

Virus Counter[®] Plus Platform

An Automated, Benchtop
System for Rapid and
Direct Virus Quantification



Product Information

The Virus Counter[®] Platform is an advanced analytical tool combining the Virus Counter system, dedicated software, and Virotag[®] reagents for fast, precise virus quantification. Using flow virometry, it delivers near real-time virus counts and supports virus-based applications like vaccine and gene therapy production. Users can efficiently set up and validate both upstream and downstream processes. The Virus Counter[®] Plus platform is optimized for all enveloped viruses, including baculoviruses, lentiviruses, and influenza A and B, with ongoing expansion to additional viruses.

Features and Benefits

- Rapid results (available in hours rather than days)
- Walk-away automation
- High precision due to direct measurement of virus
- Integrated data analysis
- No need for standard or references

Introduction

Relevant Applications

- **Vaccines:** Traditional vaccines (e.g., Influenza) and newer viral vector-based vaccines
- **Protein-Based Therapeutics:** Baculovirus-based protein expression systems
- **Gene Therapy:** Enveloped viral vectors
- **Cell Therapy:** Viral vectors for gene-modified cell therapies (e.g., Lentiviruses)
- **Recombinant Proteins:** Monoclonal antibodies (mAbs) produced in mammalian cells using enveloped viral vectors such as lentiviruses or retroviruses

Relevant Process Steps

- **Upstream Process Development and Manufacturing:** Real-time insights into virus titer in the bioreactor to determine optimal growth conditions and harvesting times, track titer in near real-time to make critical decisions sooner
- **Downstream Process Development:** Optimize conditions from lysis and formulation, track titer to ensure high yield and quality

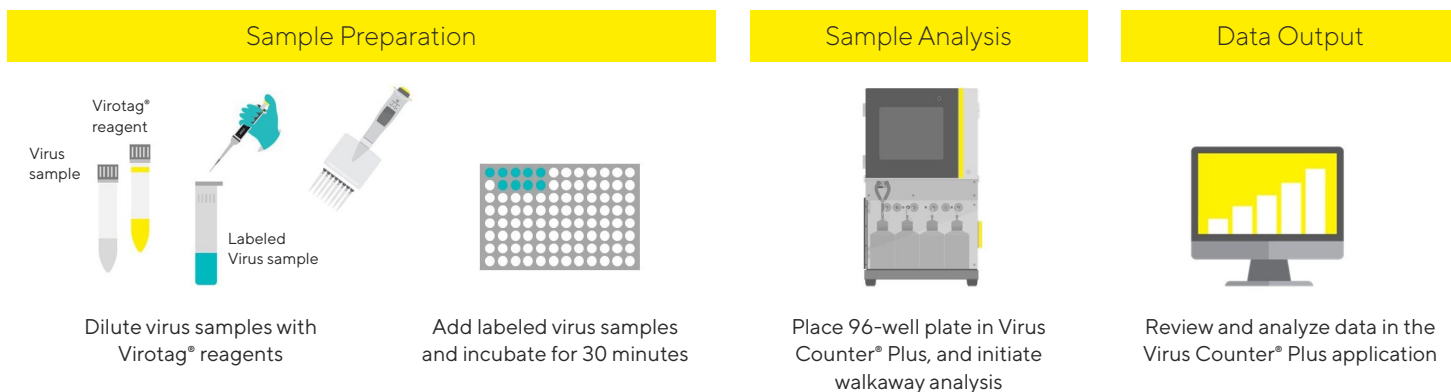
How Does The Virus Counter® Plus Platform Work?

Viruses are first labeled with specific Virotag® reagents, either using a direct fluorescent dye approach or high-affinity monoclonal antibodies labeled with fluorescent dye. The samples are then subject to precise and intense laser illumination, and light is collected by specific detectors. This approach allows rapid, direct, and specific quantification of total virus particles in a sample. The sample preparation and workflow is shown in Figure 1.

System Operation

The Virus Counter® Plus platform operates under software guidance, leveraging advanced algorithms to automate and simplify the quantification process. This software directs users through each step, ensuring consistent and accurate measurements. By standardizing the procedure across different users and labs, this approach reduces human error and improves reproducibility. Consequently, the software-driven operation of the Virus Counter® Plus enhances efficiency, reliability, and usability in virus quantification. Additionally, the software automates fluid handling for sample processing and inter-sample washing, enabling a fully hands-free workflow.

