PRODUCT MANUAL FOR REFILLABLE SEAMLESS STEEL GAS CYLINDERS - QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1 100 MPa (112 kgf/mm²) ACCORDING TO IS 7285 (Part 2):2017

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 7285 (Part 2):2017
	Title	**:**	REFILLABLE SEAMLESS STEEL GAS CYLINDERS - QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1100 MPa (112 kgf/mm²)
	No. of amendments	**:**	Nil
2.	**Sampling Guidelines**		
a)	**Raw material**	**:**	Steel - Clause 5 of IS 7285 (Part 2)
b)	**Grouping Guidelines**	**:**	Each variety of Cylinders shall be tested for GoL/CSoL. [Please see clause 9.1 of IS 7285 (Part 2) also].
c)	**Sample Size**	**:**	As per clause 9.2 of IS 7285 (Part 2)
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

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ANNEX A

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
	Test	**Clause No.**	
1	Depth of Concave bottom	Clause 6.4	Depth Gauge
2	Neck threads	Clause 6.8	Thread inspection gauges
3	Valve Fitting	Clause 6.6.3	Torque Wrench
4	Wall Thickness	Clause 7.2	Ultrasonic Thickness Gauge
5	Surface Defects	Clause 7.3	Ultrasonic Thickness Gauge
6	Out Of Roundness	Clause 7.5	Vernier Calliper or Outside Micrometre or Set of Outside Calliper and Steel Rule
7	Mean Diameter	Clause 7.6	Pi tape
			Outside Calliper with Steel Rule
			Micrometre
8	Straightness	Clause 7.7	Feeler Gauge
			Steel Rule/Straight Edge
			Steel Rule/Straight Edge
9	Verticality	Clause 7.8	Fixture for measuring Verticality
			Feeler Gauge
			Steel Rule/Straight Edge
10	Stability	Clause 7.9	Vernier Calliper
			Scale
11	Water Capacity	Clause 7.11	Digital Electronic Balance
12	Hydraulic Bursting Test	Clause 10.5	Pressure Gauge
			Test Fluid Reservoir
			Tank for measurement of fluids
			Pressure/Time curve recorder
			Vent or air release valve
			Test well
			High Pressure Pump
13	Pressure cycling Test	Clause 9.2.3	Pressure Gauge
			Temperature Sensor
			Non-Corrosive Liquid
			Pressure cycling test set up
			Stop Watch
14	Base Check	Clause 9.2.4	Magnifying Glass
15	Tensile Test	Clause 10.2	Universal Testing Machine
			Vernier Calliper
			Micrometre

16	Impact Test	Clause 10.3	Impact testing Machine
			Deep Freezer/Dry ice
			Thermometer– Digital / Glass type
			Profile Projector/Go-No Go gauges
17	Bend Test	Clause 10.4	Universal Testing Machine
18	Hydrostatic Stretch Test	Clause 11.2 Water Jacket Method	Overflow
			Hydraulic Line Valve
			Water Supply
			Jacket Filling Valve
			Air Bleed Valve
			Pump
			Relief device
			Drain
			Calibrated Burette
			Priming Valve
			Pressure Gauge
			Weighing Balance – Electronic
		Non- Water Jacket Method	Water Tank
			Bleed Valve
			Pressure Gauge
			Pump
			Weighing Balance Electronic
19	Hardness test	Clause 11.3	Hardness Testing Machine (Brinell or Rockwell)
20	Leakage Test	Clause 11.4	Pressure Gauge
			Tank with Lighting Arrangement
21	Colour Identification	Clause 12	Coating thickness Gauge
22	Sulphide Stress Cracking Resistance Test	Clause 9.2.5	Universal testing machine
			Distilled Water
			Sodium Acetate tri-hydrate
			Acetic Acid
23	Ultrasonic Examination	Clause 7.4	Ultrasonic Testing Machine
			Standard Piece for UT
			Ultrasonic Flaw Detector

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 Impact Testing Machine - Once in a year

1.1.3 Pressure Gauges - At least once in a month

1.1.4 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 7285 (Part 2):2017.

4. BATCH - For the purpose of this scheme, a quantity of upto 200 cylinders plus cylinders for destructive testing of the same nominal diameter, thickness and design, made successively from the same steel and subjected to the same heat treatment for the same duration of time 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 13 of IS 7285 (Part 2).

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 cylinders shall be done as per clause 5.5 of IS 7285 (Part 2). The cylinders shall be punched with serial number before heat treatment to maintain traceability throughout the 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. INSPECTION AND TESTING/ RE-TESTS

7.1 In order to ensure that the cylinders are in compliance with IS 7285 (Part 2), they shall be subjected to Inspection and Testing in accordance with clause 8 of IS 7285 (Part 2).

7.2 In the event of failure of cylinders in meeting the requirements, procedure in accordance with clause 7.10.1 of IS 7285 (Part 2) shall be followed for retesting/re-heat treatment.

