



**PRODUCT MANUAL
FOR
VALVE FITTINGS FOR COMPRESSED GAS CYLINDERS EXCLUDING
LIQUEFIED PETROLEUM GAS (LPG) CYLINDERS
ACCORDING TO IS 3224: 2002**

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 3224: 2002
	Title	:	Valve Fittings for Compressed Gas Cylinders excluding Liquefied Petroleum Gas (LPG) Cylinders
	No. of Amendments	:	Three
2.	Sampling Guidelines:		
a)	Raw material	:	As per Cl. 5 of IS 3224
b)	Grouping guidelines	:	Each Variety of valve shall be tested for GoL/CSoL.
c)	Sample Size	:	(a) Assembled valves- 5 pieces (b) Samples for material testing, Izod and tensile- 3 pieces each (c) Valve body piece for chemical test- 3 pieces
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

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

Tests Used in with Clause Reference	Test Equipment
Tensile strength and % Elongation, 5.3.1	Tensile testing machine
Izod impact test, Cl. 5.3.2	Izod Impact testing machine
Coating thickness, Cl. 5.5	Coat Meter
PRD Test, Cl. 7.1.9	Flow meter
Fusible alloy, Cl. 7.1.7.1	Test bath
Hydrostatic Strength Test, Cl. 7.4	Test bench with pressure gauge
Leakage Test, Cl. 7.5	Test bench with pressure gauge
Cyclic Test, Cl. 7.6	Suitable fixture with pressure gauge
Accelerated life Test, cl. 7.7	Suitable test bench
Activation Test, Cl. 7.8	Suitable test bench
Thermal Cyclic Test, Cl. 7.9	Test bench with pressure gauge
Condensate Corrosion Resistance Test, Cl. 7.10	Corrosion resistance test apparatus
Vibration Test, Cl. 7.11	Suitable fixture with necessary arrangement
Valve inlet connections, Cl. 8	Thread Plug Gauges and Ring gauges of suitable sizes
Valve outlet connections, Cl. 9	Thread Plug Gauges and Ring gauges of suitable sizes
Hydraulic Test (Cl. 10.1.1.1)	Test bench with pressure gauge
Pneumatic test, Cl. 10.1.1.2	Test bench with Pressure gauges
Valve Impact Machine, Cl. 10.1.1.3	Suitable fixture with mass
Valving Torque test, 10.1.1.4	Torque wrench with fixture
Cycle test, 10.1.1.5	Holding fixture for cycle test and arrangement counter
Stress Corrosion Test, Cl. 10.1.1.6	Stress Corrosion Test Apparatus with glassware & chemical (DM water, Nitric acid, Mercurius Nitrate, Nitric Acid)
Valve dimensions, Cl. 6	Vernier caliper, micrometer

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 Universal Testing Machine - Once in a year

1.1.2 Impact Testing Machine- Once in three years

1.1.3 Pressure Gauges - Once in a month

1.1.4 Pyrometer used for heating furnace- Once in six months

1.1.5 Master gauges against which inspection gauges are checked periodically shall be sent for rechecking in an independent laboratory once in three years.

1.2 The firm shall procure a set of certified gauges for inspection of different components.

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 valve manufacturer's work shall be kept and copies of test certificates shall be forwarded to the purchaser of the valve and the inspecting authority.

3. LABELLING AND MARKING – As per the requirements of IS 3224: 2002.

4. CONTROL UNIT – The control unit shall consist of a lot of forged valve blanks of the same type and size manufactured in a day from the material of the same supplier or blanks from the same heat number, whichever is later, under similar process of production.

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 Each control unit of finished valves shall be offered for inspection to BIS before dispatch (See Table 2). Valves failing to meet the requirements of the specification shall not be marked with the BIS Standard Mark.

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

5.3 The manufacturer shall maintain a system of works inspection at all stages of manufacture to ensure that the individual valve fittings are free from all manufacturing defects and comply in all respect with the requirements of the Indian Standards Specification.

5.4 One sample of each consignment from raw materials received in the factory shall be analyzed for chemical composition. The composition shall be such that the material shall be compatible under the conditions of service with the gas to be contained in the cylinder and complies with the declaration submitted at the time grant of license or inclusion.

