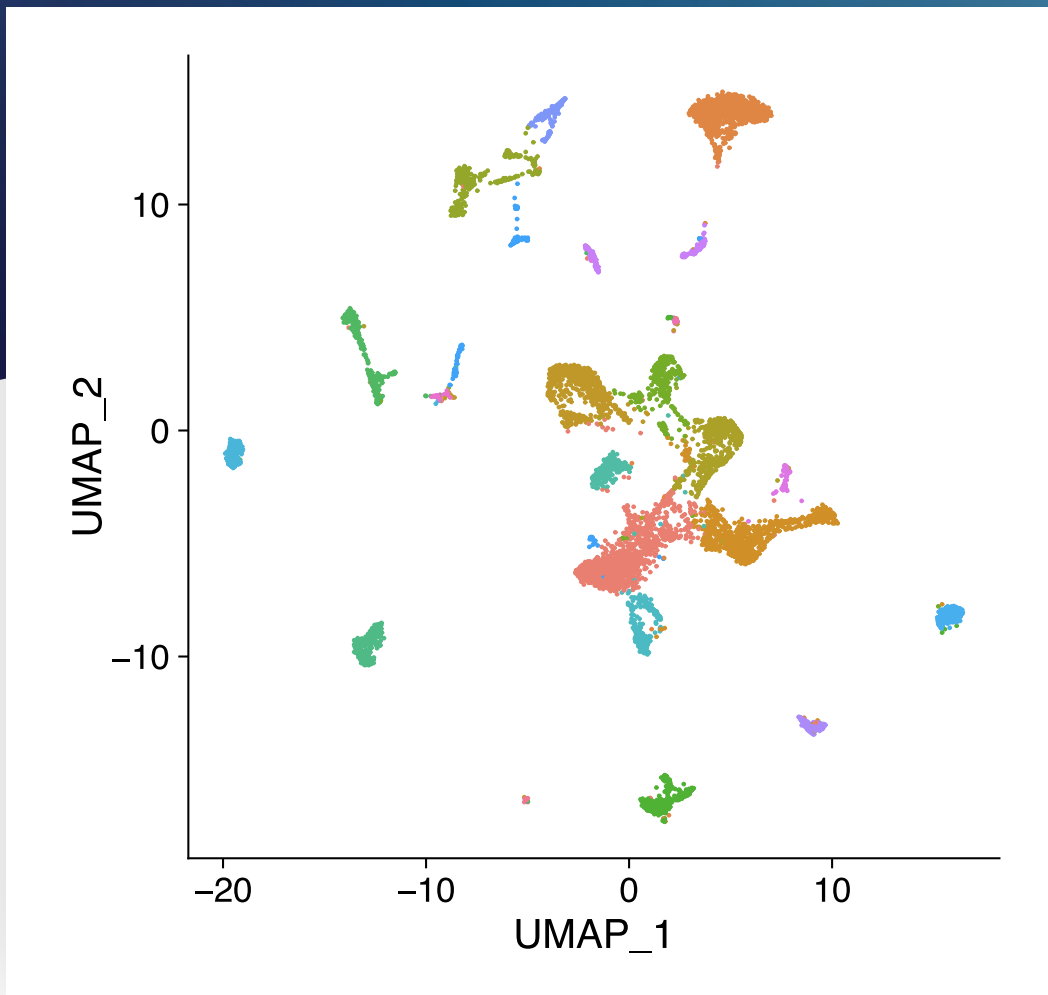




S2 Genomics
From Samples to Genomics

The Singulator™ Platform

Automated Tissue Dissociation Systems



Set... Select... Isolate



The Singulator™ Platform

Automated Sample Preparation for Single-Cell Genomics

The Singulator™ Platform automates tissue dissociation for single-cell genomics applications, including scRNA-seq, scATAC-seq, scDNA-seq and scMultiomics. The platform includes the benchtop Singulator instrument, single-use consumables, and predesigned and installed protocols optimized for different tissues and applications. The Singulator Platform enables scientists to generate reproducible and precise single cell results across experiments and users from as little as 2 mg of tissue.

Product Features:

- Designed for use with single-cell genomics applications.
- Simple and easy to use instrument significantly reduces manual steps and chances for mistakes.
- Reproducible and precise results through automation and protocol standardization.
- Fast operation times which reduce the stress on tissues and enable batch processing.
- Temperature control ensures the tissues, cells and nuclei are incubated at the optimal temperature for each preparation.
- Extremely low inputs requirement (2 mg of tissue) enables the utilization of more samples for single-cell genomics applications.

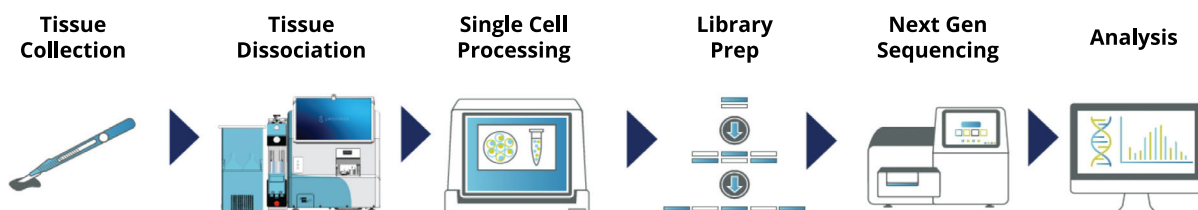
Inside the Singulator

The Singulator Platform works by dissociating solid tissue into single-cells by mechanical disruption and enzymatic digestion, or into single-nuclei by mechanical disruption and chemical lysis, followed by passage through one or two filters to remove large debris within a single-use cartridge.

Next, the suspension is removed from the cartridge, and assessed for downstream applications. If there are significant amounts of small debris, we recommend using our Nuclei Debris Removal Reagent prior to loading on the single-cell application of your choice.

A Workflow That Works for You

As part of an integrated workflow, the Singulator Platform will give you higher yields of high viability cells and nuclei resulting in better downstream results. Turn tissue into single-cells or nuclei in minutes.





Intuitive Software Featuring Customizable Protocols

The Singulator 100, 200 and 200+ come with predefined and validated protocols designed to process most solid tissues into single-cell or single-nuclei suspensions using single-use consumables from S2 Genomics. The protocols can be edited and saved to optimize specific parameters, including reagent source, buffer volumes, incubation time, incubation temperature, mixing type, mixing speed, disruption type and disruption speed. On screen instructions guide the user through setting up the run.