8. 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** R: required (or) S: Sub-contracting permitted	**Levels of Control**		
Cl.	Requirement	Test Methods Clause/ Reference		No. of Sample	Frequency	Remarks
5.	**MATERIAL**					
5	Steel	5.1 to 5.3 IS 7285 (Part 2)	S	One	Each cast/ heat	The cylinder manufacturer shall obtain certificates of cast (heat) analysis of steel.
		5.4 5.5 IS 7285 (Part 2)	---	Each Batch		
6.7, 6.8.2	Material for neck ring and foot ring	6.7 6.8.2 IS 7285 (Part 2) (As per design/ drawing)	S	Two	Each consignment	No further testing is necessary if the consignment is received with Test Certificate.
6	**DESIGN**					
6.6	Neck Design	6.6.1 6.6.2 IS 7285 (Part 2)	R	Each cylinder		---
	Valve Fittings	6.6.3 IS 7285(Part 2)	R	Each cylinder		
6.7	Foot Ring	6.7 IS 7285 (Part 2)	R	Each cylinder		
6.8	Neck Ring and Cap	6.8 IS 7285 (Part 2)	R	Each cylinder		
7	**MANUFACTURE**					
7.1	General	7.1 IS 7285(Part 2)	R	Each cylinder		---
7.2	Wall thickness	7.2 IS 7285 (Part 2)	R	Each cylinder		

7.3	Surface defects	7.3 IS 7285 (Part 2) Annex-A	R	Each cylinder	---
7.4	Ultrasonic Examination	7.4 IS 7285 (Part 2) Annex-B	R	Each cylinder	The ultrasonic testing shall be certified by the cylinder manufacturer. Every cylinder which has passed the ultrasonic testing shall be stamp marked with the symbol "**UT**"
7.5	Out - of - roundness	7.5 IS 7285 (Part 2)	R	Each cylinder	---
7.6	Mean Diameter	7.6 IS 7285 (Part 2)	R	Each cylinder	
7.7	Straightness	7.7 IS 7285 (Part 2)	R	Each cylinder	
7.8	Verticality	7.8 IS 7285 (Part 2)	R	Each cylinder	
7.9	Stability	7.9 IS 7285 (Part 2)	R	Each cylinder	
7.11	Water Capacity	7.11 IS 7285 (Part 2)	R	Each cylinder	
9	**TYPE APPROVAL PROCEDURE**				
9.2.2.b.1	Hydraulic Bursting Test	10.5 IS 7285 (Part 2)	R	As per clause 9.2.2.(b) of IS 7285 (Part 2)	Each new design of cylinder as well as any change in design as per the details given in clause 9.1 of IS 7285 (Part 2) shall be subjected to prototype testing. If the results are satisfactory type approval certificate shall be issued as per clause 9.3 of IS 7285 (Part 2).
9.2.3	Pressure Cycling Test	9.2.3 IS 7285 (Part 2)	R		
9.2.4	Base Check	9.2.4 IS 7285 (Part 2)	R		
9.2.5	Sulphide Stress Cracking Resistance Test	9.2.5 IS 7285 (Part 2) 9.2.5.1	R	As per clause 9.2.5 and 9.2.5.1 of IS 7285 (Part 2)	

10	**BATCH TESTS**					
10.1.3	Tensile Test	10.2	IS 7285 (Part 2)	R	As per clause 10.1.3 of IS 7285 (Part 2)	Each new design of cylinder as well as any change in design as per the details given in clause 9.1 of IS 7285 (Part 2) shall be subjected to batch tests for prototype testing.
	Impact Test	10.3	IS 7285 (Part 2)	R		
	Bend Test	10.4	IS 7285 (Part 2)	R		
	Hydraulic Bursting Test	10.5	IS 7285 (Part 2)	R		
10.6	Pressure Cycling Test	10.6	IS 7285 (Part 2)	R	One cylinder	
11	**TEST ON EVERY CYLINDER**					
11.2	Hydrostatic Stretch Test	11.2	IS 7285 (Part 2)	R	Each cylinder	---
11.3	Hardness Test	11.3	IS 7285 (Part 2)	R	Each cylinder	
11.4	Leakage Test (Pneumatic)	11.4	IS 7285 (Part 2)	R	Each cylinder	
11.5	Water Capacity Check	7.11	IS 7285 (Part 2)	R	Each cylinder	
12	Colour Identification	12	IS 7285 (Part 2)	R	Each cylinder	
14	Cylinder Marking	14	IS 7285 (Part 1)	--	Each cylinder	
17	Preparation for despatch	17	IS 7285 (Part 1)	--	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.

ANNEX C

Possible Tests in a day

i) Wall thickness and other dimensions/requirements as per approved drawing
ii) Surface defects
iii) Ultrasonic examination
iv) Hardness Test
v) Tensile Test
vi) Bend test
vii) Impact Test
viii) Water Capacity
ix) Hydrostatic Stretch Test
x) Leakage Test
xi) Hydraulic Bursting Test

ANNEX D

Scope of the Licence

Licence is granted to use Standard Mark as per IS 7285 (Part 2):2017 with the following scope:	
Name of the product	REFILLABLE SEAMLESS STEEL GAS CYLINDERS - QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1 100 MPa (112 kgf/mm²)
Type	Material Water Capacity (litre) Diameter (mm) Wall thickness (mm) Working Pressure (bar or kgf/cm^2) Test Pressure (bar or kgf/cm^2) Bottom Profile Gas application
Any Other Aspect required as per Standard	PESO approved drawing number and approval number