5.5 The material shall conform to the requirements specified in 5.1 to 5.5 of IS 3224:2002. A test certificate shall be supplied by the supplier with the supply of the material for the valve fabrication. BIS shall be given the opportunity of making an independent check test, if necessary. The manufacturer of the valves should establish means to identify the valves with the certificate. Material with seams, cracks, lamination or other injurious defects shall not be used.

5.6 DESIGN - At the time of design approval the valves shall be checked for conformity to all the requirements of the specification including the cycle test. Whenever there is a change in material or design of the valve it shall be retested and shall conform to all the requirements of the specification.

5.7 CYCLE TEST - The valves shall perform satisfactorily at not less than 6000 cycles of opening and closing operations. During the cycle test, the valve shall be closed in every cycle positively. After the cycle test the valve shall be subjected to the pneumatic test given in 10.1.1.2 and shall perform satisfactorily. On PRD of CNG Valves, cyclic test as per Cl. 7.6 shall also be conducted.

5.8 In respect of all other clauses of the specification at all stages of production, appropriate controls and checks shall be maintained by the factory so as to ensure that the product conforms to the various requirements of the specification.

6. FORGING & MACHINING

The licensee shall possess all the requisite infrastructure for the forging and machining of the valve housing in their own premises. Under no circumstances, the forgings of valve housing (body) or machining there of shall be permitted to be sub-contracted or bought from outside.

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				
5.5.1 Requirements for Al- Alloy Valve							
	Coating thickness	9	IS 1868	R	1 of 1000 valves or less anodized at a time		
	Quality of sealing	10	IS 1868	S	1 of 1000 valves or less anodized at a time		
	Appearance and colour	11	IS 1868	R	Each Valve		
	Corrosion resistance	12	IS 1868	R	1 of 1000 valves or less anodized at a time		If required by the customer
	Abrasion resistance	13	IS 1868	S	1 of 1000 valves or less anodized at a time		If required by the customer
	Resistance to crazing by deformation	14	IS 1868	S	1 of 1000 valves or less anodized at a time		If required by the customer
	Fastness to light	15	IS 1868	S	Once in a year for each design		
	Light reflection properties	16	IS 1868	S	Once in a year for each design		

	Electrical Breakdown potential	17	IS 1868	S	Once in a year for each design	If required by the customer	
5.5.3 Requirements for electroplating (on medical cylinder valves only)							
Coating requirement							
	Appearance	7.1	IS 1068	R	Each Valve		
	Thickness	7.2, 7.2.3, 7.2.4, 9.1	IS 1068	R	1 of 1000 valves or less electroplated at a time		
	Ductility	7.2.3.2, 9.4	IS 1068	R	1 of 1000 valves or less electroplated at a time		
	Adhesion	7.3, 9.2	IS 1068	R	1 of 1000 valves or less electroplated at a time		
	Corrosion resistance	7.4, 9.4	IS 1068	R	1 of 1000 valves or less electroplated at a time		
5	MATERIAL						
	Valve Body (Chemical composition)	5.2	IS 3224	S	One	Each Consignment	No further testing is required, if accompanied with test certificate or ISI marked. The approved material as per drawing shall only be used.
	Tensile Strength and Elongation	5.3.1	IS 3224	R	As per Annex B of IS 3224	Each Control unit	--
	Impact Strength	5.3.2	IS 3224	R			

	Fusible plug	7.1.7.1	IS 3224	S	One	Each consignment	No further testing is required, if accompanied with a test certificate from manufacturer
8	Valve Inlet connection	Gauges	IS 3224	R	Each valve		Thread shall be checked with approved gauges as applicable to types of thread.
9	Valve Outlet Connection	Gauges	IS 3224	R	Each valve		Thread shall be checked with approved gauges as applicable to types of thread.
9.3	Safety arrangement	9.3, 9.3.1 to 9.3.5	IS 3224	R	Each valve		
11	Production inspection and testing						
	Gland leakage test	11.1	IS 3224	R	Each valve		
	Valve seat leakage test	11.2	IS 3224	R	Each Valve		
12.1	Type Tests						
	Hydrostatic test	10.1.1.1	IS 3224	R	As per Annex B		
	Valve impact test	10.1.1.3	IS 3224	R	One sample out of 5000 valves of same type subject to minimum of one valve in a month		
	Valving torque test	10.1.1.4	IS 3224	R	One sample out of 5000 valves of same type subject to minimum of one valve in a month		
	Cycle test	10.1.1.5	IS 3224	R	One sample out of 5000 valves of same type subject to minimum of one valve in a month		
	Stress corrosion test for copper alloy valve bodies	10.1.1.6	IS 3224	R	As per Table 2	Each Control unit	