The screenshot shows the Singulator 100 software interface. At the top left is the Singulator logo and a keyboard icon. The title 'singulator 100' is displayed in the top center. On the top right, there is a temperature control slider set to 'off' between 'Cool' and 'Heat' labels. Below the title, the protocol name 'Protocol: Standard Nuclei Isolation v2' is shown. The main configuration area contains several rows of controls:

- NIR Source:** Chiller (selected), Manual, Single Shot. NSR Source: Chiller.
- NIR Volume:** 0.5 mL, 1.0 mL, 2.0 mL (selected).
- Incubation Time:** 0 (0 to 1440 minutes).
- Incubation Temp:** Cold (selected), RT, 37 °C.
- Mixing Type:** Top (selected), Immersion, Triturate, None.
- Mixing Speed:** Slowest, Slow, Medium, Fast, Fastest (selected).
- Disruption Type:** Default (selected), Dounce, None.
- Disruption Speed:** Slowest, Slow, Medium, Fast, Fastest (selected).

At the bottom, there is a 'Back' button, a text field for 'New Protocol Name: Standard Nuclei Isolation v2', and a 'Next' button.



Singulator™ Platform Performance

Cell Isolation

Cell Isolation is performed on the Singulator Instrument using single-use Cell Isolation Cartridges, combined with proprietary tissue-specific Cell Isolation Reagents. Each tissue-specific Cell Isolation Reagent and protocol has been optimized to give high cell yield and high cell viability.

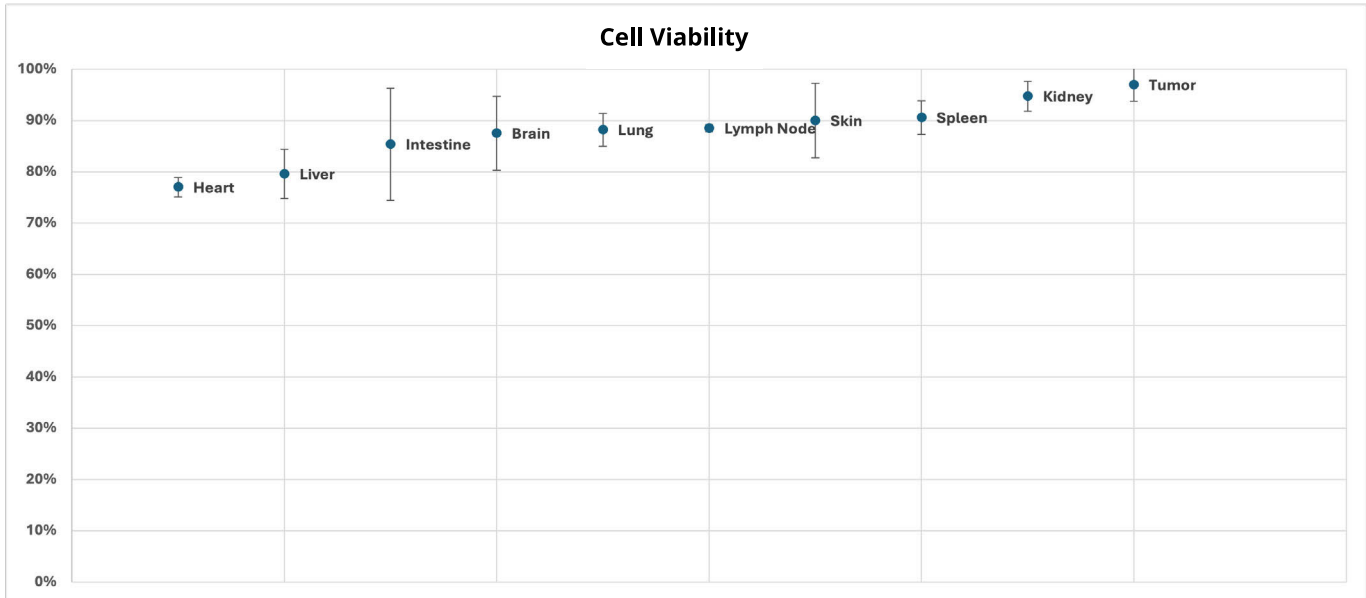


Figure 1. Single cells isolated using the Cell Isolation Cartridges have greater than 75% viability. Cells were isolated using the Cell Isolation Cartridge or the Large Cell Isolation Cartridge (heart tissue), tissue-specific Cell Isolation Kits and protocols specific for each tissue type. Viability was measured by AO/PI assay using the Nexcelom K2.

