

CytoQuant®

Instructions for the Testing of Surfaces

1. Scope

The instructions provided in this document are applicable for the testing of various surfaces within the food supply chain, especially those presenting a higher food safety risk. Depending on the surface type (regular or irregular), users may choose between a quantitative and a semiquantitative testing approach. Semi-quantitative testing is generally adequate for monitoring purposes.

Surfaces should not be visibly soiled, as samples tested with the CytoQuant® instrument are required to have low levels of contamination with particulate matter. Therefore, testing is most appropriate for the monitoring of sanitation (cleaning and disinfection).

2. Equipment and consumables

Supplied by Romer Labs:

- CytoQuant® flow cytometer (#10006469), including CytoQuant® CountCell™ (#10006471)
- CytoQuant® Swab Vial (#10006468)
- Sampling template (#10003780, #10003786) – for the quantitative testing of flat surfaces

3. General remarks

The microbiological testing of surfaces is especially challenging, as the uptake of microorganisms by swabs is uneven. Therefore, it is critical that sampling is carried out in a consistent manner and that swabbed areas are representative for the tested surfaces.

Adequate contact between the swab bud and the surface is required to guarantee effective loading of bacteria and other particles. In the case of irregular surfaces, the swabbed area should be large enough and it should include gaps and other potential harborage spots. Excessively wet surfaces (*i.e.*, having a continuous film of water) should be avoided.

When testing with the purpose of monitoring sanitation, sampling can be done both before and after disinfection. Traces of commonly used chemicals do not impact the accuracy of measurements.

The time between sampling and analysis should be as short as possible – preferably less than 8 *h*, but not longer than 12 *h*. Samples that are not tested within 45 minutes from sampling should be kept cooled (2-8 °C).

4. Procedure

Testing follows a simple workflow (see page 2) that involves sampling the surface of interest, by employing either a quantitative or a semiquantitative swabbing technique, and then directly analyzing the sample with the CytoQuant® flow cytometer.

Semiquantitative testing (all surface types)

Swab an approximate area, while making sure its size does not vary significantly throughout the monitoring period. For optimal result consistency, we suggest selecting an area size of 20 *cm* × 20 *cm* (8 *in* × 8 *in*).

Quantitative testing (regular surfaces)

Swab an area with a known size, preferably not larger than 10 *cm* × 10 *cm* (4 *in* × 4 *in*). If the surface is flat, use a sampling template.

5. Expression of results

Semiquantitative testing

Use the default result as displayed by the CytoQuant® instrument (*intact cells* or *particles* per *mL* of buffer).

Quantitative testing

Calculate *N*, the number of *intact cells* and/or *particles* per surface area unit (*cm*² or *in*²), using the formula below.

$$N = 3 \frac{n}{A}$$

where:

n – number of *intact cells* or *particles* per *mL* of buffer (default result as displayed by the instrument)

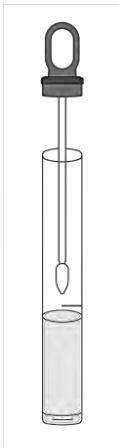
3 – *mL* buffer in CytoQuant® Swab Vial (3 *mL* ± 2%)

A – swabbed surface area size, expressed in surface area units (*cm*² or *in*²).

