



**उत्पाद मैनुअल
आई एस 9972:2023 के अनुसार
अग्नि संरक्षण सेवा हेतु स्वचालित स्प्रिंकलर हेड के लिए**

दस्तावेज संख्या – पीएम/आईएस 9972/2/मई 2023

भारतीय मानक ब्यूरो की स्कीम-I (अनुरूपता मूल्यांकन) विनियम, 2018 के तहत यह उत्पाद मैनुअल प्रमाणीकरण के प्रचालन में रीति और पारिश्रिता की सुसंगतता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसी द्वारा संदर्भ सामग्री के रूप में उपयोग किया जाएगा। बीआईएस प्रमाणीकरण लाइसेंस/प्रमाणपत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज का उपयोग किया जा सकता है।

**PRODUCT MANUAL FOR
AUTOMATIC SPRINKLER HEADS FOR
FIRE PROTECTION SERVICE
ACCORDING TO IS 9972 : 2023**

Document No - PM/IS 9972/2/May 2023

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.

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PRODUCT MANUAL FOR AUTOMATIC SPRINKLER HEADS FOR FIRE PROTECTION SERVICE ACCORDING TO IS 9972 : 2023

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1.	Product	:	IS 9972 : 2023
	Title	:	Automatic Sprinkler Heads for Fire Protection Service
	No. of Amendments	:	Nil
2.	Sampling Guidelines:		
a)	Raw material	:	NA
b)	Grouping guidelines	:	Automatic sprinkler head of each Model identification as per manufacturers catalogue, which defines type, design size, distribution type and mounting position, shall be tested to include that particular variety in the scope of the licence. Whenever there is any significant alteration in shape, materials or method of manufacture, additional shall be tested.
c)	Sample Size	:	Automatic sprinkler head - 60 Nos + 50 Glass bulbs for ageing test
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 :		
	“Licence is granted to use Standard Mark as per IS 9972: 2023 with the following scope:		
	Name of the product	Automatic Sprinkler Heads for Fire Protection Service	
	Variety	Model identification as per manufacturers catalogue which defines uniquely the design size, distribution type and mounting position.	

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
1.	General requirements (Clause 5) Examination of sprinklers (Clause 5.3.4)	- Vernier Caliper - Micrometer - Sphere of 8 mm + 0.010 mm - Thread Gauges as per IS 2643 - Air Conditioner
2.	Leakage test (Clause 6.1.1) - Hydrostatic leakage test - Pneumatic leakage test - 30-Day Leakage Test	- Hydrostatic test equipment with variable pressure rating arrangement and with pressure gauge - Stop watch - Deep freezer - Glycol liquid
3.	Hydrostatic Strength (Clause 6.2)	- Hydrostatic test equipment with variable pressure rating arrangement and with pressure gauge - Stop watch
4.	Water hammer test(Claude 6.3)	- Arrangement for pressuring sprinkler head in cyclic manner with pressure gauge (small motor operated piston pump that produce a rapid rise in discharge pressure at the rate of 60 cycles/min) and counter for measurement of number of cycles
5.	Hang-up of Operating Parts (Lodgement Test) (Clause 6.4)	- Installation facility of individual sprinklers - Arrangement to induce water pressure on inlet alongwith pressure gauge - Open flame heat source
6.	Operating Temperature (Liquid Bath) Test (Clause 6.5)	- Vessel with heating source - Thermometer - Paddle - Gate/rack
7.	Operating Temperature (Air Bath) Test (Clause 6.6)	- Air circulating oven - Stop watch
8.	Heat exposure test (For glass bulb sprinklers) (Clause 6.7)	- Liquid bath with temperature-controlled arrangement - Stop watch - Distilled water - Refined vegetable oil - Test oven pressurized with water as per clause 6.3.1and Fig. 1 of IS 9972 : 2023 - Thermometer or temperature recorder
9.	High Temperature Exposure Test (Clause 6.8)	- Oven/ furnace - Water bath (temperature controlled)
10	Freezing Test (Clause 6.9)	- Hydrostatic test equipment with variable pressure rating arrangement and with pressure gauge

