

BS 8663-1: 2019 and electronically controlled nozzles

BS 8458 states, in its introduction, that ‘the testing and approval of watermist system components for residential and domestic applications is a developing area’. As per FM 5560-2017, page 16:

“Due to the current state of water mist system technology, a comprehensive absolute standard for the testing of water mist components is not possible. Since each water mist system is unique in its operation and design, the component testing of the water mist system shall be performed on a case-by-case basis.”

BS 8663-1:2019 provides a basis to validate the design resilience and robustness to ageing of automatic or open water mist nozzles only. Nozzles with no moving parts. As electronic nozzles are neither fully open, automatic, nor pre-action nozzles, we are working with the industry to develop further voluntary guidance to certify such systems. In the meantime, there are parts of the standard which are applicable and elements which are not. Plumis has summarised all the first-party (internal) and third-party (external) testing done on its system, either using the BS 8663-1 test protocols or equivalent certification protocols with minor differences in procedure.

Summary Table

CLAUSE	APPLICABILITY	COMMENTS
4.1 Product Assembly	Applicable	Complies. A Plumis seal on the nozzle assembly indicates when it has been disassembled by severing the label. The cover can be removed with a Torx tool to reveal the product code and serial number.
4.2 Technical Literature	Applicable	Complies. Nozzle technical specifications are present in the system DIOM.
4.3 Dimensions and Pressure rating	Applicable	Complies. Nozzle technical specifications are present in the system DIOM. Note: there is no standby pressure given it is a dry pipe system.
4.4 Nominal operating temperatures for automatic nozzles	Not Applicable	Not an automatic nozzle
4.5 Operating temperatures for automatic nozzles	Not Applicable	Not an automatic nozzle

4.6.1 K-factor	Applicable	Complies. K-factor of 0.62 +/-0.03 included in nozzle technical specification present in the system DIOM. 100% controlled in production.
4.6.2 Water flow and distribution	Not Applicable	Not a gravity-based system with nozzle close/on to the ceiling. DIOM states the area of coverage of the movable nozzle. There is no need to communicate density as it will not vary given its pre-engineered construction.
4.7 Function	Not applicable	It is not an automatic nozzle, and it does not contain a deflector or blow-off cap. Its function is to rotate the spray nozzle to the target angle, which is electronically controlled. Typically, electronic detection is tested for 6000 cycles. The nozzle has completed up to 70,000 full angle range cycles before failure.
4.8.1.1 Mechanical strength test	Not applicable	Not an automatic nozzle
4.8.1.2 Hydrostatic strength test	Applicable	Procedure E.1.2 can be carried out on this nozzle in the closed position. Internal tests have demonstrated robustness up to 4 times (400 bar) the maximum operating pressure (± 100 bar). Third-party report available " Pressure Testing Report 400 bar.pdf "
4.8.2 Strength of nozzle deflector	Not applicable	The nozzle does not contain a deflector
4.9 Strength of release element for automatic nozzles	Not applicable	Not an automatic nozzle
4.10 Leak resistance for automatic nozzles	Not applicable	Not an automatic nozzle
4.11 Heat exposure for automatic nozzles	Not applicable	Not an automatic nozzle
4.12 Thermal shock for automatic glass bulb nozzles	Not applicable	Not an automatic nozzle
4.13.1 Stress corrosion	Applicable	Deviates as a default but can be made to comply with optional material. Failed on a test carried out by a third party. Passed with upgraded annealing treatment. Report available upon request. Plumis does not consider this test relevant for

