Test Kit Instructions

QuenchGone21™ Wastewater Test Kit

Product # QG21W-50 / QG21Wb-25

At LuminUltra, we are committed to providing high quality test kits to anyone that needs fast and reliable results about the microbiological characteristics of any process! Visit www.luminultra.com to learn about all the exciting opportunities that our technology can bring to your application.

Whereas traditional microbiological tests require days for feedback and measure only a fraction of the microorganisms, **2nd Generation** Adenosine Triphosphate (ATP) test kits from LuminUltra measure total microorganisms and provide feedback in minutes!

In this test kit instruction guide, you will learn...

- Where this kit can be used;
- How 2nd Generation ATP technology works;
- How to handle and store components of this kit;
- How to perform tests;
- How to calculate and interpret results; and
- Where to find more information and how to contact us.

Choosing the Right Test Kit

QG21W Test Kit (QG21W-50C)

LuminUltra provides 6 core test kits for measuring total microbiological concentration via ATP, each tailored to specific applications:

- Quench-Gone™ Aqueous (**QGA™**):
  For low-solids water-based samples, such as drinking, cooling and oilfield waters.
- Quench-Gone Organic Modified (**QGO-M™**):
  For low-solids organic-based samples, such as fuel, oily brine, lubricants and latex polymers.
- Deposit & Surface Analysis (**DSA™**):
  For measuring deposits and surfaces, including corrosion products and slimes.
- QuenchGone21 Industrial (**QG21I™**):
  For high-solids process fluids, including paper process and other wash waters.
- QuenchGone21 Specialty (**QG21S™**):
  For chemical product testing, such as slurries, adhesives and other coatings.
- QuenchGone21 Wastewater (**QG21W™**):
  For wastewater and bioprocessing samples, whether influent, bioreactor or effluent.

All test kits are designed to be used with any photomultiplier-based luminometer. New users are advised to acquire the kit or kits of their choice to pair with the Field Kit & Luminometer Package (Product # **EQP-PAC**) when getting started with LuminUltra's 2nd Generation ATP test kits.

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Where Can I Use QG21W?

QG21W test kits provide a real-time measurement of the active biomass population, stress levels, and solids viability in any biological wastewater treatment process. By isolating the living population and eliminating all interferences, the operator can maximize efficiency and stability in treatment processes such as:

- ✓ Activated Sludge
- ✓ Lagoons
- ✓ Anaerobic Bioreactors
- ✓ UASB Bioreactors
- ✓ Membrane Bioreactors
- ✓ Digesters

QG21W test kits are also designed to assess living biomass population size and stress level in untreated, incoming wastewaters and process effluents. Supplementing bioreactor measurements with upstream and downstream measurements facilitates proactive notification of process upsets.

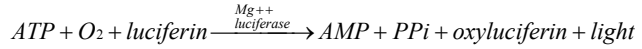
QG21W test kits can also be used in a variety of biological production processes (including biological fermentation for alcohol or ethanol production) and bioremediation processes such as those used to rehabilitate soil.

QG21W test kits are available in two formats. Choose the best format to suit your needs from the following descriptions:

- QG21W Standard (**QG21W-50**) provides the basic means to measure biomass concentration and health at <u>any process location</u> using the Total ATP (or **tATP™**: living plus dead biomass) and Dissolved ATP (or **dATP™**: dead biomass only) measurements. **QG21W-50** test kits include sufficient materials to test 50 samples.
- QG21W Bulking (**QG21Wb-25**) is designed specifically for measuring biomass concentration, health and bulking in <u>suspended growth aerobic bioreactors only</u> through the tATP, dATP, and Floc-Bulking ATP (or **fbATP™**) protocols. **QG21Wb-25** test kits include sufficient materials to test` 25 samples.

How Does QG21W Work?

QG21W test kits are based on the measurement of ATP. ATP is a direct and interference-free indicator of total living biomass. ATP is measured using the firefly luciferase assay, where a sample containing ATP is introduced to a solution containing the enzyme Luciferase, which naturally occurs in the tails of fireflies, to produce light. The light is detected in a **luminometer** as Relative Light Units (RLU).



$$ATP + O_2 + luciferin \xrightarrow[luciferase]{Mg^{++}} AMP + PPi + oxyluciferin + light$$

QG21W test kits use two parallel 1-minute analyses (tATP and dATP) on each sample to determine three valuable pieces of information:

- **Cellular ATP (cATP™)** – represents ATP from living microorganisms and therefore is a direct indication of the living population. This information greatly facilitates inventory management and process optimization.
- **Biomass Stress Index (BSI™)** – represents the stress level experienced by the microbiological population. This quantity is very useful in monitoring for toxicity in bioreactors and upstream processes.
- **Active Biomass Ratio (ABR™)** – represents the percentage of bioreactor solids that are active microorganisms. Maximizing the ABR provides many benefits such as enhanced sludge quality and improved settling. <u>Note that Total Suspended Solids (TSS) data are required to calculate ABR</u>.

