Designation: D8422 − 21

Standard Practice for
Pre-Stressing Terminal Point-of-Use Water Filters before Testing by Test Method F838[1]

This standard is issued under the fixed designation D8422; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers terminal point-of-use (POU) filters intended for intermittent use on showers, faucets, and other water use end-point devices that deliver hot and cold potable water.

1.2 This practice does not cover in-line filters.

1.3 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1129 Terminology Relating to Water

D1193 Specification for Reagent Water

F838 Test Method for Determining Bacterial Retention of Membrane Filters Utilized for Liquid Filtration

2.2 *ISO Standards:*[3]

ISO 13485 Medical devices — Quality management systems — Requirements for regulatory purposes

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this standard, refer to Terminology D1129.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *in-line water filter, n*—device installed on the water supply line upstream of a water use end point, such as a shower, faucet, or ice machine, for the purpose of removing contaminants from the water before the water enters the water use end point.

3.2.2 *terminal point-of-use water filter, n*—device installed at the point where water exits a water use end point, such as a shower or faucet, for the purpose of removing contaminants from the water before the water exits the water use end point.

4. Summary of Practice

4.1 This protocol has two parts, Part A, described in 7.1 and Part B, described in 7.2. Two variations of this protocol may be implemented: Part A (alone) or both Part A and Part B. When both Part A and Part B are implemented: for each filter tested, Part A shall be implemented first followed by Part B. For both Parts A and B, cycles shall be run consecutively and continuously. Up to 72 h pause is acceptable between cycle sets.

4.2 Part A is a series of cycles that alternate the flow of cold and hot water. A set of ten hot water-cold water flow pairs under Part A conditions shall be considered the equivalent of one filter-use day. Part B is a series of cycles that alternate the flow of cold and hot water. A set of two hot water-cold water flow pairs under Part B conditions shall be considered the equivalent of one filter-use day. Test requirements for Parts A and B shall be the same except where specifically provided.

4.3 When only Part A is implemented and compliance with this practice is referenced by the vendor of the terminal point-of-use water filter ("device") tested, the reference shall state: "This device has been tested under Part A of ASTM Practice D8422, which includes testing only to water temperatures up to 125°F (51.7°C); it has not been tested under Part B of ASTM Practice D8422, which includes testing to water temperatures greater than 125°F (51.7°C). This device should not be used in any application where the water temperature

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[1] This practice is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.08 on Membranes and Ion Exchange Materials.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

may exceed 125°F (51.7°C), even if only infrequently or for brief periods of time."

5. Significance and Use

5.1 This practice has been developed to simulate the stress encountered by terminal point-of-use filters under a range of real-world use conditions with emphasis on thermal and pressure swings. Two parts, A and B, are intended to account for more frequent, less extreme use conditions and less frequent, more extreme use conditions, respectively. The purpose of pre-stressing the filters before testing by Test Method F838 is to demonstrate the ability of the filters to retain bacteria as determined by Test Method F838 after exposure to a series of temperature and pressure swings representative of those that may be encountered under actual use conditions.

5.2 This practice is not intended to account for effects on filter performance attributable to differences in the quality of the water being filtered that may be encountered under actual use conditions.

5.3 This practice is not intended to simulate the very extreme stress associated with systemic remedial procedures, such as thermal or chemical shock, sometimes implemented in premise plumbing systems.

6. Reagents

6.1 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type IV of Specification D1193. (Types I–III, which exceed the purity specifications of Type IV, may be used.)

6.2 If water used for testing is recirculated, an in-line filter in the recirculation loop may be used to prevent buildup of particulates in the hot and cold water being used in the test protocol.

7. Procedure

7.1 *Part A* (Table 1)—Alternate flow of cold water [10 min at ≤50°F (10°C)] and hot water [10 min at ≥125°F (51.7°C)] with ≤30 s of no flow between hot- and cold-water flow. A set of ten hot water-cold water flow pairs, conducted with no more than 30 s between each pair, shall be considered the equivalent of one filter-use day.

7.2 *Part B* (Table 2)—Alternate flow of cold water [10 min at ≤50°F (10°C)] and hot water [10 min ≥140°F (60°C)], with ≤30 s of no flow between hot- and cold-water flow. A set of two hot water-cold water flow pairs, conducted with no more than 30 s between each pair, shall be considered the equivalent of one filter-use day.

7.3 *Test Conditions:*

7.3.1 *Dynamic Pressure*—The dynamic pressure of the water being delivered to each filter shall be ≥50 psi (345 kPa), measured at a point ≤6 ft (1.8 m) upstream of the filter.

7.3.2 *Temperature*—The temperature of the water being delivered to each filter shall be measured at a point ≤6 ft (1.8 m) upstream of the filter.

7.3.3 *Feed Line*—The line that feeds water to each filter shall be ½ in. (1.27 cm) diameter and no more than 6 ft (1.8 m) in length from the point at which the dynamic pressure of the water and the temperature of the water are measured. There shall be no obstructions in the line between the point at which the temperature and dynamic pressure are measured.