General Workflow

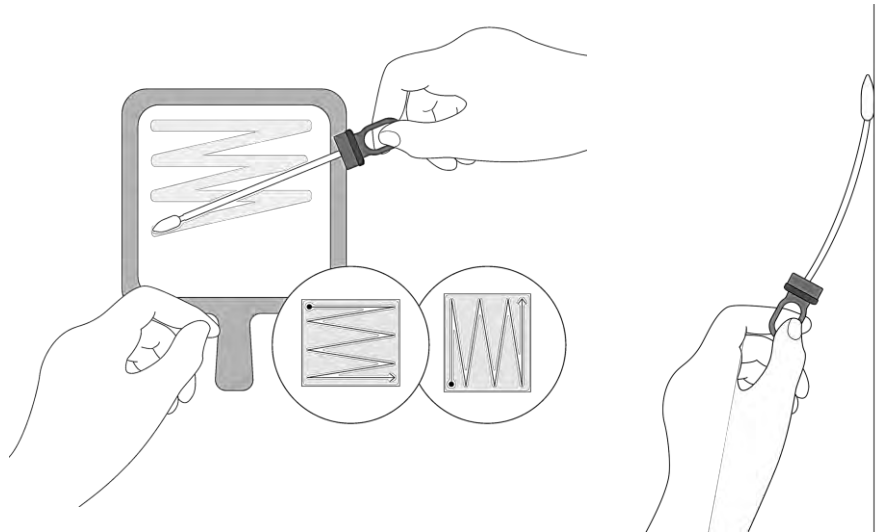
1

Open the vial by twisting the handle-cap counterclockwise, then draw the swab from the buffer. Touch the inner wall of the vial to drain off surplus liquid.



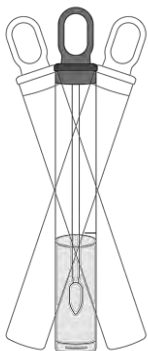
2

Swab the targeted surface meticulously. For quantitative tests, use a sampling template. **Swab in a crisscross pattern**, horizontally and vertically, **reversing the swab when changing direction**. While swabbing, make sure to **apply sufficient pressure so as to flex the swab stick**. Always hold the swab stick by the handle-cap.



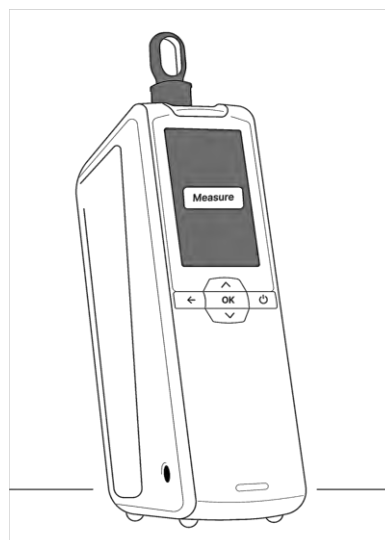
3

Return the swab stick into the vial, close the vial, and **mix the test portion well by shaking the vial horizontally**. Up and down movements will cause excessive aeration of the liquid.



4

Insert the vial into the CytoQuant® instrument and select the preferred measuring program.



CytoQuant®

Instructions for the Testing of Water

1. Scope

The testing protocol described within this document is applicable for the analysis of various types of process and environmental waters from the food supply chain.

Water samples that are adequate for testing with the CytoQuant® device have conductivity values ranging from 650 to 950 $\mu\text{S}/\text{cm}$ (at 25 °C). Samples outside the optimum range require adjustment, by either dilution with deionized (distilled) water or addition of CytoQuant® Electrolyte Solution. Most food and feed sector waters have conductivity values of up to 1600 $\mu\text{S}/\text{cm}$ (at 25 °C).

2. Equipment and consumables

Supplied by Romer Labs:

- CytoQuant® flow cytometer (#10006469), including CytoQuant® CountCell™ (#10006471)
- CytoQuant® Aqua Vial (#10007101)
- CytoQuant® Electrolyte Solution (#10007030) – for samples requiring upward conductivity adjustment

Not supplied:

- Deionized or distilled water – for samples requiring downward conductivity adjustment
- Graduated transfer pipettes, 3 mL, non-sterile
- Sample containers, non-sterile

As testing does not include incubation, sterility of diluents and materials is not crucial. However, overall background contamination should not be above the lower limit of determination to ensure the consistency of results. Deionized or distilled water will likely require filtration (pore size $\leq 0.4 \mu\text{m}$) prior to diluting the sample. Most non-sterile laboratory plasticware is practically free of microorganisms and other similar-size particles.

3. Sampling

General microbiological requirements and guidelines regarding sampling and the transportation and storage of samples, as set in international standards (e.g., ISO 19458), should be followed. The time between sampling and analysis should be as short as possible – ideally less than 8 h, but not longer than 12 h. Samples that are not tested within 45 minutes from sampling should be kept cooled (2-8 °C).

