Designation: F1094 – 87 (Reapproved 2020)

Standard Test Methods for
Microbiological Monitoring of Water Used for Processing Electron and Microelectronic Devices by Direct Pressure Tap Sampling Valve and by the Presterilized Plastic Bag Method[1]

This standard is issued under the fixed designation F1094; 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 These test methods cover sampling and analysis of high purity water from water purification systems and water transmission systems by the direct sampling tap and filtration of the sample collected in the bag. These test methods cover both the sampling of water lines and the subsequent microbiological analysis of the sample by the culture technique. The microorganisms recovered from the water samples and counted on the filters include both aerobes and facultative anaerobes.

1.2 Three methods are described as follows:

	Sections
Test Method A—Sample Tap—Direct Filtration	6 to 8
Test Method B—Presterilized Plastic Bag Technique	9 to 12
Test Method B2 —Dip Strip Technique[2]/Presterilized Plastic Bag	

1.3 *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.*

1.4 *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:*[3]
D1129 Terminology Relating to Water
D1193 Specification for Reagent Water
F60 Test Method for Detection and Enumeration of Microbiological Contaminants in Water Used for Processing Electron and Microelectronic Devices (Withdrawn 1991)[4]
F488 Test Method for On-Site Screening of Heterotrophic Bacteria in Water (Withdrawn 2005)[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *total bacteria count*—number of viable heterotrophic bacteria capable of growing under test conditions specified.

3.1.1.1 *Discussion*—Total bacteria count is the general term for heterotrophic plate count, now commonly used. Heterotrophic bacteria are those microorganisms that cannot use CO_2 for food. They require more complex organic compounds for use as growth nutrients. The majority of bacteria fall into this major grouping.

3.1.2 For definition of other terms used in this test method, refer to Terminology D1129.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *presterilized plastic bag*—a commercial presterilized plastic bag of 200-mL capacity (or as appropriate to larger sample sizes) to hold sample water. The bag should have integral fold over tabs to allow for resealing.

3.2.2 *bacteriological monitor*—a commercial presterilized plastic filter holder containing a 0.45-μm membrane filter. (No other filter pore size should be used.)

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[1] These test methods are under the jurisdiction of ASTM Committee F01 on Electronics and are the direct responsibility of Subcommittee F01.10 on Contamination Control.

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[2] The dip strip (Total Count Tester or SPC Sampler) method is permissible for waters containing >10 microorganisms per millilitre.

[3] 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.

[4] The last approved version of this historical standard is referenced on www.astm.org.

NOTE 1—If a larger pore size filter is used, organisms may pass through the filter; a smaller pore size filter does not wick up sufficient growth media, hence the level of recovery will be less than that of the 0.45-μm filter.

3.2.3 *total count tester*—a paddle shaped plastic filter assembly containing a 0.45-μm membrane filter and dehydrated nutrient pad.

4. Summary of Test Method

4.1 *Test Method A—Sample Tap—Direct Filtration*—A sampling valve as or similar to that shown in Fig. 1 is installed in a pressurized line. The valve illustrated has a self closure and a male luer outlet fitting. This valve design minimized the chance of extraneous contamination. Any valve used for sampling should be constructed in a manner to reduce or prevent the retention of bacteria within its internal surfaces, and should be easily sanitized. The bacterial monitor is connected to either the luer outlet of the illustrated sampling valve, or in a suitable manner to an equivalent valve. The water sample is passed directly through the monitor, and the effluent volume is measured after this filtration. Test Methods F60 are then employed for bacteriological examination of the sample.

4.2 *Test Method B—Presterilized Plastic Bag*—The sampling valve is installed as in Test Method A, then flushed clean prior to taking the samples. The water sample is directly flowed into a presterilized, precalibrated plastic disposable bag. After sampling, the plastic bag is sealed and stored briefly prior to bacteriological analysis of the sample. The sample may be stored at room temperature if analyzed within 2 h, otherwise, it should be stored from 4 to to 10°C and analyzed within 6 h.

4.2.1 Sample analysis is conducted by either Test Methods F60 or Test Method F488 for bacterial content of the water.

5. Significance and Use

5.1 These test methods provide a field technique for the bacteriological analysis of electronic process waters. The sampling of these waters and subsequent bacteriological analysis may be critical to electronic product yields. Bacteria can be the prime source of harmful contamination which can significantly reduce the yield of satisfactory microelectronic device production.

5.2 The test methods described here may be used both to monitor the bacteriological quality of water used in microelectronic product processing, and to locate the source of bacterial contamination in a water purification system.

5.3 These test methods are simple field methods, combining sampling and bacteriological analysis techniques that do not require bacteriological laboratory facilities.

5.4 The test methods described employ culture techniques for bacteriological analysis. The user should be aware that such techniques cannot provide a complete count of the total viable bacteria present, since clumps and clusters of bacteria will appear as one single colony when cultured, and since some viable bacteria will not grow under the test conditions used. However, a meaningful comparative bacteria count will be achieved by this method if the culturing of the sample is always done at the same temperature, and for the same period of time. The temperature of incubation should always be at 28 ± 2°C, and the period of incubation should be 48 h (or 72 h if time
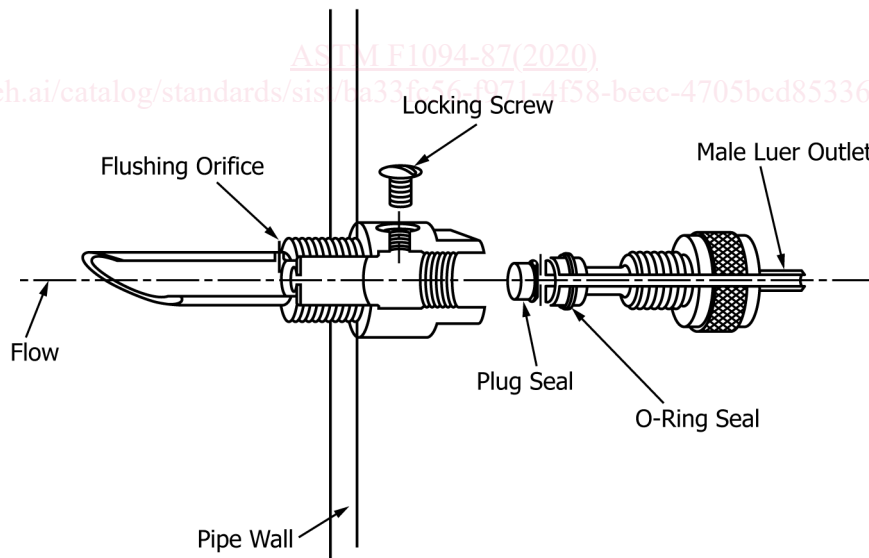
FIG. 1 Sampling Valve in Wall of Pressurized Line