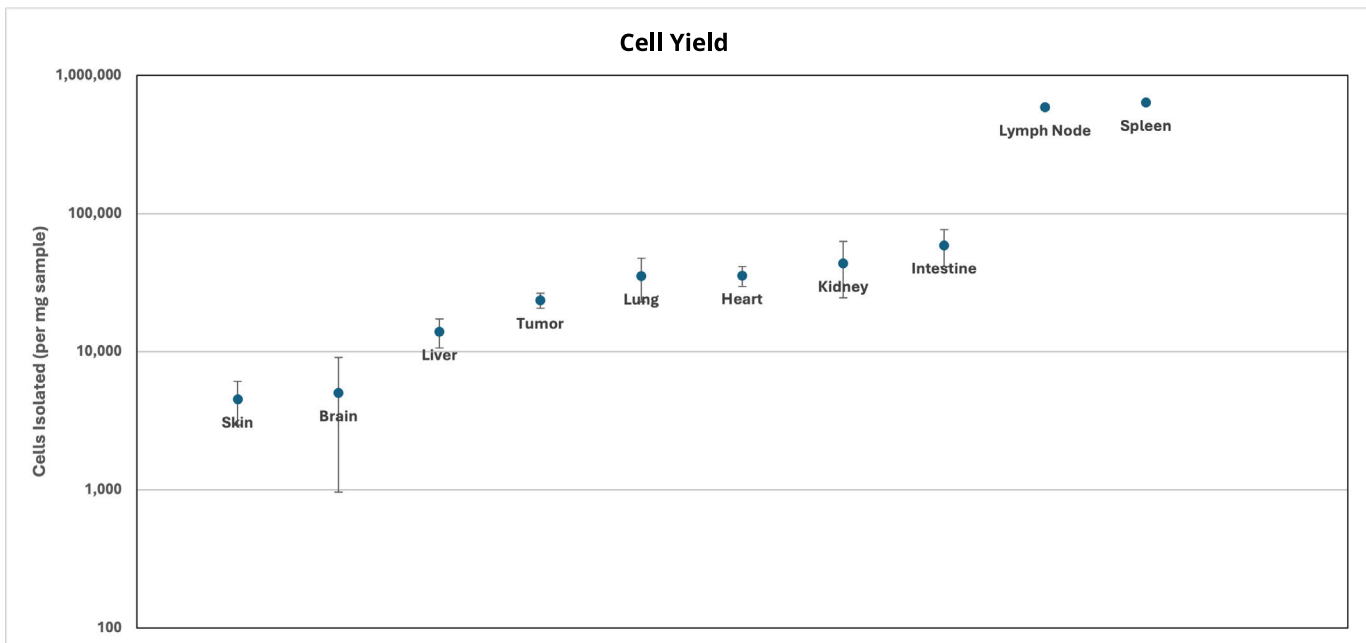


Figure 2. Yield of Single-Cell suspension isolated using the Cell Isolation Cartridges are sufficient for Single-Cell Applications. Cells were isolated using the Cell Isolation Cartridge or the Large Cell Isolation Cartridge (heart tissue), tissue-specific Cell Isolation Kits and protocols specific for each tissue type. Yield was measured by AO/PI assay using the Nexcelom K2.



Nuclei Isolation

Nuclei Isolation is performed on the Singulator Instrument using Nuclei Isolation Cartridges, combined with proprietary Nuclei Isolation Reagents. Cartridges have been designed for optimal yields depending upon input mass.

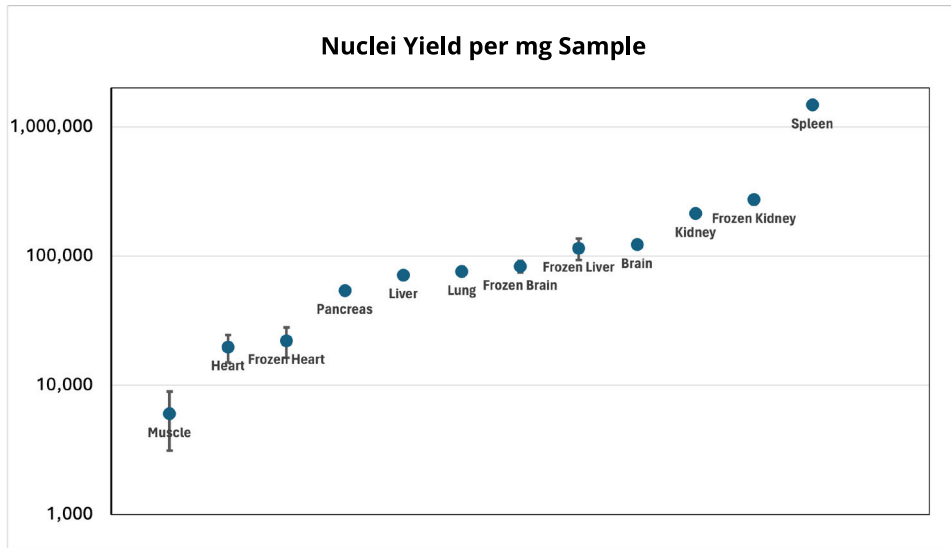


Figure 3. Yield of Single-Nuclei suspension isolated using the Nuclei Isolation Cartridge is sufficient for Single-Cell Genomics Applications. Nuclei were isolated using Nuclei Isolation Cartridges, Nuclei Isolation Reagents and the standard Nuclei Isolation protocols. Yield was measured by AO/PI assay using the Nexcelom K2.

NIC+ Cartridge Supports Extremely Low Input Mass for Single-Nuclei Applications

The NIC+ cartridge was designed for optimal recovery of nuclei from extremely low input masses for use in 10x Genomics Single Cell assays, supporting as low as 2 mg of input tissue.

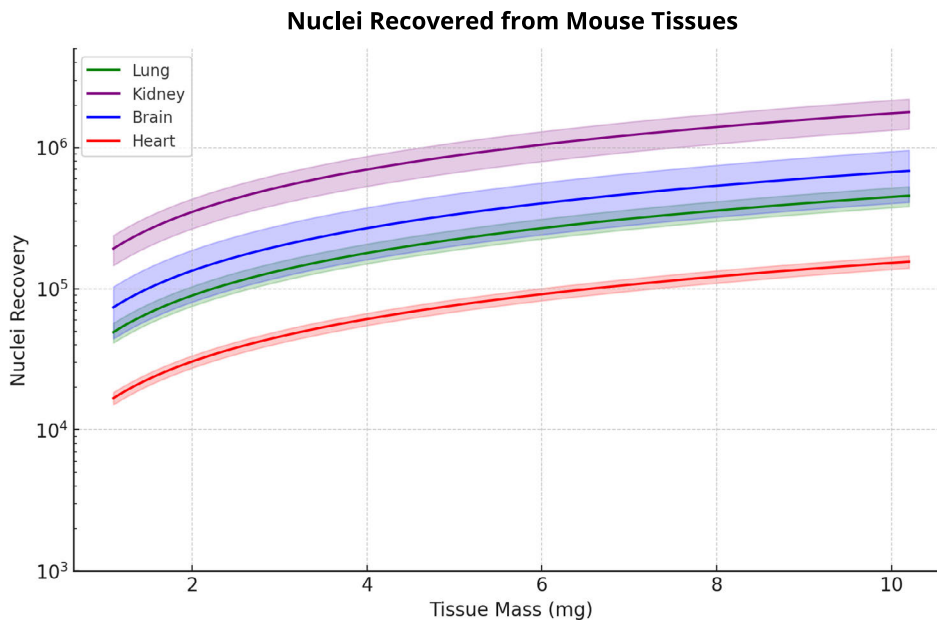


Figure 4. High nuclei recovery efficiency with the NIC+ cartridge. Nuclei were isolated using NIC+ Cartridges, Nuclei Isolation Reagents and the Low Volume Nuclei Isolation protocol between the range of 2-10 mg of tissue for mouse lung, brain, kidney and heart tissue. Each tissue type was run on at least two instruments across the input masses. Nuclei recovery is sufficient for targeting up to 10,000 nuclei into a 10x Genomics Chromium Single Cell Assays. Yield was measured by AO/PI assay using the Nexcelom K2.