		domestic applications given the room temperature, minimum stress cycling (once a year) and no contact with water or chloride salts, as per assessment in this HSE study: https://www.hse.gov.uk/research/rrpdf/rr902.pdf
4.13.2 Sulphur dioxide corrosion	Applicable	Comparable test carried out per UL 2167 by a third party. K-factor consistency was tested in-house, and the test passed. Report available upon request. <i>Note: K factor of 0.82 was used instead of 0.62 for this test with no expected impact on results expected given the exact same construction.</i>
4.13.3 Salt mist corrosion	Applicable	Exposure test carried out as per BS 8663-1. K-factor consistency was tested in-house, and the test passed. Report available upon request. <i>Note: K factor of 0.82 was used instead of 0.62 for this test with no expected impact on anticipated results given the same construction.</i>
4.13.4 Moist air exposure	Applicable	Exposure test carried out as per BS 8663-1. K-factor consistency was tested in-house, and the test passed. <i>Note: K factor of 0.82 was used instead of 0.62 for this test with no expected impact on anticipated results given the same construction.</i>
4.14 Integrity of water mist nozzle coatings	Not applicable	The nozzle has no coatings
4.15 Water hammer for automatic nozzles	Not applicable	Not an automatic nozzle
4.16 Thermal response	Not applicable	Not an automatic nozzle
4.17 Resistance to heat	Not applicable	The nozzle is not in a pendent position, the body does not protrude from the ceiling and cannot be held by a threaded inlet and immersed in the water bath as proposed in the procedure.
4.18 Resistance to vibration	Applicable	Comparable test carried out as per UL 2167 at a third party. Visual inspection and electrical function tests were carried out in-house. <i>Note: K factor of 0.82 was used instead of 0.62 for this test with no expected impact on anticipated results given the same construction. Also, a prototype spray head enclosure was used in test "SH14" with no anticipated impact on results. All functional parts, including electronics, were production construction.</i>
4.19 Resistance to impact	Applicable	No test has been carried out yet using the BS 8663-1 procedure by a third party. In-house tests were carried out using UL 2167 procedure, and the test passed. Report available upon request.

4.20 Resistance to low temperatures for automatic nozzles	Not applicable	Not an automatic nozzle
4.2.1 Filter rating or strainer mesh opening	Not applicable	It does not contain mesh on the nozzle
5 Marking	Applicable	Complies. All applicable data is marked on the spray head assembly, including “to not cover” instead of “do not paint”.
6 Data sheet	Applicable	Complies. Nozzle installation instructions are present in the system DIOM.
8.2 Evaluation of conformity	Applicable	Certification is not possible given notified bodies will not test a nozzle which is not a traditional open nozzle or an automatic nozzle.
8.2 Factory Production control	Applicable	Plumis is ISO 9001 accredited for the design, manufacture and supply of water mist fire suppression systems and installer support. The spray head assemblies are tested for spray pattern, k-factor and target angle accuracy.
8.4 Inspection and testing of in-service nozzles	Applicable	System servicing includes a complete system discharge which verifies function and k-factor annually on every installation

Definitions

Traditional automatic nozzle: used on a pressurised wet pipe or dry-pipe system where a thermal frangible or fusible link allows for water discharge from nozzle.

Open nozzle: system is not pressurised and an external signal (manual or from a detection or alarm system) discharges water from all nozzles linked to that water supply. Zoned systems might only allow from a portion of open nozzles.

Electronically controlled nozzle: a nozzle which might be open in a standby condition, but which once triggered, will further process data to decide whether to point at the fire or shut flow to it. It will not act simply in a binary manner (open/close) from an electrical input. Not yet captured by standards.

Electrically actuated system: A system which uses a detection or alarm system to open a valve or activate a pump in an open nozzle or pre-action system. It acts in a binary manner (open/close).

Pre-action system: Uses both an automatic nozzle and electrical actuation to require both flow control systems to result in discharge of water from the nozzle.

Targeted, valved system: A system used with an electronic nozzle to only discharge water to a targeted location when a fire has been validated electronically. It may also decide to shut-off its flow to ensure that the discharge is only through the nozzle(s) involved in firefighting. Not yet captured by standards.

BS 8663-1: 2019: a standard for 'requirements and test methods for the construction and performance of open and automatic watermist nozzles for use in water mist systems conforming to BS 8458 or BS 84891-1.'

BS 7273-3: 2008: a standard for 'design, installation and commissioning of electrical actuation arrangements for watermist systems. It covers the interface between fire detection and fire alarm systems (see BS 5839-1) and watermist systems.'

BS 7273-5: 2008: 'design, installation and commissioning of electrical actuation arrangements for pre-action watermist and sprinkler systems. BS 7273-3 covers the interface between fire detection and fire alarm systems, sprinkler systems and watermist systems.'