TABLE 1 Part A Data

Part A – Pre-Stressing Protocol (Moderate Temperature)	
Temperature	Duration
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥125°F (51.7°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
Total time (ten hot-cold pairs) = 200 min + up to 10 min	

TABLE 2 Part B Data

Part B – Pre-Stressing Protocol (High Temperature)	
Temperature	Duration
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥140°F (60°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≤50°F (10°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
≥140°F (60°C)	≥10 min
Off (no flow)	Full stop ≤ 30 s
Total time (two hot-cold pairs) = 40 min + up to 2 min	

7.3.4 *Measurements:*

7.3.4.1 *Temperature*—The temperature of the water shall be measured at a point in the feed line to each filter at a point not more than 6 ft (1.8 m) from the filter inlet. Temperature measurements shall be made and recorded continuously at intervals not to exceed 30 s.

7.3.4.2 *Dynamic Pressure*—The dynamic pressure of the water shall be measured at a point in the feed line to each filter at a point not more than 6 ft (1.8 m) from the filter inlet. Pressure measurements shall be made and recorded continuously at intervals not to exceed 30 s.

7.3.4.3 *Calibration*—Instruments used to measure temperature of the water and dynamic pressure of the water shall be calibrated as recommended by the manufacturer.

7.3.5 All trials shall be in triplicate with one filter from each of three production lots.

7.3.6 Simultaneous stressing of three filters on one test rig is permissible.

7.3.7 Testing shall be by an ISO 13485 accredited facility; all documentation shall comply with applicable ISO requirements.

8. Keywords

8.1 microfilter; pathogen; point-of-use filter

APPENDIXES

(Nonmandatory Information)

X1. DATA SHEETS FOR PARTS A AND B

X1.1 See Fig. X1.1 for data sheets for Parts A and B.

Data Sheet for Part A

Data Sheet for Part A Pre-Stressing Protocol (Moderate Temperature)

Indicate *yes* or *no* for each step or enter *data value*.

	Cold ≤10°C (50°F)	Duration, min (≥10 min)	Stop Time (≤30 s)	Hot ≥51.7°C (125°F)	Duration, min (≥10 min)	Stop Time (≤30 s)
Cycle 1						
Cycle 2						
Cycle 3						
Cycle 4						
Cycle 5						
Cycle 6						
Cycle 7						
Cycle 8						
Cycle 9						
Cycle 10						

Data Sheet for Part B

Data Sheet for Part B Pre-Stressing Protocol (High Temperature)

Indicate *yes* or *no* for each step or enter *data value*.

	Cold ≤10°C (50°F)	Duration, min (≥10 min)	Stop Time (≤30 s)	Hot ≥51.7°C (125°F)	Duration, min (≥10 min)	Stop Time (≤30 s)
Cycle 1						
Cycle 2						

FIG. X1.1 Example of Data Sheets for Parts A and B

X2. TEST RIG EXAMPLES

X2.1 See Fig. X2.1 and Fig. X2.2 for test rig examples.

