EMD MILLIPORE

Product Brochure

Scepter™ 2.0 Cell Counter

Precise, handheld cell counting

Fisher Scientific

EMD Millipore is a division of Merck KGaA, Darmstadt, Germany

What people are saying...

"At last, an alternative to lining up for the Coulter Counter®, and far easier than sweating over fragile hemocytometers."

AMY A. CAUDY is a Lewis-Sigler Fellow at Princeton University's Lewis-Sigler Institute for Integrative Genomics

The Scientist, Dec. 2010.
Top Ten Innovations of 2010.

"Cell counting is normally a very tedious process and usually only provides minimal information on the cell population. This instrument, which is only slightly larger than an automatic pipette, allows you to count cells in your tissue-culture hood, simplifies the procedure, and provides much useful data, such as the fraction of intact cells."

H. STEVEN WILEY is a lead biologist at the Environmental Molecular Sciences Laboratory at the Pacific Northwest National Laboratory

The Scientist, Dec. 2010.
Top Ten Innovations of 2010.

Scepter™ 2.0 – Precise, handheld cell counting

Scepter™ 2.0 is your portable cell counter. While other automated counters consume bench space and rely on object recognition software, manual focusing, and clumsy loading chambers, the Scepter™ cell counter provides true automation without the error that accompanies vision-based systems. With its microfabricated, precision-engineered sensor, the Scepter™ cell counter does all the work and delivers accurate and reliable cell counts in less than 30 seconds.

Scepter™ 2.0 marks the next generation in Scepter™ technology, highlighted by:

Compatibility with More Cell Types

The Scepter™ cell counter is the only one on the market to accurately count particles as small as 3 µm in diameter

Increased Cell Concentration Range

The new 40 µm sensor can count samples with concentrations as high as 1,500,000 cells/mL

Powerful Software for Complex, Effortless Cell Analysis

- Compare sample sets side by side using histogram overlay and multiparametric data table
- Create and save gating templates
- Generate reports, graphs and tables

The power of precision

Trust Scepter™ counting with your most valuable samples to get reproducible and reliable counts. The reliability of Scepter™ counting is particularly apparent with smaller cell types. Because the Scepter™ cell counter measures volume using the Coulter Principle, it can quantify cells based on size and will discriminate larger cells from smaller debris, unlike vision based techniques, which rely on object recognition software and cannot reliably detect small cells.

Scepter™ sensor technology

Compatible with 60 µm and 40 µm sensors, the Scepter™ 2.0 cell counter can meet even more of your cell- and particle-counting needs. Use the 60 µm sensor for particles between 6 and 36 µm. Use the 40 µm sensor for particles between 3 and 17 µm.

- Precise volumes are drawn into the Scepter™ sensor.
- As cells flow through the aperture in the sensor, resistance increases. This increase in resistance causes a subsequent increase in voltage.
- Voltage changes are recorded as spikes with each passing cell.
- Spikes of the same size are bucketed into a histogram and counted. This histogram gives you quantitative data on cell morphology that can be used to examine the quality and health of your cell culture.

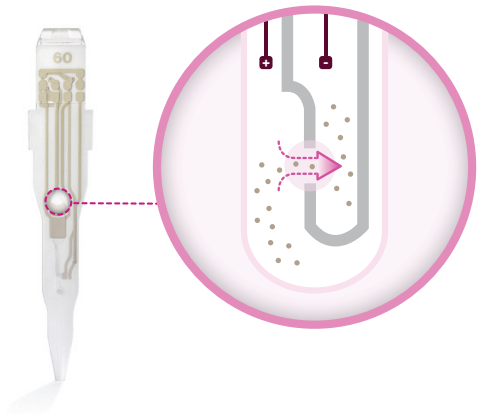


Figure 1.

Particles are detected by Ohm's Law V=IR (V=voltage, I=current, and R=resistance)

Cell Type	Measured size (µm)	40 µm sensor	60 µm sensor
2102 Ep	15-19		■
454 beads			■
A172	15		■
A253	14-18		■
A375	16		■
A431	15-17		■
A549			■
Algae (various)	7-9	■	
B35	13-16	■	■
B Cells	6-11	■	
C2C12	12	■	■
C305	12-14	■	■
C6	12-13		■
CA46	10-12	■	■
Caco-2	17		■
CHO	14-17		■
COS-1	12	■	■
Cos-7	15		■
D283	12	■	
Daudi	10-12	■	■
DU-145	15-17		■
Epithelia	14-15		■
HCT-116	10	■	■
HEK293	11-15		■
HeLa	12-14		■
HepG2	12		■
HFF	18-20		■
Hs27	14	■	■
HT-1080	14-16		■
HT-29	11		■
HUH7-Hepatoma line			■
Human ES Cells	9-12	■	
HUVEC	14-15		■
IMR-32	12-14	■	■
IMR-90	15	■	■
Jurkat	13		■
K562	22		■
KB	14		■
KG-1	10-13	■	■
L6	14-16		■
LNCaP	15-16		■
Luminex® beads	5-6	■	
MCF7	15-17		■
MDCK	13-15		■