The QG21W Bulking test kit also includes the novel fbATP measurement:

- **Specific Floc-Bulking ATP (s-fbATP™)** – represents the quantity of ATP from bulking floc relative to microorganisms. This measurement has been shown to provide early-warning of bulking conditions, allowing operators the ability to proactively mitigate bulking conditions in suspended growth aerobic bioreactors.

Using a QG21W test kits is as easy as 1-2-3…

1. Calibrate the luminometer;
2. Measure tATP and dATP (and fbATP, if applicable) on each sample;
3. Calculate cATP, BSI and ABR (and s-fbATP, if applicable) to assess true microbial control!

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Getting Started

LuminUltra's test kits contain all of the consumable materials required to run their specified number of tests (Defined by the last 2 or 3 digits of the product code). To use these test kits, LuminUltra recommends one of the following equipment bundles:

- Field Kit & Luminometer (**EQP-PAC**):
  Field Case, Micropipettors, Kikkoman Lumitester.
- Bench Materials & Luminometer (**EQP-BTM**):
  Micropipettors, Kikkoman Lumitester, Test Tube Racks.
- Kikkoman Lumitester™ C-110 (**EQP-LUK**):
  Kikkoman Lumitester luminometer & accessories.

Field Kit & Luminometer Package (EQP-PAC)

NOTE: *LuminUltra's test kits can be used with the majority of photomultiplier tube–based luminometers. Contact LuminUltra to confirm compatibility of your luminometer.*

LuminUltra is sensitive to the needs of each individual customer. Our expert staff can consult with you to determine the best means by which the data collected from our test kits can be integrated into your existing data management practices. We have multiple software platforms and can even assist you to integrate ATP data directly into existing control systems, process historians, and data archives.

Getting started with QG21W is easier with direct training. LuminUltra can supply you with on-site auditing and training services, web-based training, and one-on-one consultation to get your process improvement program off the ground. Contact us today to learn more!

Test Kit Contents and Storage

When you receive your QG21W test kit, utilize the following guidelines for material storage. Note that the quantity of each item listed below will depend on test kit size.

QG21W Test Kit Contents & Storage Conditions

Component (Part Number)	Store At	Shelf Life
Luminase™ ^{W} Dropper (**Lu(W)-8mL**) *Luciferase Enzyme Reagent, 8mL*	4°C*	4 mo*
UltraCheck™ 1 Dropper (**UC1-5mL**) *1 ng ATP/mL Standard, 5mL*	20°C	12 mo
QG21W Extraction Tubes (**UL30(21)-2mL-50R**) *UltraLyse™ 30^{21}, 2mL, 50/rack*	20°C	12 mo
QG21W Dilution Tubes (**ULuW-8mL-50R**) *UltraLute™/Resin, 8mL, 50/rack*	20°C	12 mo
QG21W LumiSolve™ Tubes (**LS-10mL-50R**) *LumiSolve, 10mL, 50/rack*	20°C	12 mo
UltraLyse 30^{21} Bottle ** (**UL30(21)-125mL**) *fbATP Extraction Reagent, 125mL*	20°C	12 mo
100 to 1000µL Blue Pipette Tips, 100/rack (**DIS-PT1-100R**) ***	20°C	-
1 to 5mL Natural Pipette Tips, 50/pk (**DIS-PT5-50**) ***	20°C	-
12x55mm Assay Tubes, 50/pk (**DIS-CT12-50**)	20°C	-
2" x 2" 250µm Mesh Squares, 25/pk ** (**DIS-MESH-25**)	20°C	-
120mL Specimen Containers, 25/pk ** (**DIS-CONT-25**)	20°C	-

* Luminase^{W} shelf life can be extended to 6 months when frozen, or can be left at room temperature for as long as 3 weeks during routine use. Note that the Luminase^{W} supplied in QG21W kits is NOT interchangeable with other forms of Luminase (i.e. Luminase, Luminase Lite, and Luminase^{XL}).

** Materials are included as part of QG21W Bulking (QG21Wb-25) test kit only.

*** Pipette tips supplied in complete test kits are compatible with most Fisherbrand and Eppendorf adjustable micropipettors.