4. Procedure

Samples that do not require conductivity adjustment are tested directly, by simply dispensing 3 mL \pm 5% into a vial and running the short or long measuring program on the device (see CytoQuant® User Manual).

Samples beyond the measuring range for bacteria and/or particles require dilution with deionized water adjusted for conductivity.

Table 1. Conductivity adjustment chart for water samples with values higher than 950 $\mu\text{S}/\text{cm}$ (at 25 °C)

Sample Conductivity	$\mu\text{S}/\text{cm}$	1000	1100	1200	1300	1400	1500	1600
Sample : Deionized Water	parts	1 : 0.25	1 : 0.4	1 : 0.5	1 : 0.6	1 : 0.75	1 : 0.9	1 : 1

Table 2. Conductivity adjustment chart for water samples with values lower than 650 $\mu\text{S}/\text{cm}$ (at 25 °C)

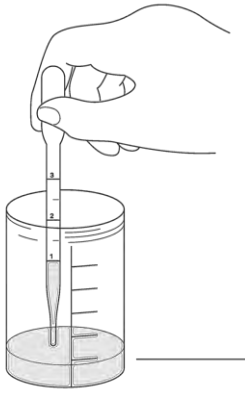
Sample Conductivity	$\mu\text{S}/\text{cm}$	0	100	200	300	400	500	600
CytoQuant® Electrolyte Solution*	drops	7	6	5	4	3	2	1
	μL	140	120	100	80	60	40	20

* Dosages are expressed for sample volumes of 3 mL \pm 5%

General Workflow

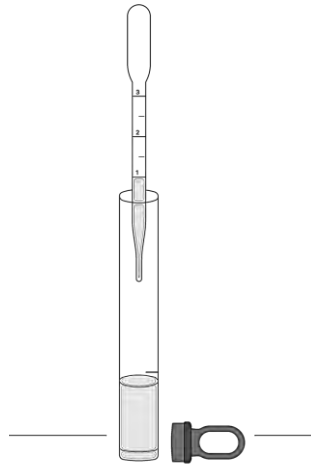
1

Mix the sample thoroughly and then draw 3 mL ± 5% with a pipette. **If the sample requires downward conductivity adjustment, predilute it with distilled or deionized water** by following the instructions in Table 1.



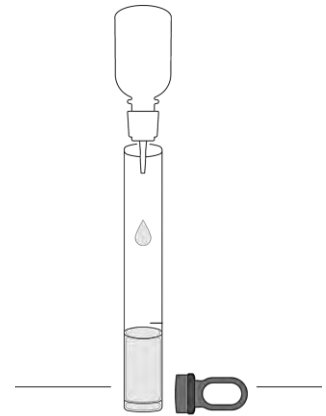
2

Transfer the sample into an unused CytoQuant® Aqua Vial.



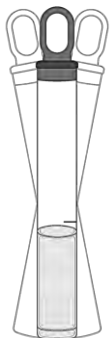
3

If the sample requires upward conductivity adjustment, add CytoQuant® Electrolyte Solution directly into the vial by following the dosage instructions in Table 2.



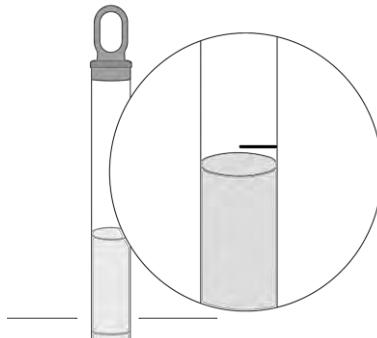
4

Mix the test portion well by shaking the vial horizontally. Up and down movements will cause excessive aeration of the liquid.



