



**PRODUCT MANUAL FOR
WELDED AND SEAMLESS STEEL
DISSOLVED ACETYLENE GAS CYLINDERS
ACCORDING TO IS 7312:2018**

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 licence/certificate.

1.	Product	:	IS 7312:2018
	Title	:	Welded and Seamless Steel Dissolved Acetylene Gas Cylinders
	No. of amendments	:	1
2.	Sampling Guidelines		
a)	Raw material	:	Clause 4 of IS 7312
b)	Grouping Guidelines	:	Each variety of Cylinders shall be tested for GoL/CSoL. [Please see clause 20.1 of IS 7312 also].
c)	Sample Size	:	As per clause 20.2 of IS 7312
3.	List of Test Equipment	:	Please refer Annex - A
4.	Scheme of Inspection and Testing	:	Please refer Annex - B
5.	Possible tests in a day	:	Please refer Annex - C
6.	Scope of the Licence	:	Please refer Annex - D

BUREAU OF INDIAN STANDARDS
Manak Bhawan, 9, Bahadur Shah Zafar Marg,
New Delhi – 110002

ANNEX A**List Of Test Equipment***Major test equipment required to test as per the Indian Standard*

Sl. No.	Test Equipment	Tests used in with Clause Reference
1	Universal Testing Machine	Tensile Test, Yield Strength, Elongation, Bend test (Clause 18)
2	Dial Vernier caliper, Ultrasonic mini thickness gauge, Goose Neck Gauge, Micrometer	Minimum Thickness (Clause 8.4)
3	Profile Gauge, Circularity gauge, Straightness gauge fixture	Profile regularity, circularity, offset at joint, Straightness (clause 8.5)
4	Weighing Balance	Water capacity (Clause 14)
5	X-ray Radiographic Machine	Radiographic Examination (Clause 13)
6	Hydrostatic Test Bench	Hydrostatic Test (Clause 15.2)
7	Pneumatic Test facility, Pressure Gauge	Pneumatic Leakage Test (Clause 16)
8	Hydrostatic Test Bench (non-Jacket method)	Hydrostatic Stretch Test (Clause 15.1)
9	Burst Test setup	Burst test (Clause 17)
10	Weighing balance, vacuum pumping facility	Porosity (clause 19.2.4)
11	Mechanical/Hydraulic Crushing Strength Machine, Oven, Desiccator, Micrometre	Crushing Strength (19.2.5)
12	Water bath	Elevated Temperature Test (clause 20.3)
13	Steel or cast iron surface solidity supported by a concrete foundation or equivalent.	Vibration Test (Clause 20.4)
14	Apparatus as per Fig 3 & Fig 4 of IS 7312, Water bath, Air conditioner	Backfire Test (Clause 20.5)
15	Facility to connect to remotely located recording or continuously observed pressure gauge , dry, yellow pine, or similar timber	Bonfire Test (Clause 20.6)

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

ANNEX B

Scheme Of Inspection And Testing

1. LABORATORY - A 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 furnace - Once in six months

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 7312:2018.

4. BATCH - For the purpose of this scheme, Cylinders of identical type and design constructed from steel of similar analysis made by the same steel manufacturer and heat treated during one continuous production run in the same manner and under similar conditions shall constitute a Batch.

4.1 The identity of each batch shall be maintained. Each batch conforming to all the requirements shall be accompanied by a Certificate in accordance with clause 22 of IS 7312.

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.