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Preparing to Test

- New to 2nd Generation ATP technology? Before getting started, consult the training center at www.luminultra.com for video demonstrations, use guidelines, validation guidelines, and more!
- Be certain to allow **Luminase**[W] to reach ambient temperature prior to use!
    - For room temperature (15 to 25 °C) storage, no warming is required.
    - For refrigerator (2 to 8 °C) storage, let stand at ambient for at least 1 hour prior to testing.
    - For freezer (-10 to -20 °C) storage, let stand at ambient for at least 2 hours prior to testing.
    - **Luminase**[W] exposure to temperatures between 30 and 40 °C should be limited to 1-2 hours. Prolonged exposure will result in accelerated activity loss. Never expose to temperatures > 40°C.
    - For more information on **Luminase**[W] storage and handling, consult the **Luminase**[W] insert.
- If you are new to the use of micropipettors, consult the Micropipetting Fundamentals training materials on www.luminultra.com.
- Avoid analysis contamination by always using a new pipette tip for each pipetting step.
- Avoid usage of expired test kit components. Contact LuminUltra to replace expired components.
- Because ATP and bacteria are present on skin, do not to touch the surface of pipette tips.
- Ensure that all assay tubes are clean inside and outside. Do not mark on assay tubes as this may impact light detection by the luminometer.
- Microbiological characteristics of most samples will begin to change immediately upon collection. Analyze samples **within 2 hours of collection** whenever possible.
- If samples cannot be tested within 2 hours of collection, store refrigerated (2 to 8 °C) and test within 24 hours of collection. Ensure that samples are first allowed to reach ambient temperature prior to testing.
- For bioreactor samples, it is recommended that the same samples as those used for measuring MLSS or MLVSS are used for QG21W tests.
- Waste reagent can be discarded as general waste in most cases. Consult MSDS for more information. Obtain MSDS and other product documentation from www.luminultra.com.
- When testing influent samples for toxicity, it is recommended that raw samples be mixed 1:1 with bioreactor biomass and then the mixture tested using this test kit. Consult the QG21W training section at www.luminultra.com or contact us for more detailed instructions on this procedure.
- For all samples – including influent, effluent, bioreactor and return sludge samples – always measure tATP and dATP. When using the QG21Wb test kit, utilize fbATP measurements only on bioreactor samples to assess bulking conditions.

Diagnostics and Troubleshooting

- LuminUltra's test kits are the most robust and quantitative ATP test kits available. If you suspect you are encountering interferences in your application of these kits, first check to ensure you are using the correct kit type for your sample. If you are unsure or feel you have unique testing requirements, contact LuminUltra's support staff for assistance.
- When testing samples that yield low RLU values (i.e. $RLU_{tATP\ or\ dATP\ or\ fbATP} \leq 50$ when using a Kikkoman Lumitester C-100 or C-110), it is recommended that you account for background noise in the test procedure prior to the final calculations.
    - To assess background noise, simply follow the procedure without adding any of the ATP-containing sample into the analysis.

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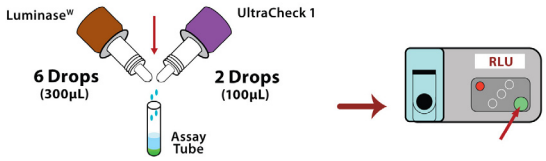
- Correct for background noise by subtracting the background RLU (RLU_{bg}) from the measured RLU ($RLU_{tATP\ or\ dATP\ or\ fbATP}$) prior to executing calculations.
- Typical RLU_{bg} when using a Kikkoman Lumitester C-100 or C-110 are ≤ 10. If high RLU_{bg} are consistently observed, repeat assays in an area out of direct sunlight or intense lighting. If problems still occur, contact LuminUltra for assistance.
- A single RLU_{bg} may be used for multiple analyses much like a single UltraCheck 1 RLU (RLU_{UC1}).

- If dropper bottles become plugged or you encounter difficulty dispensing drops, remove and discard the dropper tip and use a pipettor to measure and dispense the reagent.

Step 1 – UltraCheck 1 Calibration

The **UltraCheck 1** (**UC1**) Calibration converts luminometer RLU values into actual ATP concentrations. Perform one **UltraCheck 1** calibration per day or for each set of samples analyzed at the same time. Be sure that **Luminase^W** is allowed to reach ambient temperature prior to use.

PROCEDURE: Add 2 drops (100µL) of **UltraCheck 1** and 6 drops (300µL) of **Luminase^W** to a new 12x55mm test tube (the Assay Tube), swirl gently five times, immediately insert into the luminometer and measure. Record RLU_{UC1} for use in Step 5.