The Singulator™ Platform is Reproducible and Precise

The Singulator Platform is designed to be highly reproducible across instruments and users. To demonstrate the reproducibility, we isolated six nuclei suspensions from a single mouse kidney on two Singulator 100 instruments and two Singulator 200 instruments using the NIC+ Cartridge, Nuclei Isolation Reagents, RNase Inhibitor and Standard Nuclei Isolation v2 protocol on the Singulator Platform.

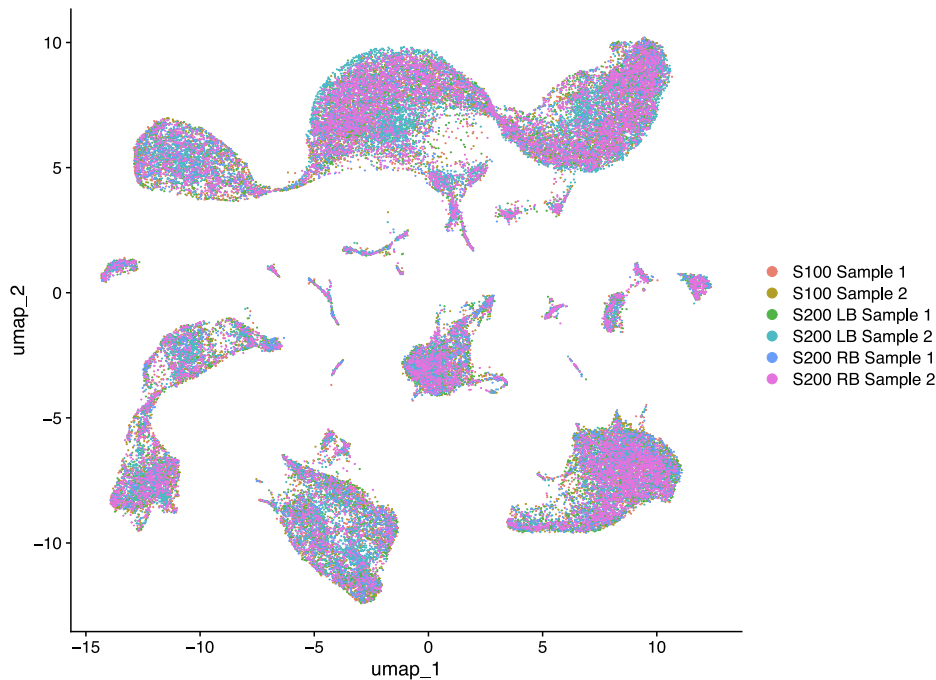
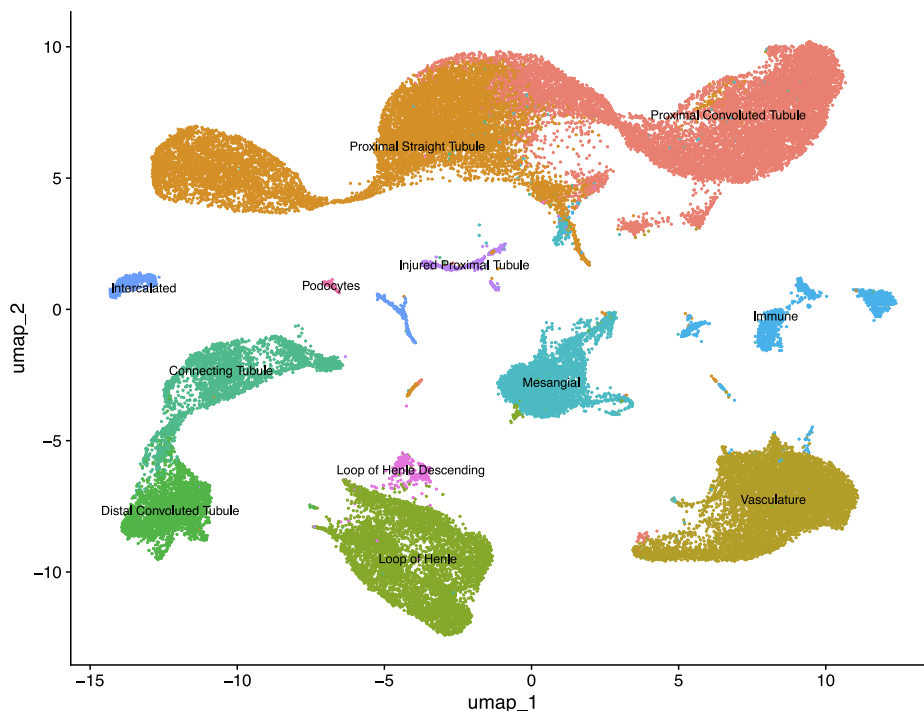


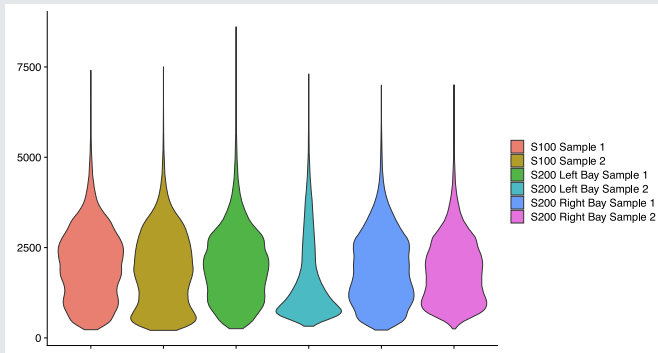
Figure 5. The Singulator™ Platform isolates highly reproducible cell populations across technical replicates. (A)

Integrated UMAP projection of six technical replicates isolated from a single mouse kidney dissociated with the Singulator 100 and 200 Platform. Nuclei were profiled with the 10x Genomics Chromium Next GEM Single Cell 3' v3.1 solution. Nuclei were isolated from a single mouse kidney on two different Singulator 100 and both bays of two different Singulator 200 instruments. **(B)** UMAP colored by different cell types. The Singulator Platform was able to capture the representative cell types in the kidney, including rare, large and fragile cells like podocytes.

