PRODUCT MANUAL FOR
BRAZED LOW CARBON STEEL GAS CYLINDERS NOT EXCEEDING 13 LITRE WATER CAPACITY ACCORDING TO IS 12586 : 1988

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification license/certificate.

1.	**Product**	:	**IS 12586 : 1988**
	Title	:	**BRAZED LOW CARBON STEEL GAS CYLINDERS NOT EXCEEDING 13 LITRE WATER CAPACITY**
	No. of Amendments	:	**4**
2.	**Sampling Guidelines:**		
a)	**Raw material**	:	Please refer **ANNEX - A**
b)	**Grouping guidelines**	:	Each Variety of Cylinder shall be tested for GoL/CSoL.
c)	**Sample Size**	:	Please refer **ANNEX - B**
3.	**List of Test Equipment**	:	Please refer **ANNEX - C**
4.	**Scheme of Inspection and Testing**	:	Please refer **ANNEX - D**
5.	**Possible tests in a day**	:	Please refer **ANNEX - E**
6.	**Scope of the Licence**	:	Please refer **ANNEX - F**

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ANNEX - A

Raw Material

Raw Material	**Requirement**
Steel	IS 6240 or IS 513 or IS 1079 (Other suitable steel as per Cl. 4.1.1 may be used with the prior permission of the statutory authority)
Bung/Valve pad	IS 2062 or Class 1A of IS 1875 or IS 7283 (Other suitable steel as per Cl. 4.2 may be used with the prior permission of the statutory authority)
Foot ring, Valve protection ring, Shroud and Valve Guard, Handle	Steel for Non-Pressure attachments shall not have Carbon content of more than 0.2% and Sulphur and Phosphorous content of more than 0.05% each. (Suitable steel other than those mentioned as per Cl. 4.2 may be used with the prior permission of the statutory authority)
Valve	IS 3224 IS 8737 – In case of LPG Cylinders exceeding 5 litre water capacity IS 8776 – In case of LPG Cylinders not exceeding 5 litre water capacity Any other type as agreed to between the manufacturer and the purchaser subject to their satisfying the safety requirements of the statutory authority may be used.
Brazing material	The following three are the standard copper brazing filler metals: Filling metal having a minimum of 99.90% Copper and maximum of 0.10% of other elements. Filling metal having a minimum of 99.0% Copper and maximum of 0.30% of other metallic elements. Filling metal available in the form of a paste having a minimum of 86.50% Copper and maximum of 0.50% of other metallics and 1.3% non-metallic contaminants. The remainder is oxide.

ANNEX - B

Sample Size

1. For considering grant of license/inclusion of additional varieties, a trial batch of prototype cylinders as per the approved drawings shall be manufactured during the joint inspection of BIS and Statutory Authority after in-principle approval is received from the Statutory Authority. Unless otherwise stated by the statutory authority, the trial batch shall be of minimum one-hour production (heat treatment) of prototype cylinders in continuous cycle furnace.

2. One sample consists of the following cylinders drawn from the above batch of prototype cylinders:

   i) One Unpainted cylinder with valve for all tests as per the requirements of clause 6.3 of IS 12586.

   ii) One painted cylinder for Acceptance tests, Bend test, Brazed joint test, peel test and Minimum thickness test requirements.

   iii) One painted cylinder for Proof test, Hydrostatic stretch test and Burst test requirements.

ANNEX - C

List of Test Equipment

Major test equipment required to test as per the Indian Standard

Sl. No.	Tests used in with clause reference	Test Equipment(s)
1.	Valve pad/bung – Cl. 6.5	Thread Plug Gauges
2.	Pressings/Halves/Cylinder shell, Circularity, Profile regularity, Straightness, Verticality – Cl. 6.3	Vernier caliper, Surface plate, Vernier Height gauge, Goose neck gauge.
3.	Foot ring – Cl. 6.7	Vernier caliper, Angle protector
4.	Heat treatment – Cl. 7	Furnace with temperature recorder, graphs, thermocouples, temperature indicators
5.	Checking for water capacity – Cl. 6.4	Weighing balance or measuring cans of appropriate capacity
6.	Proof test – Cl. 8	HST test setup with pressure gauges
7.	Valve fixing and Pneumatic leakage test – Cl. 6.5 and Cl. 9	Torque Wrench, Pressure gauge
8.	Bursting Test Under Hydraulic Pressure , Cl. 10	Burst test setup with pump, pressure gauge, weighing balance, HSST set up
9.	Acceptance Test – Cl. 11	Universal testing machine with graph plotter, Suitable mandrels for bend test, Vernier caliper, Copper Sulphate solution
10.	Brazed Joint test – Cl.11.2	Universal testing machine, Suitable mandrels for peel test, Vernier caliper
11.	Internal cleaning, drying - Cl 14	Rod fitted with light source at one end

The above list is indicative only and may not be treated as exhaustive.