Figure 1: Virus Counter® Plus Sample Preparation and Workflow



Reagents

Virotag® reagent kits are tailored for use with the Virus Counter® Plus platform, enabling accurate virus detection and quantification. Each kit includes all necessary reagents and consumables for operation. Depending on the kit, they provide either fluorescently labeled antibodies or fluorogenic dyes to stain the viral genome (RNA or DNA) and envelope proteins. Two consumables verify instrument performance, while three washing solutions minimize sample crossover. Using the correct consumables for maintenance and washing steps is essential for optimal performance. All consumables are color-coded for easy identification.

Fluidics

Accurate quantification requires that the virus sample stream passes through a laser interrogation point and that the particles traverse that point temporally separated. Differential flow rates of the sheath and sample lead to accelerated laminar flow as the core stream passes in front of the laser spot and collection lens. This hydrodynamic focusing of the sample stream ensures that sample particles travel through the interrogation point at the peak of laser intensity. The instrument is designed to measure particles from approximately 20 nanometers (nm) up to several micrometers (μm).

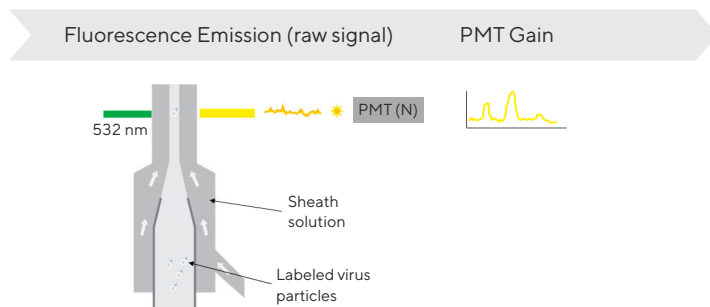
Optics

As the laser illuminates the narrow sample stream within the flow cell, fluorescence is collected from stained particles as they pass through the detection point. The emissions are detected and split into dual channels, with filters further isolating each channel's fluorescence.

Virus Signal Detection

Signals collected are processed in real-time to convert the observed fluorescence emission into a quantitative measure of virus particles per ml (vp/mL). During analysis with the Virotag® DY ENV reagents, stained particles pass through the flow cell of the Virus Counter® Plus instrument where they are excited by a laser. The dyes emit at two distinct wavelengths as they pass through the light, and these signals are detected using separate photomultiplier tubes (PMTs) (Figure 2). Only instances where signals from both dyes are detected by both PMTs simultaneously are quantified as virus particles. Virotag® AB (antibody-based) results represent fluorescence emission from a fluorochrome-conjugated antibody reagent in one channel. Instrument quantification limits are 5×10^5 to 1×10^9 vp/mL.

Figure 2: Fluorescence Emission



Data Analysis

Experimental data is automatically collected and stored within a database management system (SQL server) installed on the Virus Counter® Plus laptop. This data can be viewed and analyzed using the Virus Counter® Plus Software data analysis feature. Alternatively, data can be exported as a .csv file and viewed using third-party data analysis packages.