		- Stop watch - Steel pipe - Freezer -
11	High ambient temperature (Ageing) test for all Sprinklers (Clause 6.10)	- Temperature controlled air oven
12	Thermal shock test (For glass bulb sprinklers) (Clause 6.11)	- Liquid bath- temperature controlled - Stop watch - Temperature controlled water bath - Stop watch
13	Minimum Operating Pressure Test (Clause 6.12)	- Hydrostatic test equipment with variable pressure rating arrangement and with pressure gauge - Stop watch
14	Moist Air Test (Clause 6.13)	- Hydrostatic test equipment with variable pressure rating arrangement and with pressure gauge - Humidity chamber - Pipe manifold
15	Vacuum Test (Clause 6.14)	- Arrangement to create vacuum and pressure gauge
16	Assembly Load/Frame Strength (Clause 6.15)	- Arrangement for load application on sprinklers and deflection measuring apparatus
17	Strength of Heat Responsive Element (Clause 6.16)	- Weight - Loading arrangement - Air conditioner - Steel inserts with seating surfaces (shall be provided by the manufacturer each time the test is specified) - Test rig for loading bulb with arrangement for applying force at rate of 250 ± 10 N/s - Test rig for loading fusible heat responsive element under controlled temperature condition of $20^{\circ}\text{C} \pm 3^{\circ}\text{C}$
18	Deflector Strength Test (Clause 6.17)	- Force loading arrangement as per clause 6.11 with rate of loading 30 N/s - Arrangement for supply of water under pressure
19	Vibration test (Clause 6.18)	- Arrangement for subjecting sprinkler to vibration of 1 mm amplitude and 18 to 37 Hz frequency
20	Drop and Tumble Tests (Clause 6.19)	- Weight (equal to sprinkler) - Vinyl lined right hexagonal prism shaped drum - Wood blocks -
21	Discharge Co-efficient (K-Factor) (Clause 6.20)	- Water flow test set up as per fig.5 of IS 9972:2023
22	Endurance Test (Clause 6.21)	- Installation facility of sprinkler on an elbow in a pressurized system with pressure gauge - Stop watch

23	Salt Spray Test (Clause 6.22.1)	- Deionized water & non-reactive material - Salt spray chamber
24	Stress cracking test (Clause 6.22.2.1)	- Moist ammonia air - Glass chamber with cover - Thermometer - Microscope of magnification 25 X - Flask of 500 ml with thermometer and wet condenser - Magnesium chloride - De-ionized water
25	Boiling magnesium chloride test (Clause 6.22.2.2)	- Arrangement for degreasing - Magnesium chloride - Flask fitted with a wet condenser - Thermostatically-controlled electrically-heated mantle - Potable water
26	Corrosion – Carbon-dioxide and Sulphur-dioxide Tests (Clause 6.22.3)	- carbon dioxide-sulphur dioxide-air mixture - Deionized water & non-reactive material - Chamber having provisions for gas inlet and outlet
27	Corrosion - Hydrogen Sulphide Test (Clause 6.22.4)	- Moist hydrogen sulphide-air mixture - Deionized water & non-reactive material - Chamber having provisions for gas inlet and outlet
28	Water Distribution Test (Clause 6.23)	- Equal sized pans – 100 Nos - Arrangement for maintain temperature of $20 \pm 15^{\circ}\text{C}$ during the test - Test room of suitable sizes (based on type of sprinkler) - Piping arrangement for installation of sprinklers as per fig 6 to 11 - Steel scale - Measuring cylinders - Flow meter
29	Determination of Time Constant (Clause 6.24)	- Wind tunnel as per Fig 11 of IS 9972 : 2023 - Arrangement for maintaining temperature in tunnel to 20°C - Arrangement for pressuring the sprinklers
30	Response Test for Ceiling, Flush, Recessed and Concealed Sprinklers (Clause 6.25)	- Test set up as per fig. 14 & 16 - Room of suitable size - Heat source - Thermal sensors or thermometer - Temperature controlled cabinet - Cylindrical mass - Scale
31	Conductivity (C-Factor) (Clause 6.26)	- PTFE sealant tape - Hydrostatic test equipment with variable pressure rating arrangement and with pressure gauge - Stop watch