ANNEX - D

Scheme of Inspection and Testing

1. LABORATORY – A Testing laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments. The following equipments shall be calibrated at a frequency shown against each and records kept:

1.1.1 Tensile Testing Machine - Once in a year

1.1.2 Pressure Gauges - At least once in a month

1.1.3 Pyrometer used for Heat Treatment/Brazing furnace – Once in six months

1.2 QUALITY CONTROL- All units manufacturing and supplying cylinders shall obtain and hold valid Quality Management System certification in accordance with IS/ISO 9001from BIS to ensure that the manufacturer adheres to various steps during each stage of manufacturing process constantly.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity. Records of all the tests made at the cylinder manufacturer's work shall be kept for the life time of the cylinder and copies of test certificates shall be forwarded to the purchaser of the cylinder and the inspecting authority.

3. LABELLING AND MARKING – As per the requirements of IS 12586:1988

4. CONTROL UNIT – For the purpose of this scheme, Batch/ Inspection Lots shall be as under:

4.1 Batch – A batch shall consist of finished cylinders not exceeding 3000 cylinders made consecutively by the same manufacturer using the same manufacturing technique, to the same design, size and material specifications on the same type of Brazing process and subject to the same heat treatment conditions. A batch may contain material from more than one cast [Clause 10.1.a of IS 12586].

4.2 Inspection Lot - For acceptance purposes the batch shall be divided into inspection lots not exceeding 1000 cylinders. For selection of sample cylinders for either burst or mechanical tests, each lot is sub-divided into sub-lots of 250 cylinders [see Fig.4 of IS 12586]. The samples taken for 'mechanical or burst test' shall be alternated between the mechanical and burst tests [Clause 10.1.b of IS 12586].

4.3 The identity of each batch shall be maintained. The period of manufacture/inspection/test shall be taken from the date of release of steel to the date of final inspection/testing.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 A certificate shall be issued by the BIS Inspecting Officer as per Annexure 1 in respect of every batch/inspection lots of cylinders marked with BIS Standard Mark.

6. **HEAT TREATMENT** - The heat treatment of the cylinders shall be done as per clause 7 of IS 12586. The cylinders shall be punched with serial number before heat treatment to maintain traceability throughout manufacturing process.

6.1 Adequate care shall be taken to ensure the consistency of heat treatment cycle. The deviation of temperature shall be within the specified temperature range. In case the temperature goes outside the specified limits, furnace shall be stopped and all such cylinders shall be segregated. Heat treatment shall be resumed only after attaining the requisite temperature and the furnace temperature is maintained between the specified limits. The complete records of heat treatment cycle and interruptions of cycle shall be maintained.

7. REJECTIONS – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement Required (R) or Sub-contracting permitted (S)	Levels of Control		
Cl.	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
5	Design	5	IS 12586	--	--	--	Drawings shall be approved by statutory authority. The agreed finished thickness shall not be less than that calculated as per clause 5.2.2 of IS 12586
4,6	**Material**						
	Material for cylinder shell	4.1, 4.1.1, 4.1.2	IS 12586	S	--	Each consignment	i. The materials shall be ISI marked and the cylinder manufacturer shall obtain test certificates for each consignment. ii. Approved material as per drawing shall only be used.
	Bung/ Valve pad	4.2	IS 12586	S	--		
	Foot ring/ shroud/ Valve Guard /Handle	4.2.1 4.2.2	IS 12586	S	--		
	Brazing Material	6.1.3	IS 12586	S	--		
	Valves	6.5.1, 6.5.2	IS 12586	S	--		

6	**Brazing/ Manufacture/ Inspection**					
	Pressings/ Halves/ Cylinder shell	6.2,6.2.1, 6.3	IS 12586	R	i. Each pressing, half and cylindrical shell shall be examined for surface defects (external and internal) before closing in operation and only those conforming shall be used for further processing. All rejections shall be deshaped in such a way that it cannot be used at any stage. ii. Each cylinder shall be examined for wall thickness before the closing-in operation. Any piece which is less than the specified minimum thickness shall be deshaped in such a way that it cannot be used at any stage. iii. Circularity, Surface defects, profile regularity and straightness shall be checked according to 6.3.1, 6.3.2, 6.3.3 and 6.3.4. All rejections shall be deshaped in such a way that it cannot be used at any stage. iv. The above examination shall be done after degreasing.	
	Brazing of Cylinder and attachments/ fittings	6.1,6.1.1, 6.1.2	IS 12586	R	Each Cylinder	Joggle joint shall be according to 5.1.1 of IS 12586 and as per approved drawing.
7	Heat Treatment	7.1, 7.1.1	IS 12586	R	Each cylinder	Please see **clause 6** of SIT also.
6.4	Checking of Water Capacity	6.4	IS 12586	R	One cylinder / Each inspection lot	In case of failure, all the remaining cylinders shall be checked for water capacity and the rejected cylinders shall be deshaped. The production shall be stopped and the reasons for failure shall be ascertained. Normal production shall be resumed only after taking corrective actions and 100% cylinders shall be checked for water capacity for the next four inspection lots.
8	Proof test	8	IS 12586	R	Each cylinder	The test may be carried out using suitable adapter at the bung. For rejected cylinders, procedure as per Clause 11.6 of IS 12586 shall be followed.