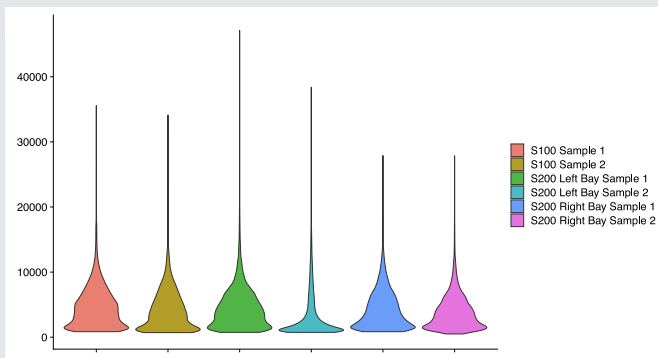




Genes per cell



UMIs per cell



Percent Mitochondrial Contamination

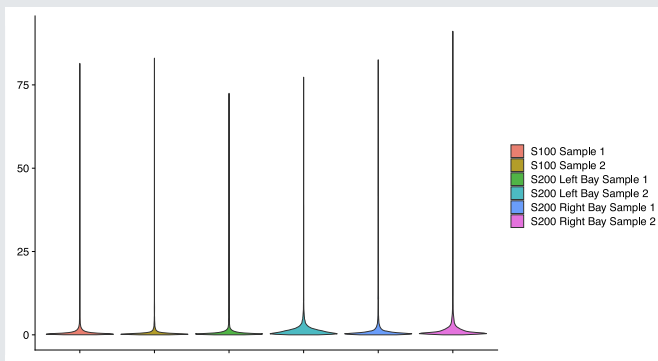


Figure 6. Gene expression is highly reproducible across technical replicates. The six samples exhibit comparable gene expression profiles per cell (A), consistent UMI (Unique Molecular Identifier) counts per cell (B), and extremely low levels of mitochondrial contamination (C) after down sampling to equivalent reads per cell.

The Singulator Platform gives highly reproducible gene expression results

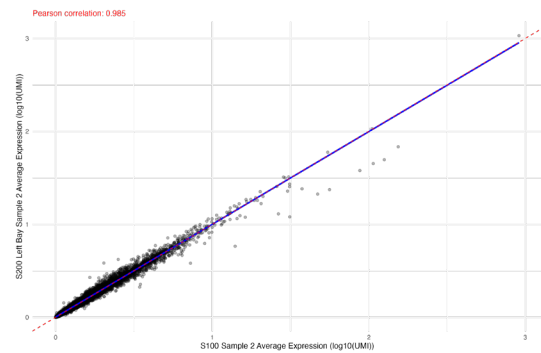
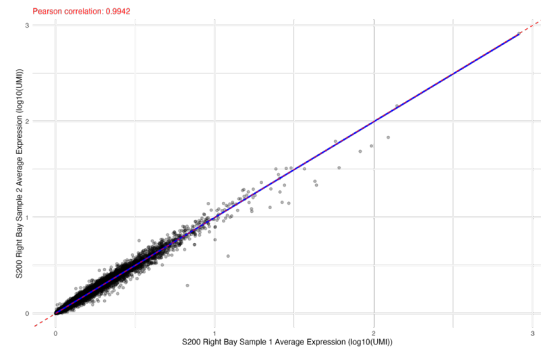


Figure 7. Gene expression is highly reproducible across technical replicates. These two representative Pearson Correlations demonstrate excellent reproducibility across technical replicates.



The Singulator 200+ Automates Sample Preparation from FFPE Tissue

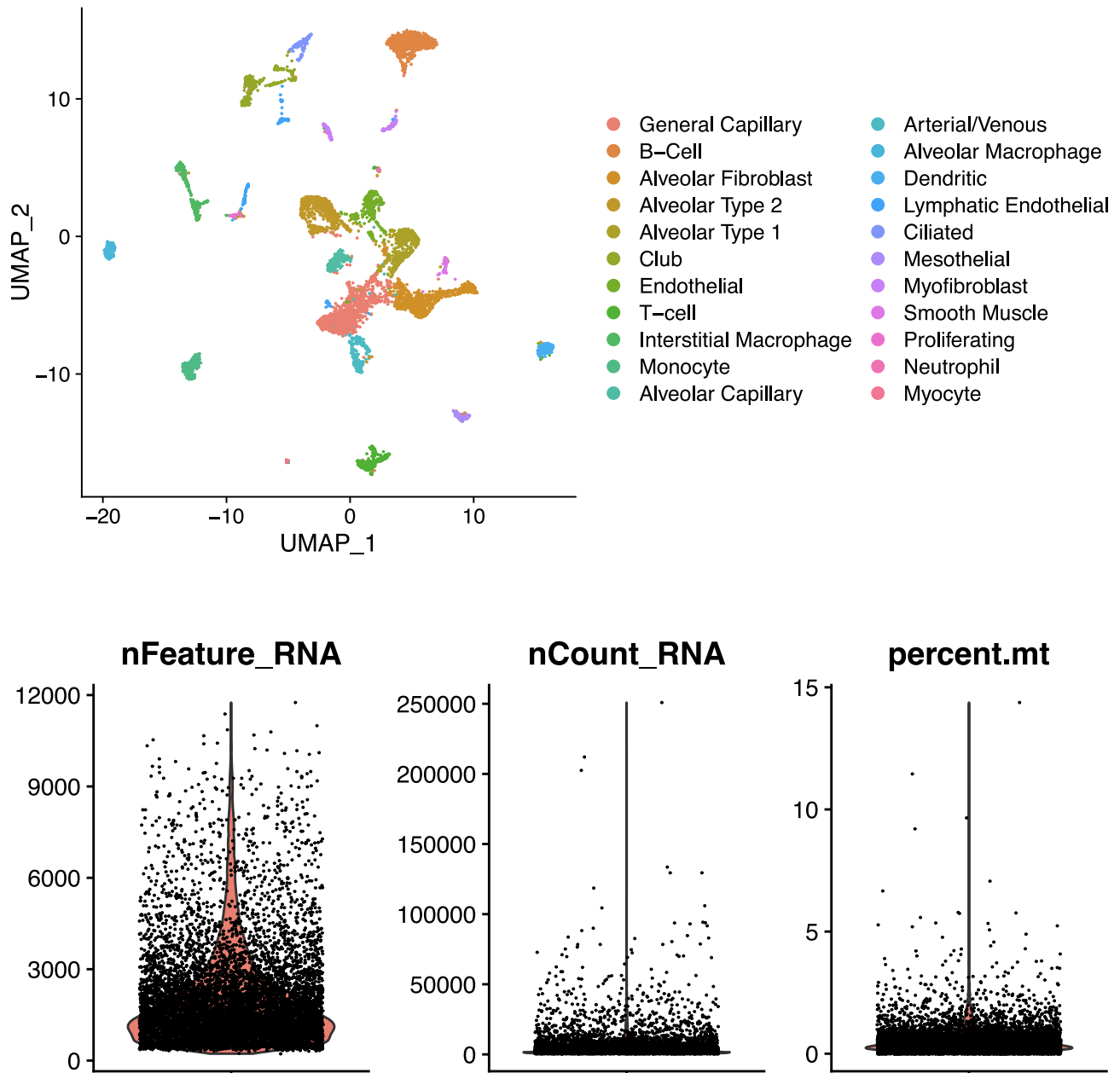


Figure 8. Cell clustering and QC metrics of single nuclei samples from mouse lung FFPE samples processed using the Singulator 200+. (A) UMAP colored by different clusters and cell types were identified by canonical type markers. (B) QC metrics demonstrate typical performance by median genes per cell (1,552), median UMI counts per cell (2,362) and mitochondrial contamination (<math>< 5\%</math> for most cells).