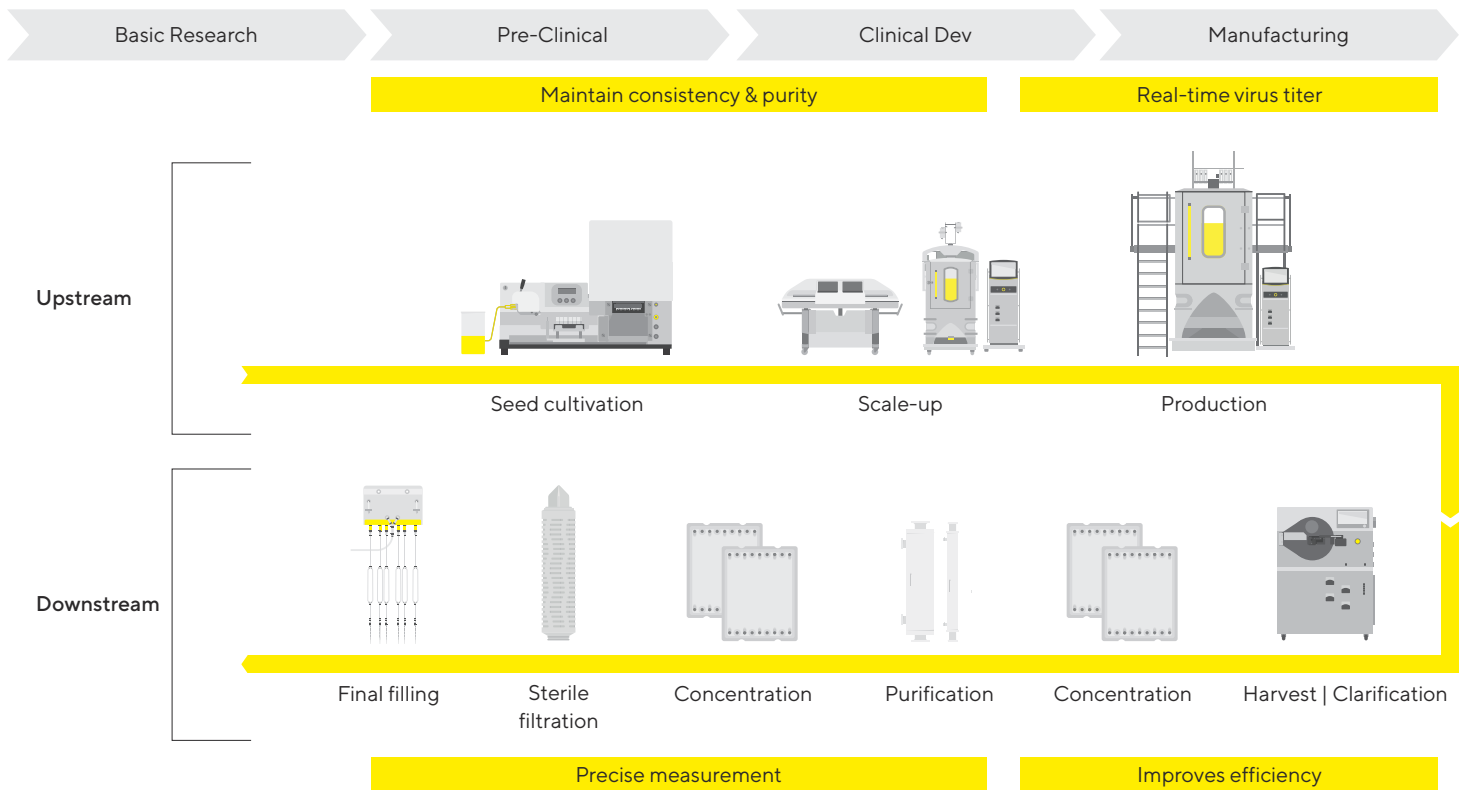


Learn more

[Experience the Virus Counter® Plus in 3D](#)

Figure 3 shows an example of how the Virus Counter® Plus Platform might be applied to different unit operations in a viral vector production process.

Figure 3: Process Steps Using the Virus Counter® Plus



Technical Specifications

Attribute	Virus Counter® Plus
Dimensions (W x D x H) [inches mm]	32.15 x 17.44 x 28.67 815.7 x 443 x 728.3
Weight [lbs kg]	~140 (fully loaded) ~63.5 (fully loaded)
Conventional laboratory rooms, max. height above sea level	2,000
Pollution level according to IEC 61010-1	2
Temperature [°C °F] <ul style="list-style-type: none">▪ During operation▪ For transport and storage	<ul style="list-style-type: none">▪ +10 - +35 +50 - +90▪ +5 - +40 +41 - +104
Relative humidity [%] <ul style="list-style-type: none">▪ At temperatures up to 35 °C, non-condensing	<ul style="list-style-type: none">▪ Max 80
Not for use in potentially explosive atmospheres	
Surface	Vibration-free environment on a flat surface
Overvoltage category	II
Protective class according to IEC 61140	I
Voltage [V _{AC}]	100 - 240 (±10%)
Frequency [Hz]	50 60
Power consumption [VA]	600
Protection class according to EN 60529	IP21
Warm up time after starting	Not necessary. The device is constantly powering thermal control boards when power is supplied.



Ordering Information

Description	Order Number
Virus Counter® Plus Instrument	VIR-92394

Peripherals and Accessories

Product Name	Description	Quantity	Order Number
Virotag® VSVG	Lentivirus (VSV-G pseudo-typed)	200 samples per kit	VIR-K2400
Virotag® BCVB	Budded Baculovirus	200 samples per kit	VIR-K2000
Virotag® INVA	Influenza A Viruses (H1 and H3 subtype)	200 samples per kit	VIR-K2200
Virotag® INVB	Influenza B viruses	200 samples per kit	VIR-K2300
Virotag® DY ENV	Universal stain for enveloped viruses	200 samples per kit	VIR-K1000

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