	Pressure Relief devices design of pressure relief devices	7.1	IS 3224	R	As per Table 2	Each Control unit	
7	Discharge rate of pressure relief devices & relief pressure	7.1.9, 7.2	IS 3224	R	As per Table 2	Each Control unit	
	Hydrostatic Strength Test	7.4	IS 3224	R	Three	Once in a year	Hydrostatic strength test may also be conducted when there is change in design or as asked by BIS/CCOE. All of these tests are to be done on PRD of CNG Valves
	Leakage Test	7.5	IS 3224	R	Three	Once in a year	
	Cyclic Test	7.6	IS 3224	R	Four	Once in a year	
	Accelerated life Test	7.7	IS 3224	R	Five	Once in a year	
	Activation Test	7.8	IS 3224	R	One	Once in a year	
	Thermal Cyclic Test	7.9	IS 3224	R	Three	Once in a year	
	Condensate Corrosion Resistance Test	7.10	IS 3224	R	One	Once in a year	
	Vibration Test	7.11	IS 3224	R	One	Once in a year	
12.2	Routine tests						
	Pneumatic proof test	10.1.1.2	IS 3224	R		Each Valve	

Tests for solenoid Valve (Automatic valve) as per ISO 15500 Part 6 (If Provided)

10.1.1.7	Hydrostatic Strength	6.2	ISO 15500-6	S	Three	once in year from each supplier	
	Leakage Test (External & Internal)	6.3	ISO 15500-6	S	Three	once in year	
	Excess Torque Resistance	7	ISO 15500-2	S	Three	once in year	
	Bending Moment	8	ISO 15500-2	S	Three	once in year	
	Continued Operation	9	ISO 15500-2	S	Two	once in year	
	Corrosion Resistance	10	ISO 15500-2	S	Two	once in year	

	Oxygen Ageing	11	ISO 15500-2	S	Three	once in year from each supplier	
	Electrical Over Voltage	12	ISO 15500-2	S	Three	Each control unit	
	Non-Metallic Material Immersion	13	ISO 15500-2	S	Three	once in year from each supplier	
	Vibration Test	14	ISO 15500-2	S	One	once in year	
	Brass Material Compatibility Test	15	ISO 15500-2	R	Three	Each control unit	
	Insulation Resistance	6.5	ISO 15500-6	R	Three	Each control unit	
	Minimum Opening Voltage as per ISO 15500-6	6.6	ISO 1550-6	R	Three	Each control unit	
	Pressure impulse as per ISO 15500-6	6.7	ISO 15500-6	R	Three	Each control unit	

Tests for Excess Flow valve as per ISO 15500 Part 14 (If Provided)`

10.1.1	Hydrostatic Strength	6.2	ISO 15500-14	R	Three	Each control unit
	Leakage	6.3	ISO 15500-14	R	Three	Each control unit
	Excess Torque Resistance	6.4	ISO 15500-14	R	Three	Each control unit
	Bending Moment	6.5	ISO 15500-14	R	Three	Each control unit
	Continued Operation	6.6	ISO 15500-14	R	Two	Each control unit
	Operation	6.7	ISO 15500-14	R	each piece	Each control unit
	Pressure Impulse	6.8	ISO 15500-14	R	Three	Each control unit

	Excess Flow Valve Operation Test	10.1.1.8.1 0.1	IS 3224	R	each piece	Each control unit
	Excess Flow Valve Flow Test	10.1.1.8.1 0.2	IS 3224	R	Two	Each control unit

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.

Table 2
(Cl. 5.1 of SIT)

INSPECTION OF FINISHED LOT

Lot – For the purpose of lot inspection, the lot shall be the same as the Control Unit defined in Clause 4 of the Scheme of Inspection and Testing.