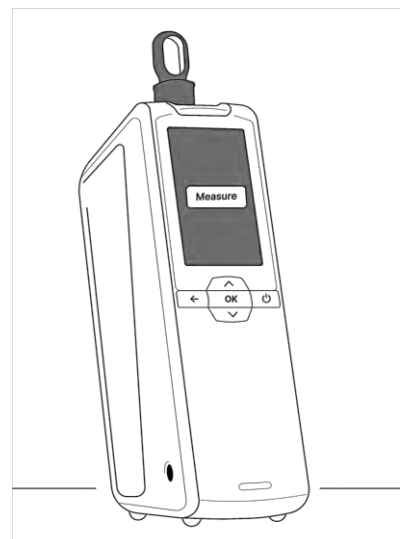
5

Make sure that the level of liquid in the vial is lower than the upper rim of the inner tube. Higher levels will hinder the correct flow of the liquid.



6

Insert the vial into the CytoQuant® device and select the preferred measuring program.





CytoQuant®

Mobile Flow Cytometer

CytoQuant® is an impedance flow cytometer that empowers risk-based decision-making and facilitates proactive intervention by delivering total viable counts in just 30 seconds, right on the production site.

Enhanced process control

CytoQuant® revolutionizes microbial monitoring by providing point-of-need, direct, real-time counts. Producers can monitor total contamination at critical control points with greater precision, efficiency, and higher resolution. This proactive approach allows for early identification of deviations from acceptable microbiological criteria, facilitating timely interventions to maintain process control and uphold safety and quality.

CytoQuant® enables comprehensive quality assurance. By ensuring that microbial counts remain within acceptable limits, companies can maintain the highest standards, thereby enhancing consumer trust.

Risk mitigation and regulatory compliance

Using CytoQuant® for on-site microbiological testing enables prompt risk mitigation. With direct, real-time counts, producers can implement targeted interventions to prevent contamination and minimize the risk of foodborne illnesses. This proactive approach safeguards consumer health and protects brand reputation.

Regulatory agencies emphasize the importance of monitoring microbial contamination in the production environment to ensure compliance with safety standards. By incorporating CytoQuant®, companies can demonstrate their commitment to food safety and regulatory compliance, minimizing the risk of non-compliance penalties and product recalls.

What is impedance flow cytometry?

Due to their intact outer layers, viable microbial cells suspended in an electrolyte solution have electrical properties that vary with the frequency of a passing current, causing subtle fluctuations in impedance. Impedance flow cytometry measures these fluctuations, directly counting all types of bacteria, regardless of their growth requirements or physiological state.



Features and Benefits

Fast total viable counts allow for focused and effective preoperational action

→ enhanced food safety

Direct microbial counting provides a high-resolution view into production hygiene

→ improved shelf-life, less food loss and food waste

Accurate microbiological results facilitate efficient risk mitigation

→ no false alarms, easier regulatory compliance

A handheld instrument and a straightforward method that requires minimal skill or training

→ ideal for on-site testing



CytoQuant®

Quick Reference

Carefully read the user manual before performing any test.

Protocol for surface testing

<p>1</p> <p>Unscrew the cap and take out the swab from the vial.</p>		<p>2</p> <p>Swab the surface to be tested in a crisscross pattern.</p>		<p>3</p> <p>Return the swab into the vial and screw it closed.</p>	
<p>4</p> <p>Shake to suspend bacteria and other particles in the buffer.</p>		<p>5</p> <p>Insert the swab vial into the device and select the measuring program.</p>		<p>6</p> <p>Read the results displayed on the screen after only 30 seconds.</p>	

For information on the testing of liquid samples, such as rinse waters, please consult „Instructions for the Testing of Water“.

Ordering Information

Item	Description	Item No.
CytoQuant® Flow Cytometer*	1 pc	10006469
CytoQuant® CountCell™	1 pc	10006471
CytoQuant® Swab Vial	72 pcs	10006468
CytoQuant® Aqua Vial	72 pcs	10007101
CytoQuant® Cleaning Vial	72 pcs	10007028
CytoQuant® Deep Cleaning Vial	8 pcs	10007081
CytoQuant® Electrolyte Solution	10 pcs	10007030
CytoQuant® Operational Qualification Kit	8 tests	10007195
CytoQuant® Case	1 pc	10007108

*(incl. CytoQuant® CountCell™)