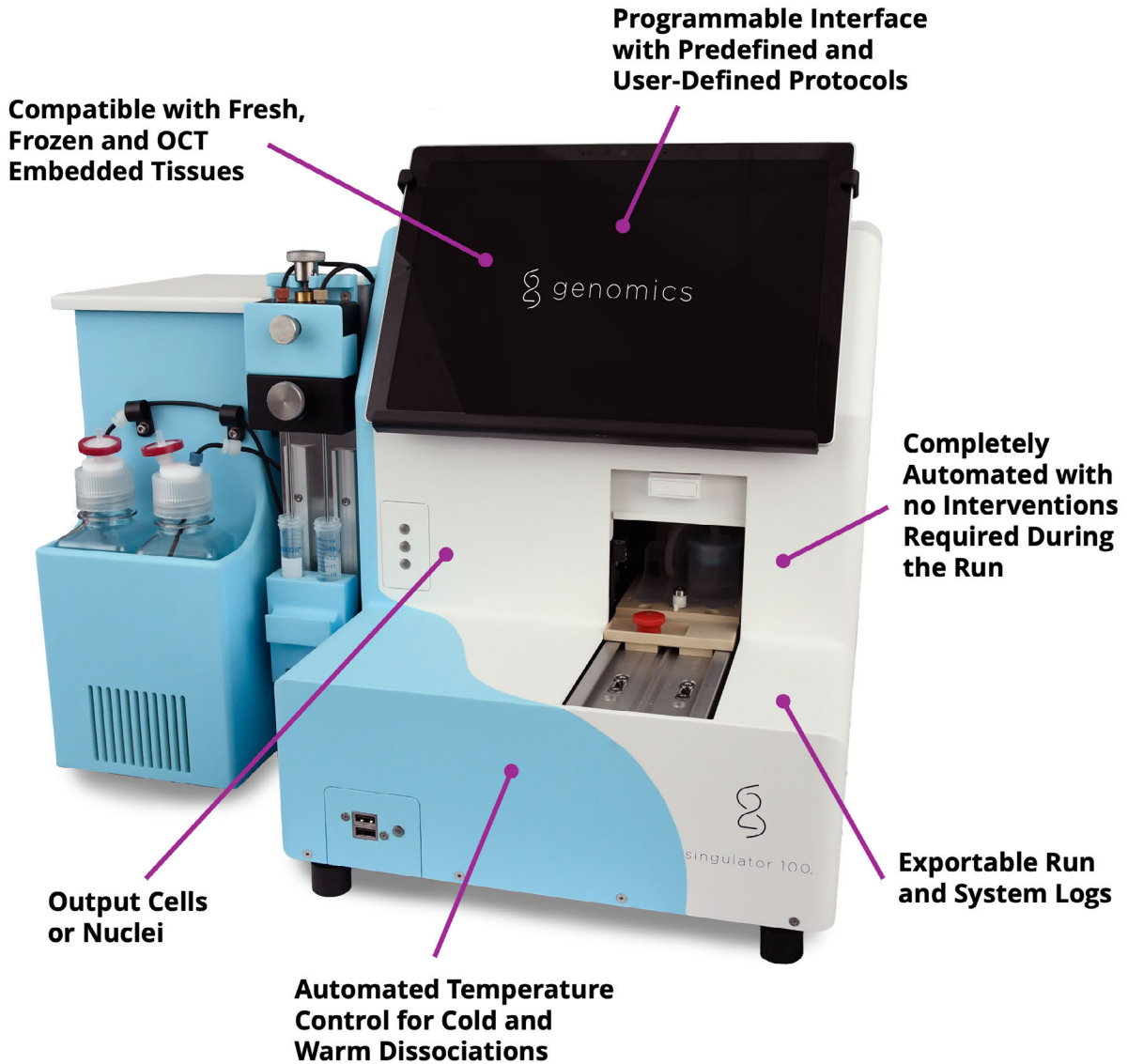
Sigulator Platform Compatible Tissues

List of tissue types by species that were isolated in customer labs and in-house with the Singulator Platform.

| | |
|---|---|
| Human *S2 Genomics Lab Demonstrated | Aorta, Brain (adult, infant, fetal), Breast (normal*, tumor*), Colon (normal, polyp, tumor), Heart (adult, fetal), Hemangioma, Hepatoblastoma, Intestine (adult, fetal), Lung (fetal, adult*, tumor*), Muscle (TA, SA), Organoids (retinal, cerebral), PBMC*, Prostate (normal, tumor), Retinal Organoids (WT, gene knockout), Spleen (fetal), Thymus (fetal), Vascular Abnormality (arterial, lymphatic) |
| Mouse *S2 Genomics Lab Demonstrated | Brain*, Colon (PDX tumor*), Heart*, Intestine*, Kidney*, Liver*, Lung*, Lymph Node*, Muscle*, Ovary*, Pancreatic Tumor, Skin*, Spinal Cord, Spleen*, Testes* |
| Rat *S2 Genomics Lab Demonstrated | Brain*, Kidney*, Liver*, Lung*, Spleen* |
| Spiny Mouse (<i>A. carinis</i>) | Kidney |
| Pig | Colon |
| Cow | Heart, Colon |
| Chicken | Thymus, Liver |
| <i>Xenopus</i> | Liver, Kidney, Thymus |
| Fish | Brain, Whole |
| Zebrafish | Retina |
| Planaria | Whole |
| Honeybee (<i>A. mellifera</i>) | Thorax |
| <i>Drosophila</i> | Brain, Larvae |
| <i>A. Thaliana</i> | Whole Seedling, Roots, Leaves |
| <i>Sorghum Purpureosericeum</i> | Embryos |
| Tobacco | Leaves |