NOTE: If RLU_{UC1} ≤ 500 using a Kikkoman C-100 or C-110 LumiTester, obtain a new bottle of Luminase^W for maximum sensitivity.

NOTE: RLU_{UC1} will fall over time for the same batch of Luminase^W. This is because of decreased luciferase enzyme activity. When followed, the guideline above ensures that there is sufficient activity to meet the specified detection limit.

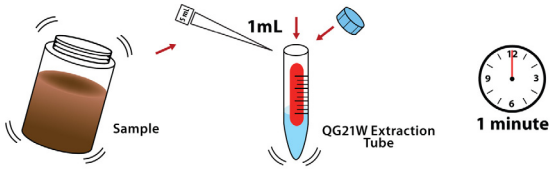
Step 2 – tATP Analysis

Included in QG21W and QG21Wb test kits.

The Total ATP (**tATP**) analysis measures ATP from both living and dead cells. Perform one tATP analysis on each sample you wish to test.

2.1 – EXTRACTION

Using a new wide-bore pipette tip, add 1mL of well-mixed sample to a **QG21W Extraction Tube**. Cap and invert three times to mix. Allow at least 1 minute for incubation.

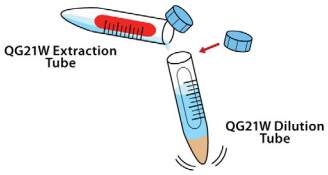


NOTE: At this point, the contents of the QG21W Extraction Tube can be capped and stored refrigerated between 2-8°C for up to 1 week prior to 2.2.

TIP: Wide-bore pipette tips are those that have sufficiently large openings to prevent tip plugging by sample particles. In general, standard 1-5mL and wide-mouth 100-1000µL pipette tips are sufficient for most samples. If required, increase the bore size of a tip using a clean pair of scissors.

2.2 – DILUTION

Pour the **QG21W Extraction Tube** contents into a **QG21W Dilution Tube**. Transfer the mixture back and forth between the two tubes several times for best mixing accuracy. Cap and invert three times to mix. Allow beads to settle.



NOTE: At this point, the contents of the QG21W Dilution Tube are stable at room temperature for up to 4 hours.

TIP: If beads do not settle or settle slowly, tap the QG21W Dilution Tube gently to assist settling.

TIP: If the QG21W Extraction Tube cannot be poured into the QG21W Dilution Tube, simply pour the QG21W Dilution Tube contents into the QG21W Extraction Tube to liquefy its contents.

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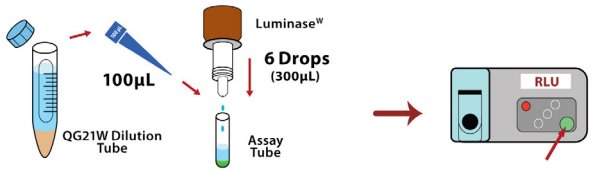
2.3 – ASSAY

Using a new pipette tip, add 100µL of the **QG21W Dilution Tube** contents and 6 drops (300µL) of **Luminase^{W}** to a new 12x55mm test tube (the Assay Tube), swirl gently five times, immediately insert into the luminometer and measure. Read and record RLU_{tATP} for use in Step 5.



NOTE: If RLU_{tATP} ≤ 10 on a Kikkoman Lumitester C-100 or C-110, you are below the low–detection limit. Report tATP (ng ATP/mL) = 0 in Step 5.

NOTE: When RLU_{tATP} ≤ 50 on a Kikkoman Lumitester C-100 or C-110, it is recommended that you measure and subtract RLU_{bg} from your measurement. See Diagnostics and Troubleshooting.

TIP: If "Scale Over" is returned, repeat the tATP analysis using 100µL of sample in 2.1 (EXTRACTION) and modify the dilution factor in Step 5 as noted.

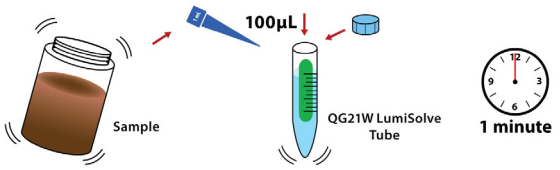
Step 3 – dATP Analysis

Included in QG21W and QG21Wb test kits.

The Dissolved ATP (**dATP**) analysis measures ATP from only dead cells. Perform one dATP analysis on each sample you wish to test.