6. HEAT TREATMENT - The heat treatment of the cylinders shall be done as per clause 11 of IS 7312. 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	Levels of Control		
Cl.	Requirement	Test Methods		R: required (or) S: Sub contracting permitted	No. of Sample	Frequency	Remarks
		Clause	Reference				
4	MATERIAL						
4.1	Steel	4.1,6.3	IS 7312	S	One	Each cast/heat	The cylinder manufacturer shall obtain certificates of cast (heat) analysis of steel.
4.2	Bung/Valve pad	4.2	IS 7312	S	Two	Each Consignment	No further testing is required, if accompanied with test certificate or ISI marked.
4.3	Foot-rings	4.3	IS 7312	S	One		
7	Welding	7.1 to 7.5	IS 7312	R	Each Cylinder	–	–
8	Manufacture	8	IS 7312	R	Each Cylinder	–	–
9	Valves and Valves Pad	9	IS 7312	R	Each Valve and Valve Pad	–	–
10	Foot- ring	10.1	IS 7312	R	Each Foot- ring	–	–
	Safety Device	10.2	IS 7312	S	As given in Annex I of SIT		No further testing is required, if accompanied with test certificate or ISI marked
11	Heat Treatment	11	IS 7312	R	Each Cylinder	–	–
12	Inspection	12.1.3	IS 7312	R	Each Cylinder/Component		–

13	Radiographic Examination	13	IS 7312	R	As per clause 13.2 of IS 7312	–
14	Checking of Water Capacity	14	IS 7312	R	Each Cylinder	–
15	Hydrostatic Tests	15.1 , 15.2	IS 7312	R		
16	Pneumatic Leakage Test	16	IS 7312	R		
17	Burst Test	17	IS 7312	R	As per clause 17.1 of IS 7312	–
18	Acceptance Tests	18	IS 7312	R	As per clause 18.1 and 18.1.1 of IS 7312	–
19	TECHNICAL REQUIREMENTS FOR ACETYLENE, POROUS FILLING MASS AND SOLVENT					
19.2	Porous Material	19.2.1, 19.2.3	IS 7312	--	Each Consignment	–
	Gap between cylinder shell and porous material	19.2.3	IS 7312	R	One Cylinder	Every Batch of 202 cylinders or less.
	Porosity	19.2.4 Annex B	IS 7312	R	One Cylinder	Every Batch of 202 cylinders or less.
	Crushing Strength	19.2.5 Annex C	IS 7312	R	One Cylinder	Every Batch of 202 cylinders or less.
19.3	Solvent and Acetylene Contents	19.3	IS 7312	R	Each Consignment	–

	Solvent	19.3	IS 7312	S	Each Consignment	--	
	Filling of Acetone in cylinder	19.3.2	IS 7312	R	Each Cylinder	-	---
20	PROCEDURE FOR TYPE APPROVAL OF DISSOLVED ACETYLENE CYLINDERS						
	Test of the Integrity of porous material	7.6, Annex E	IS 7312	R	As per clause 20.2.4 of IS 7312		Each new design of cylinder as well as any change in design per details given in clause 20.1 of IS 7312 shall be subjected to prototype testing.
	Porosity	19.2.4 Annex B	IS 7312				
	Crushing Strength	19.2.5 Annex C	IS 7312				
	Elevated Temperature Test	20.3	IS 7312				
	Vibration Test	20.4	IS 7312				
	Backfire Test	20.5	IS 7312				
	Bonfire Test	20.6	IS 7312				
19.1	Acetylene	19.1, Annex D	IS 7312	R	Three Cylinder		
21	Marking	21	IS 7312	---	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 given in column 3 are obligatory in nature to which the licensee shall comply with.

Note-3: The Stage Inspection for manufacturing of cylinders shall be as per [Annex II](#).

Note-4: The Test Certificate for cylinders shall be as per [Annex III](#).