9	Valve fixing and Pneumatic leakage test	9	IS 12586	R	Each cylinder	For rejected cylinders, procedure as per Clause 11.6 of IS 12586 shall be followed.
10	Bursting Test	10.1, 10.1.1, 10.1.2	IS 12586	R	As per Clause 10.1 and Fig.4 of IS 12586	In case of failure, procedure as per clause 11.7 of IS 12586 shall be followed.
11.1	Acceptance Test (Mechanical Tests)	11.1.1.1, 11.1.1.2	IS 12586	R	As per Clause 10.1 and Fig.4 of IS 12586	Where a batch contains material from more than one cast, the samples tested shall represent each cast of material used. In case of failure, procedure as per clause 11.4 shall be followed.
11.2	Brazed Joint Test	11.2.1, 11.2.2 11.2.3	IS 12586	R		
11.3	Minimum thickness test	11.3	IS 12586	R		
12	Marking and colour identification	12.1, 12.2	IS 12586	R	Each Cylinder	
14	Preparation for despatch	14	IS 12586	R	Each Cylinder	

Note-1: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: The control unit and levels of control as decided by the Bureau are obligatory, to which the licensee shall comply with.

ANNEXURE 1

TEST CERTIFICATE

Purchaser: _____ Certificate No. :_____
Order No. : _____ Date: _____
Batch No.: _____ Inspection Lot No.:_____
Cylinder Description: _____litres water capacity. Two/three piece Cylinder, working pressure_____
Test pressure _____ MPa . Manufacturer's Identification Mark _____

This is to certify that the cylinders manufactured, inspected and tested as mentioned below during the period from _____ to _____at M/s _____ meet the requirements of specification IS 12586: 1988, Drawing No. _____. The cylinders have been fitted with ISI marked valves (IS 2776/IS 8737/ IS 8776, as applicable).

Method of Manufacture

1. Brazing process:
2 Method of Support: : Joggling, if provided
3 Heat treatment: Normalized/Stress Relieved at _____ ºC for_____ min.

Acceptance Test

Sl. No. of Cylinders:

INSPECTION	**Min**	**Max**
The cylinders have been inspected and tested in accordance with Scheme of Inspection and Testing attached with BIS licence no. CM/L-_____	Yield stress (MPa)	
	Tensile Strength (MPa)	
	% Elonagation	

Material for Cylinder: IS 6240/IS 513/ IS 1079

TESTS
Proof Test: Satisfactory
(Test Pressure_____Mpa)
Pneumatic leakage test: Satisfactory
(Test Pressure _____ Mpa)

Bend Test
Face: Satisfactory
Root: Satisfactory

Bursting Test:
Sl. No. of Cylinders
Burst Pressure (MPa): Min. - Max. -
Cylinder bursted without fragmentation:
Nominal Hoop Stress (MPa)

Brazed joint test
Tensile test of brazed joint:
Peel test, Penetration test:
Min. Thickness: ___ mm

Cylinder Nos. _____ to_____ of _____ Batch are covered under Acceptance test cylinder no. _____ and burst test cylinder no. _____ of _____ Batch. These have been heat treated in the same manner and manufactured from steel of similar chemical composition and mechanical properties which had been produced by same steel manufacturer _____

QUANTITY INSPECTED: Cylinders Serial No. from _____ to _____inclusive
Serial No. of REJECTED CYLINDERS _____
TOTAL No. of Cylinders Passed _____

(Signature)
Name & Designation of the firm's representative

(Signature)
INSPECTING OFFICER(BIS)

ANNEX - E

Possible tests in a day

1. Water capacity (Cl. 6.4)
2. Proof test (Cl. 8)
3. Leakage test (Cl. 9)
4. Bursting test (Cl. 10)
5. Acceptance test (Cl .11)

ANNEX - F

Scope of the Licence

"Licence is granted to use Standard Mark as per IS 12586 : 1988 with the following scope:	
Name of the product	Brazed Low Carbon Steel Gas Cylinders not exceeding 13 Litre Water Capacity
Variety	Water capacity (litres)
Any other aspect	PESO approved drawing number and approval number