3.1 – DILUTION

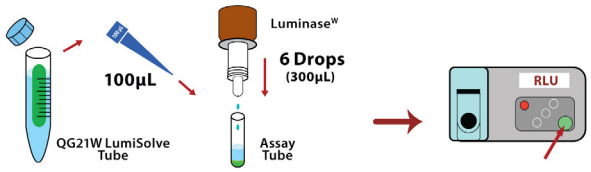
Using a new pipette tip, add 100µL of well-mixed sample to a **QG21W LumiSolve Tube**. Cap and invert three times to mix. Allow at least 1 minute for incubation.



NOTE: At this point, the QG21W LumiSolve Tube can be capped and stored between 2 to 8°C for up to 1 week prior to Part 3.2.

3.2 – ASSAY

Using a new pipette tip, add 100µL of the **QG21W LumiSolve Tube** contents and 6 drops (300µL) of **Luminase^{W}** to a new 12x55mm test tube (the Assay Tube), swirl gently five times, immediately insert into the luminometer and measure. Read and record RLU_{dATP} for use in Step 5.



NOTE: If RLU_{dATP} ≤ 10 on a Kikkoman Lumitester C-100 or C-110, you are below the low–detection limit. Report dATP (ng ATP/mL) = 0 in Step 5.
NOTE: When RLU_{dATP} ≤ 50 on a Kikkoman Lumitester C-100 or C-110, it is recommended that you measure and subtract RLU_{bg} from your measurement. See Diagnostics and Troubleshooting.

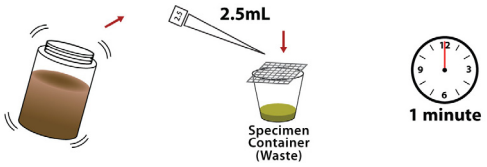
Step 4 – fbATP Analysis

Included in QG21Wb test kit only.

The Floc-Bulking ATP (**fbATP**) analysis measures only ATP from bulking floc. Perform fbATP measurements only on suspended growth aerobic bioreactor samples (e.g. Mixed Liquor).

4.1 – FILTRATION

Place an unused piece of 2" x 2" 250µm mesh over the mouth of an unused specimen container. Using a new wide-bore pipette tip, slowly and carefully pipette 2.5mL of well-mixed sample onto the top of the mesh and allow the filtrate to be collected in the specimen container. Allow 1 minute for filtration to occur.



TIP: Because your hands and surroundings can contain ATP, use care to touch only the corners of the mesh piece with your hands. For maximum care, use laboratory gloves or clean forceps to transfer the mesh piece.

TIP: The filtrate and used specimen container may be disposed following this step.

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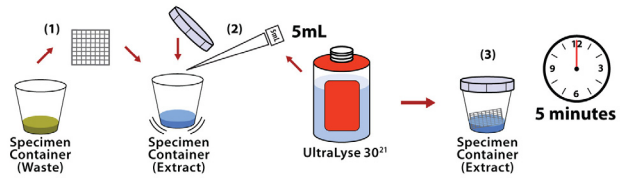
TIP: Wide-bore pipette tips are those that have sufficiently large openings to prevent tip plugging by sample particles. In general, standard 1-5mL and wide-mouth 100-1000µL pipette tips are sufficient for most samples. If required, increase the bore size of a tip using a clean pair of scissors.

4.2 – EXTRACTION

Carefully transfer the 2" x 2" 250µm mesh used in 4.1 into a second new, unused specimen container. Using a new pipette tip, add 5mL of **UltraLyse 30[21]** to the container. Cap and mix the container thoroughly to ensure complete contact between **UltraLyse 30[21]** and the mesh piece. Allow at least 5 minutes of incubation.

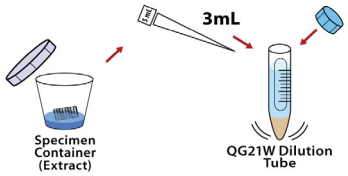


NOTE: fbATP Extracts can be capped and stored refrigerated between 2 to 8°C for up to 1 week prior to dilution.

TIP: If the mesh piece sticks to the walls of the specimen container, simply place the container on its side during the incubation period with the mesh immersed in UltraLyse 30[21].

4.3 – DILUTION

Using a new pipette tip, transfer 3mL of the contents from the specimen container into a **QG21W Dilution Tube**. Cap and invert three times to mix. Allow beads to settle.