The Singulator 100

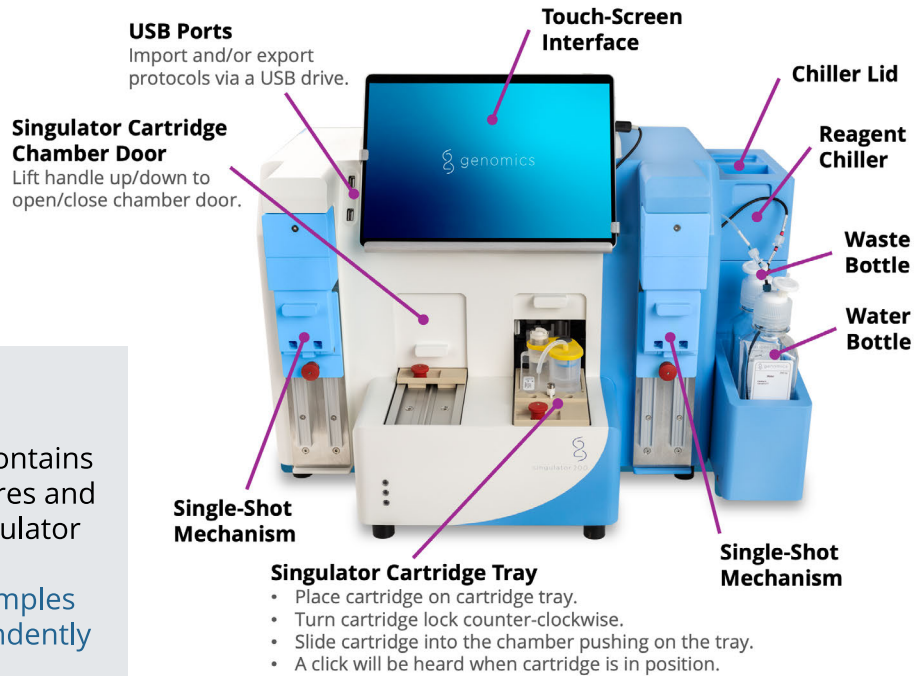




The Singulator 200

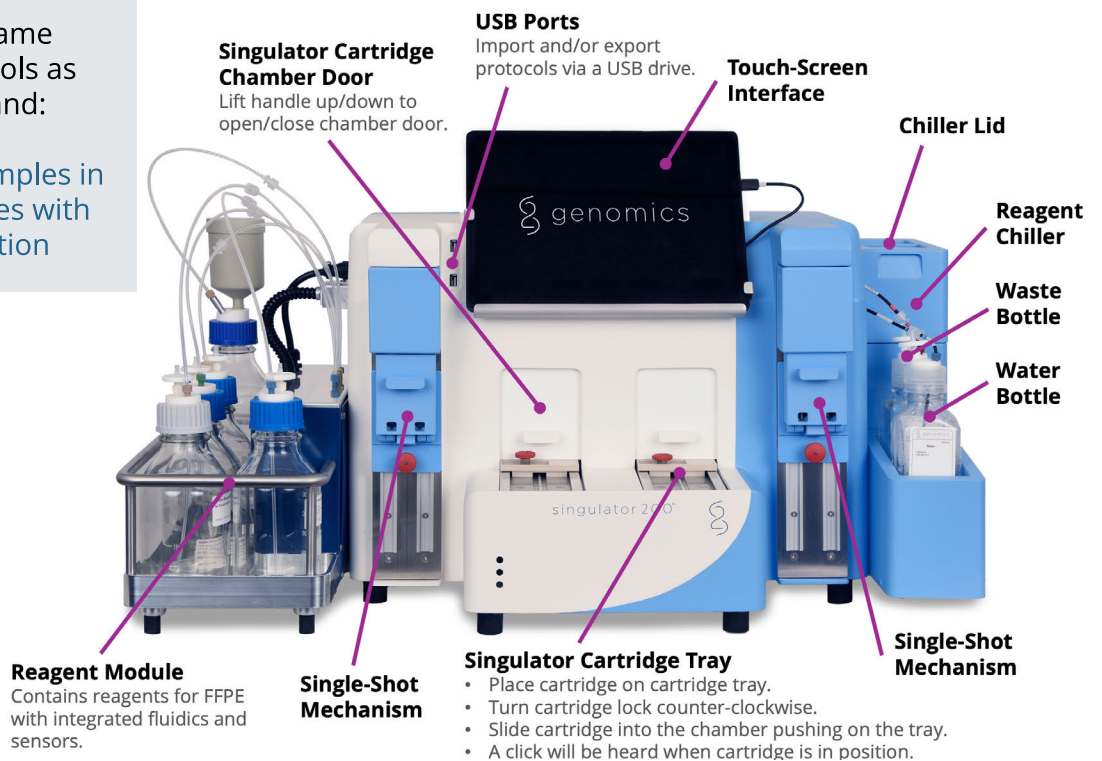
The Singulator 200 contains all of the same features and protocols as the Singulator 100 and:

Processes up to 2 samples in parallel or independently



The Singulator 200+

The Singulator 200+ contains all of the same features and protocols as the Singulator 200 and:
Deparaffinizes and dissociates FFPE samples in as little as 40 minutes with no manual intervention





Convenient Cartridges for Optimum Results

The Singulator Platform uses disposable, single-use cartridges which enable reproducible, safe, and secure tissue dissociations into single-cell or single-nuclei suspensions. There are several different cartridges available depending on your tissue, preservation method, downstream application and input mass. The cartridges are sealed and designed to optimize the isolation process while preventing cross contamination and maintaining the safety and security of the cell or nuclei suspension. The cartridges are designed to eliminate variability and work specifically with the Singulator System.

The Cell Isolation Cartridge is designed for isolating cells up to 70 µm in diameter from most tissues.

The Large Cell Isolation Cartridge is for isolating large cells up to 145 µm in diameter from heart tissue.

The Nuclei Isolation Cartridge is designed for isolating nuclei from solid tissues ranging between 20-300 mg.

The NIC+ Cartridge is designed for isolating nuclei from solid tissues and is designed to optimize the yield from low input samples, supporting inputs down to 2 mg of tissue.

The FFPE Cartridge is designed for deparaffinization and rehydration of FFPE samples upstream of input into the NIC+ Cartridge.