		- Arrangement for mount temperature - Test stream
32	Determination of automatic sprinkler head sensitivity (Clause 6.27)	- Test jig for plunger test as per fig. 17 of IS 9972 : 2023 - Wind Tunnel as per Fig 18 of IS 9972 : 2023 - Plunge test tunnel - Apparatus for plunge test - Apparatus for rate of rise test
33	Fire test (Clause 10)	- Test set up as per fig. 19 & 20 of IS 9972 : 2023
34	Wood Crib Fire test (Clause 11)	- Test set up as per fig. 21 & 22 of IS 9972 : 2023

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.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING – As per the requirement of IS 9972 : 2023. The Standard Mark, as given in the Schedule of the licence, shall be legibly and indelibly marked on each sprinkler provided always that the sprinklers thus marked conforms to all the requirement of the specification. In addition, the licence no. CM/L-_____ and details of BIS website shall be marked on sprinklers as follows: “For details of BIS certification please visit www.bis.gov.in”.

3. CONTROL UNIT – All sprinkler heads of same type/class and size manufactured in a day from same consignment of raw material shall constitute a control unit.

4. 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.

4.1 All the production which conforms to the Indian Standard and covered by the licence should be marked with Standard Mark.

5. 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) Test Details				(2) Test equipment requirement R: required (or) S: Sub-contracting permitted	(3) Levels of Control		
CI No	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
5	General requirements						
5.1	Orifice Size	5.1, 12.1 Table 1	IS 9972 IS 2643	R	Firm to have adequate in-process controls to check compliance of this parameter as per the requirements given in the Indian Standard. Appropriate records shall be maintained by the manufacturer for evidence of conformity		
5.2	Identification	5.2					
5.3	Nominal release temperature and colour coding a) Glass bulb b) Fusible elements	5.3.1, 5.3.2, Table 2, Table 3	IS 9972	R			
5.4	Examination of Sprinklers	5.4	IS 9972	R			
6	Performance tests						
6.1.1	Leakage Test						
	Hydrostatic Leakage Test	6.1.1.1	IS 9972	R	twenty	Each control unit	
	Pneumatic Leakage Test	6.1.1.2	IS 9972	R	four	Each control unit	
	30 Day Leakage Test	6.1.2	IS 9972	R	five	Once in a month	Each variety shall be tested during the period
6.2	Hydrostatic Strength	6.2	IS 9972	R	Twenty	Each control unit	

6.3	Water Hammer Test	6.3	IS 9972	S	Five	Once in six months	Each variety shall be tested during the period
6.4	Hang-up Operating Parts (Lodgement Test)	6.4 Table 4	IS 9972	R	Ten or fifteen (as per Table 4)	Each control unit	
6.5	Operating Temperature (Liquid Bath) Test	6.5 Table 5	IS 9972	R	Ten	Each control unit	
6.6	Operating Temperature (Air Bath) Test [Additional Test – See 6.5(c) of IS 9972]	6.6	IS 9972	R	Fifty	Each control unit	
6.7	Heat Exposure Test (for Glass Bulb Sprinklers)	6.7	IS 9972	R	As per Cl 6.7	Each control unit	
6.8	High Temperature Exposure Test	6.8	IS 9972	R	Five	Each control unit	
6.9	Freezing Test	6.9	IS 9972	R	Five	Once in a week	Each variety shall be tested during the period
6.10	High Ambient Temperature (Ageing) Test for All Sprinklers	6.10	IS 9972	S	Ten	Once in three months	
6.11	Thermal Shock Test (for Glass Bulb Sprinklers)	6.11	IS 9972	R	Ten	Once in a week	
6.12	Minimum Operating Pressure Test	6.12 Table 6	IS 9972	R	Ten	Each control unit	
6.13	Moist Air Test	6.13	IS 9972	S	Five	Once in three months	Each variety shall be tested during the period
6.14	Vacuum Test	6.14	IS 9972	R	Five	Each control unit	
6.15	Assembly Load/Frame Strength	6.15	IS 9972	R	Fifteen	Each control unit	
6.16	Strength of Heat Responsive Element						
	Heat Responsive Element of the Fusible Type	6.16.1	IS 9972	S	Fifteen	Once in three	Each variety shall be tested during the period