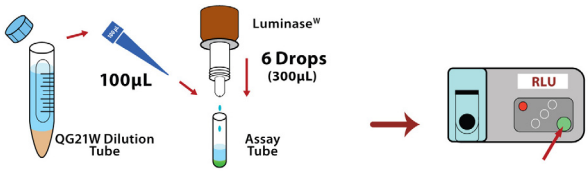


NOTE: At this point, the contents of the QG21W Dilution Tube are stable at room temperature for up to 4 hours.

TIP: If beads do not settle or settle slowly, tap the QG21W Dilution Tube gently to assist settling.

4.4 – ASSAY

Using a new pipette tip, add 100µL of the **QG21W Dilution Tube** contents and 6 drops (300µL) of **Luminase[W]** to a new 12x55mm test tube (the Assay Tube), swirl gently five times, immediately insert into the luminometer and measure. Read and record RLU_{fbATP} for use in Step 5.



NOTE: If $RLU_{fbATP} \leq 10$ on a Kikkoman Lumitester C-100 or C-110, you are below the low–detection limit. Report fbATP (ng ATP/mL) = 0 in Step 5.

NOTE: When $RLU_{fbATP} \leq 50$ on a Kikkoman Lumitester C-100 or C-110, it is recommended that you measure and subtract RLU_{bg} from your measurement. See Diagnostics and Troubleshooting.

TIP: If "Scale Over" is returned, repeat the fbATP analysis using 250µL of sample in 4.1 (FILTRATION) and modify the dilution factor in Step 5 as described.

Step 5 – Intermediate Calculations

Following completion of ATP assays, RLU values must be converted to ATP concentrations using the following calculations. For easy calculations, use **LumiCapture™** software, which can be obtained at www.luminultra.com. For manual calculations, see below. Calculate each value for each sample tested before proceeding to the final calculations.

1. Total ATP (**tATP**) – measures all ATP within a sample, including ATP from living cells in addition to ATP that has been released from dead cells.

   NOTE: If 100µL of sample was used in the tATP analysis, replace the dilution factor "11" with "101".

$$tATP\,(ng\ ATP/mL) = \frac{RLU_{tATP}}{RLU_{UC1}} \times 11\,(ng\ ATP/mL)$$

   NOTE: When applicable, subtract RLU_{bg} from RLU_{tATP} prior to executing the above calculation.

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2. Dissolved ATP (**dATP**) – represents ATP within a sample that has been released from dead cells.

$$dATP\ (ng\ ATP/mL) = \frac{RLU_{dATP}}{RLU_{UC1}} \times 101\ (ng\ ATP/mL)$$

NOTE: When applicable, subtract RLU_{bg} from RLU_{dATP} prior to executing the above calculation.

3. Floc-Bulking ATP (**fbATP**) – measures ATP associated with bulking floc in suspended growth aerobic bioreactor samples.

NOTE: If 250µL of sample was used in the fbATP analysis, replace the dilution factor "7.3" with "73".

$$fbATP\ (ng\ ATP/mL) = \frac{RLU_{fbATP}}{RLU_{UC1}} \times 7.3\ (ng\ ATP/mL)$$

NOTE: When applicable, subtract RLU_{bg} from RLU_{fbATP} prior to executing the above calculation.

Use these results to perform the final calculations shown in the next section.

Final Calculations

For monitoring basic biomass concentration and health at any process location, the following 3 parameters are used. For easy calculations, use **LumiCapture** software, which can be obtained at www.luminultra.com. For manual calculations, see below.

NOTE: If the results of Step 5 show for a given sample that dATP (ng/mL) > tATP (ng/mL), bypass these calculations and report cATP = 0, BSI = 100%, and ABR = 0%.

1. Cellular ATP (**cATP**) – represents the amount of ATP contained within living cells and is a direct indication of total living biomass quantity.

$$cATP\ (ng\ ATP/mL) = tATP\ (ng\ ATP/mL) - dATP\ (ng\ ATP/mL)$$

2. Biomass Stress Index (**BSI**) – provides a measure of the stress level (quality) of the microbiological community.

$$BSI\ (\%) = \frac{dATP\ (ng\ ATP/mL)}{tATP\ (ng\ ATP/mL)} \times 100\%$$

3. Active Biomass Ratio (**ABR**) – represents the percentage of total suspended solids that are living microorganisms.

NOTE: Calculate only if TSS data is available.

$$ABR\ (\%) = \frac{cATP\ (ng\ ATP/mL) \times 0.5}{TSS\ (mg/L)} \times 100\%$$

4. When the fbATP analysis is also performed, utilize the following calculation to obtain the s-fbATP control parameter.

Specific fbATP (**s-fbATP**) – provides the relative quantity of bulking floc to total floc. As this number increases, the risk of bulking conditions increases.