ANNEX I**LEVELS OF CONTROL OF SAFETY DEVICE (FUSIBLE PLUG) AS PER IS 13497:2017**

(1)				(2)	(3)		
Test Details				Test Equipment Requirement	Levels of Control		
Cl.	Requirement	Test Methods		R: required (or) S: Sub-contracting permitted	No. of Sample	Frequency	Remarks
		Clause	Reference				
3	Materials (of Body)	3	IS 13497	S	One	Each Consignment	No further testing is required, if accompanied with test certificate.
4	Screw Thread of the Fusible Plug	4	IS 13497	S	5 % of total quantity		In case of failure, entire consignment shall be checked and only those plugs that are conforming shall be used.
6	Flow Capacity of Fusible Plug	6	IS 13497	S	Three		
7	Test of Fusible Alloy	7 7.3.1	IS 13497 IS 5903	S	One	Each Consignment	—
8	Extrusion and Yield Temperature of Fusible Plug	8	IS 7312	S	One	Each Consignment	
9	Pneumatic Test	9	IS 7312	R	Each Fusible Plug	—	
10	Fixing of Fusible Plug	10	IS 7312	R			
11	Markings	11	IS 7312	-			

Note: No further testing is required, if the fusible plug is accompanied with test certificate or ISI marked.

ANNEX II**STAGE INSPECTION FOR MANUFACTURING OF
DISSOLVED ACETYLENE GAS CYLINDERS**

1. Material:

- a) Check physical and chemical properties of each cast/heat.
- b) Check dimensions and surface defects (visual).

2. Manufacturing of Components:

Body	Bung	Foot Ring	Cap and Handle
Shell and dished ends Check pressing for thickness and surface defects such as cracks and laminations.	Check blanks, forging for cracks and other surface defects.	Check for dimensions and other defects.	Check for surface defects.
Random check of height to maintain water capacity.	After manufacturing check dimensions and threading by gauges.	Random check for data stamped.	Check threads with gauges.

- a) Check shell, top and bottom dished ends.
- b) Inspect welding defects of body, bungs and foot ring.
- c) Check for permanent volumetric expansion.
- d) Check for defects/leakage after hydraulic test.
- e) Select cylinders for acceptance and burst test.
- f) Check bung threads, leakage between valve and bung and leakage of the cylinder (pneumatically).
- g) Check all cylinders for water capacity.
- h) Check for internal cleaning and drying.
- i) Check for weight of each empty cylinder with fusible plugs, neck-ring and foot-ring.
- j) Inspection of porous mass for gap.
- k) Weight of completed cylinder, which is the weight of item (i) plus weight of porous filling but not including valve or cap.
- l) Check for weight in item (k) plus weight of solvent at atmospheric pressure and valve but not including valve cap, if any.
- m) Check and note the percentage porosity of filling material.
- n) Inspect fitting of cap on cylinders and details stamped on the cylinder.
- o) Final visual inspection after painting.

ANNEX III

GAS CYLINDER CERTIFICATE

Certificate No.....
Date.....

Manufacturer:

Purchaser:

Order No.:

Batch No.:

Cylinder Descriptionlitre water capacity. Three piece welded Cylinder working pressure kgf. /cm²

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 IS 7312: 2018, Drawing No.....

The Cylinders have been fitted with valves bearing ISI Mark conforming to IS 3224.

METHOD OF MANUFACTURE		
1. Welding Process:		9. Check for:
2. Method of Support:		i. X-Ray Examination for Longitudinal and Circumferential welds (Sample X-Ray) OK
3. Heat Treatment		ii. Liquid Penetration Examination of Bung welding OK
		iii. Bung threads OK
		iv. Cap Threads OK
		Leakage with valve fitted; No leakage to cylinder OK
INSPECTION :		10. Porous Mass OK
4. Shells & dished End. OK		11. Valve Caps OK
5. Bung & Bung Welding OK		12. Finishing & Painting OK
6. Foot ring welding & Marking OK		
7. Internal examination before closing-in-operation. OK		TESTS:
8. i) Circumferential & Longitudinal welding OK		13. Hydrostatic stretch test atkgf/cm ² (Annex III C)
ii) Serial No. Stamping. OK		14. Hydraulic Pressure test at kgf/cm ²
		15. Leakage test at kgf/cm ² (using air)
		16. Acceptance test: Report No.....dt..... (Annex III A)
		17. Burst test:
		i. Cylinder No.....
		ii. Burst Pressure..... kgf/cm ²
		iii. Nominal hoop stress..... kgf/cm ²
		iv. Cylinder bursted without fragmentation : Yes
		18. Max. Gas capacity :kg ofpurity
		19. Porous Mass filling (Annex III B)
		20. Crushing strength test