Processing Specifications



Cell Isolation Cartridge



Large Cell Isolation Cartridge



Nuclei Isolation Cartridge



NIC+ Cartridge



FFPE Cartridge

| Cartridge | Supported Tissue Input | Processing Time | Supported Range (mg of input tissue) |
|----------------------|--------------------------|-----------------|--------------------------------------|
| Cell Isolation | Fresh | 20-60 Minutes | 20-300 mg |
| Large Cell Isolation | Fresh | 20-60 Minutes | 20-300 mg |
| Nuclei Isolation | Fresh, Frozen, OCT | 6-12 Minutes | 20-300 mg |
| NIC+ | Fresh, Frozen, OCT, FFPE | 6-12 Minutes | 2-300 mg |
| FFPE | FFPE | 40-80 Minutes | 2x 50 um curls |



Cell Isolation Reagents

Tissue-specific cell isolation reagents are optimized to isolate single-cell suspensions from solid tissue in combination with the Cell Isolation Cartridge or the Large Cell Isolation Cartridge with the Singulator Instrument:

- Brain Reagent
- Heart Reagent
- Intestine Reagent
- Lung Reagent
- Liver Reagent
- Kidney Reagent
- Skin Reagent
- Spleen Reagent
- Tumor Reagent

These are formulated to be compatible with human, mouse, and rat tissues.

Nuclei Isolation Reagents

Nuclei Isolation Reagents are optimized to isolate a single-nuclei suspension in combination with the Nuclei Isolation Cartridge or NIC+ Cartridge, and the Singulator Instrument. The Nuclei Isolation Solution is designed to chemically disrupt the cell and isolate nuclei from solid tissue within the Nuclei Isolation Cartridge or NIC+ Cartridge; the isolated nuclei are automatically processed in the cartridges with the Nuclei Storage Solution to maintain maximal integrity. Once the single-nuclei suspension is isolated, the nuclei suspension can be further cleaned up with the Nuclei Debris Removal Reagent. Finally, the Nuclei Loading Buffer can be used to adjust the magnesium concentration to within the supported range for loading into 10x Genomics Chromium Gene Expression Assays.

FFPE Reagents

Deparaffinization Reagent is optimized for deparaffinization prior to nuclei isolation in combination with the FFPE cartridge from formalin-fixed paraffin-embedded tissue sections using the Singulator Instrument.

RNase Inhibitor V2

RNase Inhibitor V2 is optimized for nuclei applications, including working with samples preserved in FFPE. The RNase Inhibitor V2 has a concentration of 40 U/ μ L and is used at 1 U/ μ L final concentration.



Singulator Consumable Bundles

Reagent Bundles are available in 24-packs to suit your research needs.

| Cell Isolation Bundle (24 Samples) P/N 100-289-261 | Count |
|--|--------------|
| Cell Isolation Cartridge | 24 |
| Cell Isolation Reagent, 20 mL (6 samples per vial) | 4 |

| Large Cell Isolation Bundle (24 Samples) P/N 100-289-370 | Count |
|--|--------------|
| Large Cell Isolation Cartridge | 24 |
| Heart Reagent, 20 mL (6 samples per vial) | 4 |

| Nuclei Isolation Bundle (24 Samples) P/N 100-288-798 | Count |
|--|--------------|
| Nuclei Isolation Cartridge | 24 |
| Nuclei Isolation Reagent, 125 mL | 1 |
| Nuclei Storage Reagent, 125 mL | 2 |

| NIC+ Nuclei Isolation Bundle (24 Samples) P/N 100-289-043 | Count |
|---|--------------|
| NIC+ Isolation Cartridge | 24 |
| Nuclei Isolation Reagent, 125 mL | 1 |
| Nuclei Storage Reagent, 125 mL | 2 |

| Nuclei Isolation Kit & RNase Inhibitor (24 Samples) P/N 100-288-807 | Count |
|---|--------------|
| Nuclei Isolation Cartridge | 24 |
| Nuclei Isolation Reagent, 125 mL | 1 |
| Nuclei Storage Reagent, 125 mL | 2 |
| RNase Inhibitor V2, 8 samples | 3 |

| NIC+ Nuclei Isolation Kit & RNase Inhibitor (24 Samples) P/N 100-289-152 | Count |
|--|--------------|
| NIC+ Isolation Cartridge | 24 |
| Nuclei Isolation Reagent, 125 mL | 1 |
| Nuclei Storage Reagent, 125 mL | 2 |
| RNase Inhibitor V2, 8 samples | 3 |

Only Compatible with the Singulator 200+

| NIC+ Nuclei Isolation Kit & RNase Inhibitor (24 Samples) P/N 100-284-221 | Count |
|--|--------------|
| FFPE Cartridge | 24 |
| Deparaffinization Reagent | 1 |
| NIC+ Isolation Cartridge | 24 |
| Nuclei Isolation Reagent, 125 mL | 1 |
| Nuclei Storage Reagent, 125 mL | 2 |
| RNase Inhibitor V2, 8 samples | 3 |



Singulator System Information and Specifications

| | Singulator 100 | Singulator 200 | Singulator 200+* |
|--|--|--|--|
| Part Number | 100-067-764 | 100-243-621 | 100-291-204 |
| Weight | 45 pounds / 20.6 kg | 70 pounds / 32 kg | 84 pounds / 38 kg |
| Instrument Dimensions (Depth x Width x Height) | 48 cm x 43 cm x 47 cm 19 in x 17 in x 18.5 in | 47 cm x 62.5 cm x 44 cm 18.5 in x 24.4 in x 17.6 in | 47 cm x 85 cm x 44 cm 18.5 in x 34 in x 17.6 in |
| Operating Temperatures | 20-26°C 68-78°F | 20-26°C 68-78°F | 20-26°C 68-78°F |
| Power Supply Voltage | 85-264 VAC, 50/60Hz | 85-264 VAC, 50/60Hz | 85-264 VAC, 50/60Hz |
| Humidity | 0-40% relative, noncondensing | 0-40% relative, noncondensing | 0-40% relative, noncondensing |
| Altitude | Up to 2000m / 6562 ft above sea level | Up to 2000m / 6562 ft above sea level | Up to 2000m / 6562 ft above sea level |

*Available for Preorder Now



Ensure the Quality of your Results

The quality of your results is directly traceable to the status of your Singulator. An annual service contract will maximize uptime.

| P/N | Description |
|-------------|---|
| 100-067-655 | Singulator 100 Annual Service Contract |
| 100-257-660 | Singulator 200 Annual Service Contract |
| 100-288-471 | Singulator 200+ Annual Service Contract |



Contact Information and Resources

For general information and technical resources: s2genomics.com

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