NOTE: If the results of Step 5 show for a given sample that fbATP (ng/mL) > tATP (ng/mL), bypass these calculations and report s-fbATP = 100%.

$$s-fbATP\ (\%) = \frac{fbATP\ (ng\ ATP/mL)}{tATP\ (ng\ ATP/mL)} \times 100\%$$

Interpretation Guidelines

Once cATP, BSI, and (if available) ABR are calculated, true microbial control can be evaluated. ATP-based measurements are extremely sensitive to differences in microbial quantity and quality. In general, microorganisms are in their best condition when **cATP is maintained**, **BSI is minimized**, and **ABR is maximized**.

QG21W test kits can be used to audit microbial quantity and quality to reveal differences at different process locations — for example, monitoring mixing efficiency or toxicity. For process control, daily monitoring using QG21W test kits will give you true microbial quantity and quality parameters to trend over time against process characteristics and performance.

When utilizing QG21W test kits it is important to remember that every process is different. During audits, relative comparisons from point to point are a reliable means to assess your process, while for daily monitoring it is important to establish a baseline trend before making adjustments. To get started, LuminUltra provides the following guidelines:

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QG21W Interpretation Guidelines

Location	Parameter	Good Control	Preventive Action Required	Corrective Action Required
Influent	BSI	< 50	50 to 75	> 75
Bioreactors	cATP	* Process Specific		
	BSI	< 30	30 to 50	> 50
	ABR	> 25	10 to 25	< 10
Activated Sludge	s-fbATP	< 30	30 to 50	> 50
Effluent	cATP	< 50	50 to 250	> 250

* The magnitude of cATP will depend on bioreactor configuration. In general, deviation from typical values by +/- 25% to 50% should be considered a preventative guideline and +/- 50% or greater should be considered corrective.

NOTE: These interpretation guidelines are designed for generic risk management guidance **only**. Users are encouraged to establish their own control ranges on which to base process decisions. LuminUltra and its affiliates do not accept any liability for any decision or assessment taken or made as a consequence of using this test kit.

You can find examples of how QG21W products have been used to solve problems for various customers at www.luminultra.com!

Ordering Information

- New to 2nd generation ATP technology? Start by ordering the Field Kit & Luminometer Package (Product # **EQP-PAC**) and the test kit(s) of your choice.
- When reordering materials for testing, it is preferred to order complete kits. QG21W is available in four formats:

Description	Part #
QG21W Standard, 50 Tests, Complete *	QG21W-50C
QG21W Standard, 50 Tests, Reagents Only	QG21W-50
QG21W Bulking, 50 Tests, Complete *	QG21Wb-50C
QG21W Bulking, 50 Tests, Reagents Only	QG21Wb-50

* Complete kits include LuminUltra-manufactured reagents plus all consumables (tips, tubes, filters, syringes) required to run analysis. If you supply your own consumables, reagent only kits are available.

- To obtain pricing information, inquire about other products and services, or to place an order, contact LuminUltra or your authorized representative.

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sales@luminultra.com

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- Major credit cards (Visa, MasterCard, AMEX) are accepted. Contact LuminUltra by phone to place credit card orders.
- Orders generally ship within 3 business days. You will receive order confirmation via Fax or Email.

Lumitester is a trademark of Kikkoman Corporation, all other trademarks are the property of LuminUltra Technologies Ltd

Quick-Reference Guide

QuenchGone21™ Wastewater Test Kit

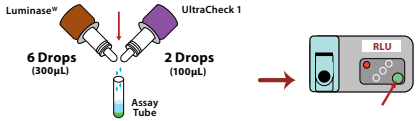
Product # : QG21W-50 / QG21Wb-25

NOTE: Please refer to Test Kit Instructions during first product use and for additional details including legal statements.

Certified System ISO 9001

Step 1 – UltraCheck™ 1 Calibration

Perform one UltraCheck 1 calibration per day or per each set of samples analyzed.



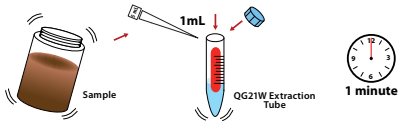
NOTE: If $RLU_{UC1} \leq 500$ using a Kikkoman Lumitester™ C-100 or C-110, obtain a new bottle of Luminase™.

Step 2 – tATP™ Analysis (1 per sample)

Included in QG21W™ and QG21Wb test kits

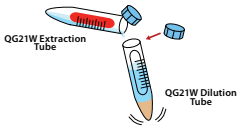
2.1 – EXTRACTION

Add sample to extract ATP.



