 bar = 10^5 N/m^2 = 100 kPa.

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Table 1. Intervals between periodic inspections and hydraulic tests			
Duty of gas container	Interval between each:		
	External inspection in accordance with 4.4.2	Internal inspection in accordance with 4.4.3	Hydraulic pressure test in accordance with 4.7
(a) Permanent gases. e.g. oxygen, argon, nitrogen, hydrogen, air, helium, xenon, krypton, neon, boron trifluoride	year	year	year 5 or 10 (see note 1)
(b) All gases used in self-contained underwater breathing dress apparatus*	2	2	4
(c) All gases used in self-contained breathing apparatus	5	5	5
(d) Corrosive low pressure liquefiable gases, e.g. boron trichloride, carbonyl chloride, chlorine, chlorine trifluoride, hydrogen cyanide, hydrogen chloride, hydrogen sulphide, nitrogen tetroxide, nitrosyl chloride, sulphur dioxide	5	5	5
(e) Non-corrosive high pressure liquefiable gases, e.g. ethane, ethylene, nitrous oxide, sulphur hexafluoride, chlorotrifluoromethane (R13), bromotrifluoromethane (R13B1)	5	5	10
(f) 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)
(g) Gas mixtures	See note 2		
(h) Non-corrosive low pressure liquefiable gases, e.g. ammonia, butadiene, butane, dimethylether, ethylamine, ethyl chloride, ethylene oxide, refrigerant (halocarbon) gases, methylamine, dimethylamine, trimethylamine, methyl bromide, methyl chloride, propane, cyclopropane, propylene, vinyl chloride	5	10	10
(i) Carbon dioxide (excluding fire extinguishing purposes)	5	5	5
(j) Gases used for fire extinguishing purposes, e.g. carbon dioxide and refrigerant gases such as bromchlorodifluoromethane (R12B1), bromotrifluoromethane (R13B1), (with or without permanent gases for pressure padding purposes)	10 or 20 (see note 3)		
*See 3.2. NOTE 1. The extended interval may only be used if the dewpoint of the gas is not higher than -46°C at 1013 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 each inspection and test 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 5), excessive corrosion (see table 7) 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 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 is not to exceed 5 years.			

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 a 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 Part 1: 1977, BS 5430: Part 2: 1978 and BS 5430: Part 3: 1980 with the 18 year cycle.

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 and 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 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. Where the container has contained a flammable non-toxic gas, the container shall be either purged or evacuated so 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, shot blasting, water jet abrasive cleaning or chemical cleaning. Care shall be taken to avoid damaging the container and its marking or removing an excessive amount of container material.

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

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

4.2.7 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 6 of appendix A.

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 subjected 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 Periodic inspection and hydraulic pressure testing

4.1 Segregation

Containers shall be segregated according to the type of periodic inspection and testing 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 standards 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

4.4.2 External inspection. Each container shall be inspected externally for the following:

- (a) dents, cuts, gouges, bulges, cracks, laminations or wear at the knuckle end of the base;
- (b) corrosion, special attention being given to the junction between the cylinder base and foot ring;
- (c) other defects, such as misaligned neck ring or collar, damaged shroud, foot ring or other fittings, illegible or unauthorized markings, fire damage, electric arc or torch burn, unauthorized additions or modifications;

NOTE. Damaged zinc coatings may need to be refurbished (see 4.12).

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, for example, shot blasting, water jet abrasive cleaning, flailing, steam jet, hot water jet, rumbling, chemical cleaning or burning out such that the container temperature does not exceed 350° C (300° C for containers in hydrogen trailer service) (see 4.2.6).

NOTE. A layer of fine rust may be formed on the inside of a container through the action of a number of 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.

Containers used in breathing apparatus shall be cleaned internally in accordance with first quality of BS 4232 or equivalent.

After cleaning, the container shall be inspected again.

4.5 Check weighing

The container shall be weighed on a machine regularly checked for accuracy, to compare the actual mass of the container with that of the stamped tare.

The tare of containers used for permanent gases shall exclude removable fittings. The tare of containers used for liquefiable gases shall include the mass of the container valve(s) and the mass of all permanent fittings.

Any gas container having a tare that is less than 95 % of the original tare of the container shall be deemed unfit for further service and be destroyed in accordance with clause 5, unless the disparity between the actual and stamped tare of a liquefiable gas container results from the fitting of a different valve, shroud, base ring or other attachment.

Where it can be clearly established that a disparity between the actual and stamped tare of containers used for liquefiable gases is not due to corrosion, the original tare shall be obliterated and the correct tare shall be marked on the container.

4.6 Inspection of container neck threads

4.6.1 Internal neck threads. The internal neck threads of each container shall be gauged and inspected to ensure that they are clean, free from burrs and other imperfections and provide the minimum number of effective threads as given in table 3 or in the relevant Part of BS 5045.

4.6.2 Retapping of taper threads. Where necessary and where the design of the neck permits, taper threads shall be retapped to provide the appropriate number of effective threads.

If the nominal size of the container neck thread has to be increased this shall be done in accordance with table 3 or the relevant Part of BS 5045.

If retapping has been undertaken, a further internal inspection of the container using a suitable light source shall be carried out to ensure freedom from debris and other contaminants. Where retapping has been carried out the appropriate sized valve shall be used.

4.7 Hydraulic pressure tests

4.7.1 General. Where a hydraulic pressure test is specified each container shall be submitted either to a proof pressure test or to volumetric expansion test at the test pressure of the container.

NOTE 1. The text of 4.7 refers to water as the test medium; however other suitable fluids may be used.

NOTE 2. A proof pressure test should normally be carried out except that a volumetric expansion test may be carried out in the following circumstances:

- (a) at the discretion of the testing station from its knowledge and experience of the history of using containers in a particular service;
- (b) at the discretion of the testing station in order to resolve any doubt arising from the inspection of a container, e.g. table 7 of appendix A;
- (c) where the owner of the container specifies a volumetric expansion test.

4.7.2 Hydraulic proof pressure test

4.7.2.1 Test equipment. The test equipment shall comply with the following.

(a) All rigid pipework, flexible tubing, valves, fittings and components forming the pressure test equipment shall be capable of withstanding a pressure 1.5 times the maximum test pressure of any container that may be tested. Flexible tubing shall have sufficient wall thickness to prevent kinking.

(b) Pressure gauges shall be manufactured and maintained to a level at least in accordance with BS 1780 and have a scale range appropriate to the container test pressure. They shall be tested and recalibrated as necessary, at regular intervals not exceeding one month, against a dead weight tester or master gauge. Where a master gauge is used, it shall be calibrated against a dead weight tester at least once a month.

(c) The design and installation of the equipment and of the containers connected to it shall be such as to avoid trapping air in the system.

(d) A suitable device shall be fitted to the test equipment to ensure that no container is subjected to a pressure in excess of its test pressure by more than the tolerances given in 4.7.2.2 (a).

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