1. Depending upon the size of the lot, the following number of samples shall be drawn at random and subjected to the test for valve inlet connections, valve outlet connections and pneumatic test etc.:

Control Unit Size	Sample Size
Upto 500	13
501 to 1000	20
Over 1000	32

In case of failure of a sample in any requirement mentioned under 1, all the valves in the lot should be tested by the licensee for the requirement where failure has occurred and segregated lot be reoffered for BIS Inspection as fresh lot.

2. Hydrostatic Test, **Stress Corrosion Test**, Relief Pressure and Discharge Rate of Pressure Relief Devices shall be carried out on 2 valves from each control unit.

Electrical over voltage test, Minimum opening voltage test and Insulation resistance test shall carried out on 2 valves from each control unit, in case of solenoid valve is present.

Excess flow valve test shall carried out on 2 valves from each control unit, in case of excess flow valve is present.

a) The lot may be considered as having passed the requirements of IS 3224:2002 if all the samples tested above are found to be conforming.

NOTES:

1. Tensile strength, Elongation and Impact Strength of the material of valve body as per frequency given in Table 1 of STI shall be carried out by the licensee. BIS officer will verify the relevant test records before carrying out lot inspection. However, such tests to be witnessed by BIS officer whenever possible.

2. Cycle test, valve impact test and valve torque test as per the frequency given in Table 1 of STI shall be carried out by the licensee in the presence of BIS officer whenever possible. Records of such tests shall be verified by BIS officer before carrying out lot inspection.

ANNEX – I

(Para 5.2 of the Scheme of inspection and Testing)

Test Certificate for Valve Fittings for Compressed Gas Cylinders excluding Liquefied Petroleum Gas (LPG) Cylinders - IS 3224

Manufacturer:		Certificate No.		
Purchaser:		Order No:		
Control unit No:				
Valve fittings description / Outlet No.		Quantity offered for Inspection :		
This is to certify that the valve fittings as mentioned below were inspected at M/s _____ and _____ these meet the Requirements of IS 3224:2002 and Drawing No. _____.				
RESULTS OF INSPECTION :				
Sr. No	Requirements	Quantity Inspected	Quantity Passed	Quantity Rejected
1	Valve inlet			
2	Valve outlet			
3	Pneumatic test			
4*	Tensile strength and elongation tests			
5*	Impact strength test			
6	Hydrostatic test			
7*	Valve impact test			
8*	Valve torque test			
9	Relief Pressure test			
10	Discharge rate of pressure relief devices			
11	Stress corrosion test for copper alloy valves			
12*	Cycle Test -			
* From manufacturer's test record.		Batch No.	Satisfactory	
IF APPLICABLE				
13	<i>Electrical overvoltage test</i>			
14	<i>Minimum opening voltage test</i>			
15	<i>Insulation resistance</i>			
16	<i>Excess flow valve test</i>			
Quantity Passed				
Rejected valve fittings and the method of their disposal				
Signature:		Signature		
Name & Designation of the Officer representing the company		Inspecting Officer Bureau of Indian Standards		

ANNEX C**POSSIBLE TESTS IN A DAY**

Sr No	Tests	Clause reference
1.	Tensile Strength & Elongation	Cl. 5.3.1
2.	Impact Strength	Cl. 5.3.2
3.	Relief pressure test on PRD	Cl.7
4.	Valve inlet	Cl.8
5.	Valve outlet Connections	Cl 9
6.	Hydrostatic test	Cl. 10.1.1.1
7.	Pneumatic test	Cl. 10.1.1.2
8.	Valve impact test	Cl. 10.1.1.3
9.	Valving Torque test	Cl. 10.1.1.4
10.	Cycle test	Cl.10.1.1.5

ANNEX D**Scope of Licence**

“Licence is granted to use Standard Mark as per IS 3224: 2002 with the following scope:	
Name of the product	Valve Fittings for Compressed Gas Cylinders excluding Liquefied Petroleum Gas (LPG) Cylinders
Classification (Direct acting/indirect acting)	
Type (A/B/C)	
Type of thread on valve inlet (type 1/2/4 and corresponding size)	
Outlet No.	
Type of gas/mixture of gas	
Any other aspect	PESO approved drawing number and approval number