QUANTITY PASSED: CYLINDERS PASSED -----NOS

Tested/Rejected:..... Cylinder Nos (Annex III D)

Cast No. of Steel					Cast No. of Steel				
i. Tensile..... kgf/mm ²					i. Tensile..... kgf/mm ²				
ii. Yield..... kgf/mm ²					ii. Yield..... kgf/mm ²				
iii. Elongation.....%					iii. Elongation.....%				
Steel used IS.....Gr.....					Steel used IS.....Gr.....				
C%	Si%	Mn%	S%	P%	C%	Si%	Mn%	S%	P%

Representative of Licensee

Inspecting Officer (BIS)

ANNEX IIIA**ACCEPTANCE TESTS**

Certificate No.....

Date.....

Tested Cylinder Nos:

Batch No.:

Cylinder Nos

Tested at.:

Particulars	Longitudinal Parent Metal	Circumferential Weld	Longitudinal Weld
Sample No.			
Width/Thickness (mm)			
Cross-sectional area (mm ²)			
Gauge Length (mm)			
Yield load (kgf)			
Yield Stress (kgf/mm ²)			
Tensile load (kgf)			
Tensile Stress (kgf/mm ²)			
Extended Length (mm)			
% Elongation			
Position of Fracture			

Bend Test:

a) Root ---
b) Face ----

Macro Examination:

a) Neck -----
b) Body ----

Minimum Thickness Test ... mm

Representative of Licensee

Inspecting Officer (BIS)

ANNEX III B

DETAILS OF POROUS MASS FILLING

Certificate No :.....

Date :

Each cylinder has been filled with porous filling material approved by Statutory Authority.

POROSITY & GAP TESTS

Tested Cylinder Nos.

Porosity:

Gap:

Each cylinder has been filled with twoFusible Plugs conforming to IS 13497

Drawing No. :

Maximum Gas filling capacity:

Representative of Licensee

Inspecting Officer (BIS)

ANNEX III C

RECORD OF HYDROSTATIC STRETCH TEST

Certificate No.

Date.....

Tare Weight - Shell weight + Filler weight + Acetone weight + Saturated Gas + Valve

Cylinder Sl. No.	Permanent Expansion %	Shell Weight (kg)	Volumetric Capacity (litre)	Filler Material Weight (kg)	Tare Weight (kg)	Remarks

Representative of Licensee

Inspecting Officer (BIS)

ANNEX III D

DETAILS OF REJECTION/TESTING

Certificate No.....

Date.....

Batch No.:

Cylinder No. : Tested/Rejected Cylinders

Acceptance Test	Burst Test	Porosity Test	Hydrostatic Stretch Test	Air Leakage Test

Welding Defects	Crushing Strength of porous mass	Gap in porous mass	Others

Total tested/rejected cylinders.....Nos. as detailed above

Representative of Licensee

Inspecting Officer (BIS)

ANNEX C

Possible Tests in a day

- i) Acceptance Tests
- ii) Burst Test
- iii) Hydrostatic Stretch Test
- iv) Pneumatic Leakage Test
- v) Wall thickness and other dimensions/requirements as per approved drawing
- vi) Water Capacity

ANNEX D**Scope of the Licence**

Licence is granted to use Standard Mark as per IS 7312:2018 with the following scope:	
Name of the product	WELDED AND SEAMLESS STEEL DISSOLVED ACETYLENE GAS CYLINDERS
Type	Water Capacity (litre)
Any Other Aspect required as per Standard	PESO approved drawing number and approval number Solvent when not Acetone