	Heat Responsive Element of the Bulb Type	6.16.2				months		
6.17	Deflector Strength Test	6.17	IS 9972	R	Four	Each control unit		
6.18	Vibration Test	6.18 Table 7	IS 9972	R	Five	Each control unit		
6.19	Drop and Tumble Tests							
	Drop Test	6.19.1	IS 9972	R	Five	Each control unit		
	Tumble Test	6.19.2	IS 9972	R	Five	Each control unit		
	Impact Test	6.19.3	IS 9972	R	Five	Each control unit		
6.20	Discharge Co-efficient (K-Factor)	6.20 Table 8	IS 9972	R	Four	Each control unit		
6.21	Endurance Test	6.21	IS 9972	R	One	Each control unit		
6.22	Corrosion Test -							
	Salt Spray Test (Optional Test)	6.22.1	IS 9972	S	Eight	Once in three months	Each variety shall be tested during the period	
	Stress Cracking Test –					Once in three months		
	(i) Copper bases materials (ammonia test)	6.22.2.1		S	Four			
	(ii) Stainless steel and other materials (boiling magnesium chloride test)	6.22.2.2						
	Corrosion – Carbon-dioxide and Sulphur-dioxide Tests	6.22.3		S	Four	Once in three months		

	Corrosion - Hydrogen Sulphide Test	6.22.4		S	Four	Once in three months	
6.23	Water distribution test -					Each control unit	
	Conventional, Spray and Dry sprinklers	6.23.1	IS 9972	R	Four		
	Sidewall sprinklers (15mm)	6.23.2	IS 9972	R	Four		
	Water Distribution Above and Below the Sprinkler Deflectors (Not Applicable to Sidewall Sprinklers)	6.23.3	IS 9972	R	Four		
6.24	Determination of Time Constant	6.24	IS 9972	R	One	Each control unit	
6.25	Response Test for Ceiling, Flush, Recessed and Concealed Sprinklers	6.25 Table 11, 12 & 13	IS 9972	R	Twenty seven	Once in a week	Each variety shall be tested during the period
6.26	Conductivity (C-Factor)	6.26 Table 14	IS 9972	S	Twenty	Once in a week	
6.27	Requirement and Testing Methods for the Determination Automatic Sprinkler Heat Sensitivity						
	Plunge test	6.27.2.1 Table 15	IS 9972	R	Two (for fusible type), Three (for glass bulb type)	Each control unit	
	Rate of rise test	6.27.2.2 Table 16	IS 9972	R			
10	Fire Tests	10	IS 9972	S	One	Once in a month	Each variety shall be tested during the period
11	Wood Crib Fire Test	11	IS 9972	S	Four	Once in a month	

Note-1: If any sample fails in any requirement, all sprinklers in the control unit may be suitably corrected and twice the number of samples from the lot shall be tested for all requirements. The control unit shall be accepted on passing of retested samples.

Note-2: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-3: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by BO Head.

ANNEX - C**Possible tests in a day:**

- (i) Orifice sizes (clause 5.1)
- (ii) Nominal release temperature and colour coding (Clause 5.3)
- (iii) Examination of sprinkler (Clause 5.3.4)
- (iv) Leakage test (Clause 6.1.1.1)
- (v) Hydrostatic Strength (Clause 6.3)
- (vi) Hang-up of Operating Parts (Lodgement Test) (Clause 6.4)
- (vii) Heat Exposure Test (for Glass Bulb Sprinklers) (Clause 6.7)
- (viii) High Temperature Exposure Test (Clause 6.8)
- (ix) Assembly Load/Frame Strength (Clause 6.16)
- (x) Discharge Co-efficient (K-Factor) (Clause 6.20)
- (xi) Vacuum test (Clause 6.14)
- (xii) Assembly load/ Frame Strength (Clause 6.15)
- (xiii) Deflector Strength Test (Clause 6.17)
- (xiv) Drop and Tumble test (Clause 6.19)
- (xv) Discharge co-efficient (K-Factor) (Clause 6.20)
- (xvi) Endurance test (Clause 6.21)
- (xvii) Water distribution test (Clause 6.23)
- (xviii) Determination of time constant (Clause 6.24)