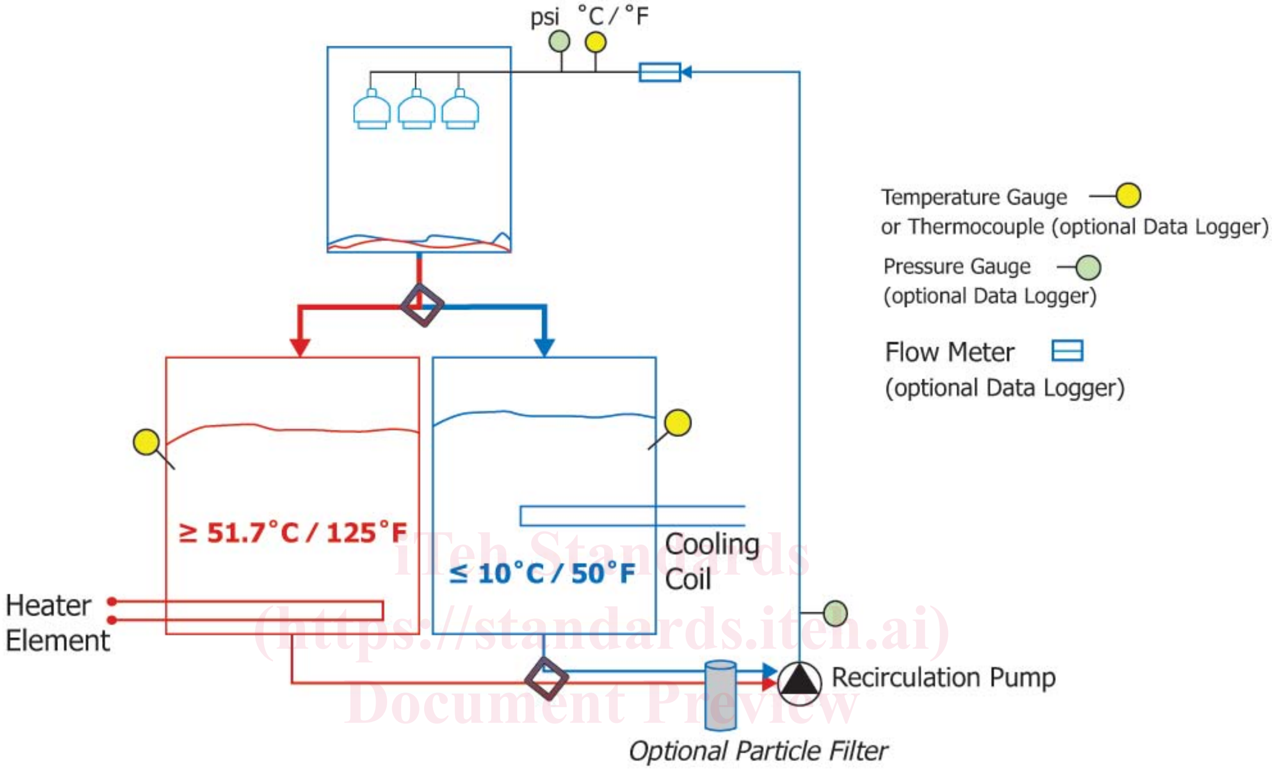

FIG. X2.1 Example of Concept for Dual Temperature Simulation Rig Using Single Pump

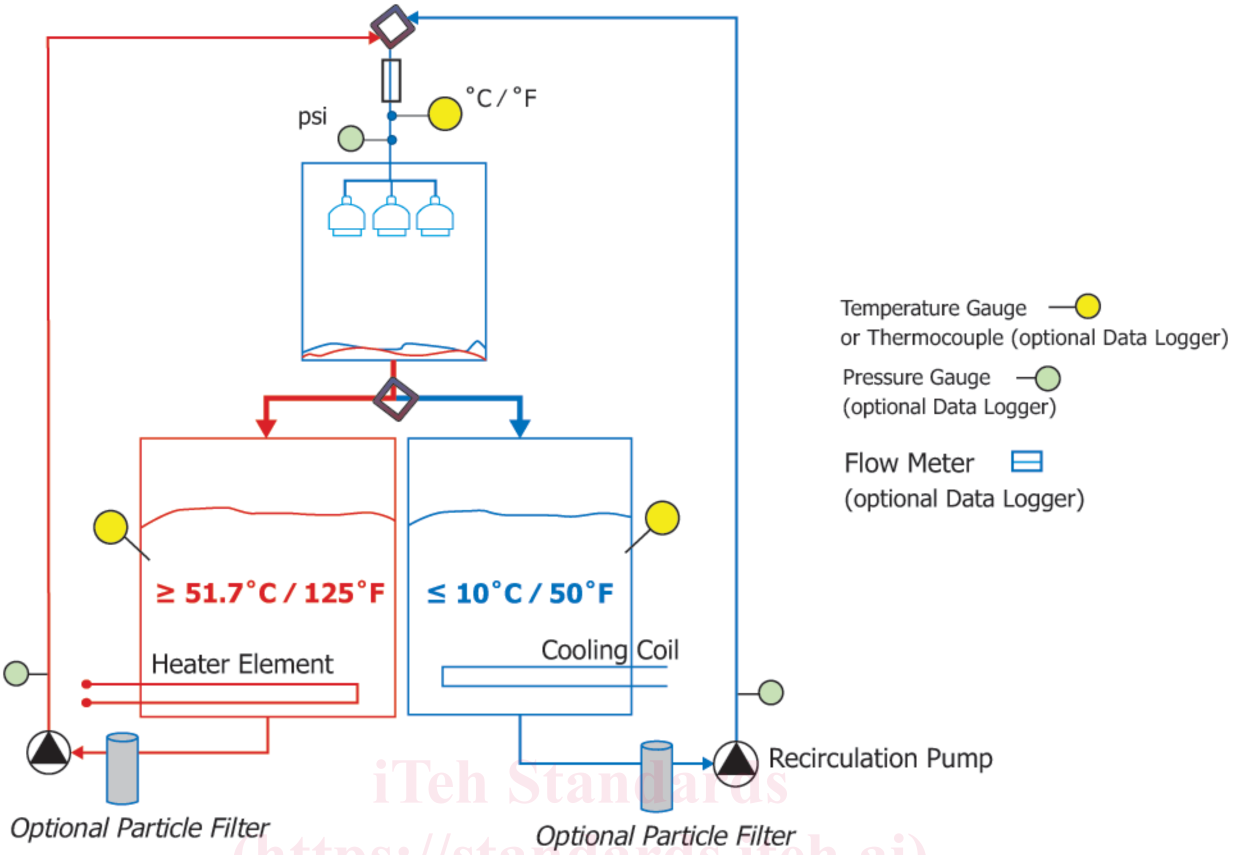

FIG. X2.2 Example of Concept for Dual Temperature Simulation Rig Using Two Pumps

X3. TEST SETUP EXAMPLES

X3.1 See Fig. X3.1 and Fig. X3.2 for test setup examples.