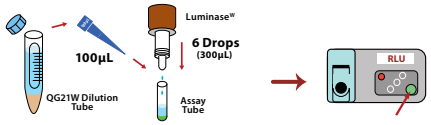
2.2 – DILUTION

Dilute out interferences.



2.3 – ASSAY

Measure ATP concentration.



NOTE: If $RLU_{tATP} \leq 10$ on a Kikkoman Lumitester C-100 or C-110, you are below the low–detection limit.

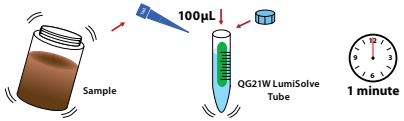
$$tATP\ (ng\ ATP/mL) = \frac{RLU_{tATP}}{RLU_{UC1}} \times 11\ (ng\ ATP/mL)$$

Step 3 – dATP™ Analysis (1 per sample)

Included in QG21W and QG21Wb test kits

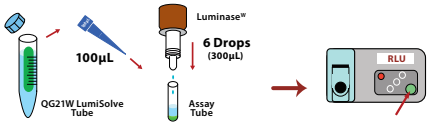
3.1 – DILUTION

Add sample to recover ATP.



3.2 – ASSAY

Measure ATP concentration.



NOTE: If $RLU_{dATP} \leq 10$ on a Kikkoman Lumitester C-100 or C-110, you are below the low–detection limit.

$$dATP\ (ng\ ATP/mL) = \frac{RLU_{dATP}}{RLU_{UC1}} \times 101\ (ng\ ATP/mL)$$

Step 4 – fbATP™ Analysis (1 per sample)

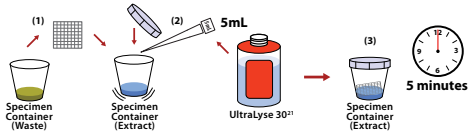
Included in QG21Wb test kit only

4.1 – FILTRATION

Filter sample to seperate bulking floc.

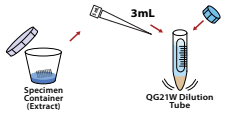
4.2 – EXTRACTION

Extract ATP from mesh.



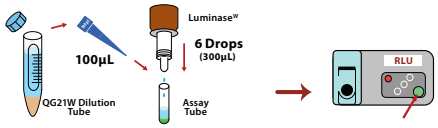
4.3 – DILUTION

Dilute out interferences.



4.4 – ASSAY

Measure ATP concentration.



NOTE: If $RLU_{fbATP} \leq 10$ on a Kikkoman Lumitester C-100 or C-110, you are below the low–detection limit.

$$fbATP\ (ng\ ATP/mL) = \frac{RLU_{fbATP}}{RLU_{UC1}} \times 7.3\ (ng\ ATP/mL)$$

Final Calculations

NOTE: If the results show for a given sample that dATP (ng/mL) > tATP (ng/mL), report cATP™ = 0, BSI™ = 100%, and ABR™ = 0%.

$$cATP\ (ng/mL) = tATP\ (ng\ ATP/mL) - dATP\ (ng\ ATP/mL)$$

$$BSI\ (\%) = \frac{dATP\ (ng\ ATP/mL)}{tATP\ (ng\ ATP/mL)} \times 100\%$$

$$ABR\ (\%) = \frac{cATP\ (ng\ ATP/mL) \times 0.5}{TSS\ (mg/L)} \times 100\%$$

NOTE: Calculate only if TSS data is available.

$$s-fbATP\ (\%) = \frac{fbATP\ (ng\ ATP/mL)}{tATP\ (ng\ ATP/mL)} \times 100\%$$

NOTE: If the results show for a given sample that fbATP (ng/mL) > tATP (ng/mL), report s-fbATP™ = 100%.

Interpretation Guidelines

Location	Parameter	Good Control	Preventative Action Required	Corrective Action Required
Influent	BSI	< 50	50 to 75	> 75
Bioreactors	cATP	* Process Specific		
	BSI	< 30	30 to 50	> 50
	ABR	> 25	10 to 25	< 10
Activated Sludge	s-fbATP	< 30	30 to 50	> 50
Effluent	cATP	< 50	50 to 250	> 250

* The magnitude of cATP will depend on bioreactor configuration. In general, deviation from typical values by +/- 25% to 50% should be considered a preventative guideline and +/- 50% or greater should be considered corrective.

NOTE: Interpretation Guidelines are provided for general guidance. For best results, establish your own baseline and control levels.

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