Cell Type	Measured size (µm)	40 µm sensor	60 µm sensor
Meg-01	16-17		■
MG-63	15-17		■
Mouse ES Cell	5-13	■	■
Mesenchymal Stem Cell	15-16		■
MRC-5			■
NCI-H146	10-13	■	
NIH 3T3	15		■
NTERA2, clone D1	13	■	■
OK	17-18		■
PBMCs	7-12	■	
PC12	9-13		■
Primary Astrocytes	7	■	
Primary Neuronal Cell		■	
Raji	12-15	■	■
Ramos	11-12	■	■
Rat Dorsal Root Ganglion Cells	7	■	
Rat Whole Blood	4.6	■	
Red Blood Cells	5-7	■	
Rat Neural Stem Cell	11-13		■
RAW 264.7	12-15		■
RBL	11-13	■	■
RIN-mF5	13-14		■
SF9	13		■
SH-SY5Y	12		■
Sk-Br-3	15-20		■
SK-MEL-28	17-19		■
SK-N-MC	14-15		■
SK-N-SH	14-15		■
Splenocytes	7-9		
SW-480	15		■
SW-620	13-14	■	■
T84	14-18		■
T98G	17		■
TF-1	13-14	■	■
U251	16-20		■
U2OS	16-19		■
U266	12		■
U87-Human Glioblastoma cell line	12-14		
U937	11-13	■	■
WI-38	12-15		■
Y79	13-14		■
Yeast- *Pichia Pastoris*	5	■	
Yeast- *S.cerevisiae*	6	■	

Table 1.

Cell types validated with the Scepter™ cell counter and the recommended Scepter™ sensor.

■ Recommended based on size ■ EMD Millipore Validated ■ Customer Validated

Scepter™ counting delivers precision

There is no need to subjectively determine cell counts, as required by vision-based counting methods. The Scepter™ cell counter detects every cell and displays the population as a histogram of cell size distributions. From the histogram, count all the cells or use the gating function to count a chosen subpopulation. By monitoring changes in your histogram, you can gain insight into the health and quality of your cell culture from one experiment to the next.

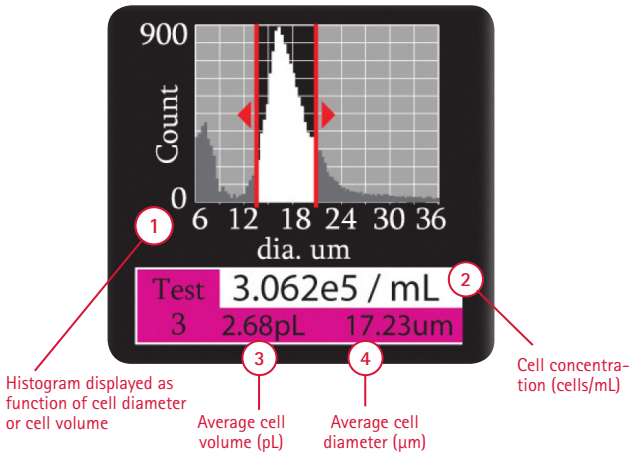
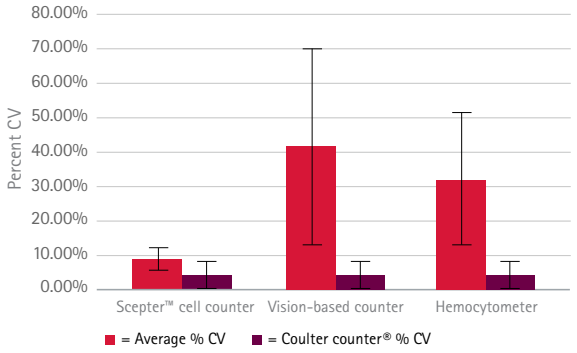


Figure 2. The average percent coefficient of variation (CV) for each counting method shown was calculated using cell concentration measurements at 50,000 cells/mL samples of 19 different cell lines. The Scepter™ cell counter is more precise than vision-based counting and hemocytometry, and approaches the precision of the Coulter Counter® standard (maroon bars). Error bars represent standard deviation.



	Format	Counting methods	Sample volume needed	Sample volume counted	Cells counted in a 100,000 cell/mL sample	Average % CV
Hemocytometer	Slide and microscope	Manual, vision-based	10 µL	.1 µL / square	10/square	41.8
Brand L	Benchtop	Automated vision-based system	10 µL	.4 µL	40	32.1
Scepter™ Cell Counter	Handheld	Impedance-based cell detection	100 µL	50 µL	5000	9.1

As easy as pipetting

Prepare the sample:

Start with a single-cell suspension, diluted to a total volume of 100 µL (recommended) in phosphate buffered saline (such as EmbryoMax® 1x DPBS) to 10,000-500,000 cells/mL (operating range for 60 µm sensor) in a 1.5 mL microcentrifuge tube.

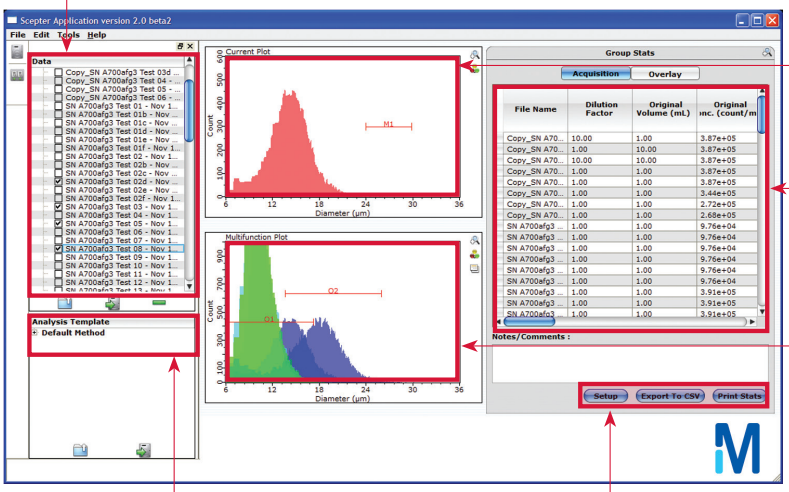
Perform cell count:

- Turn on the Scepter™ cytometer by pressing the toggle on the back of the instrument and wait for on-screen instructions to appear.
- When prompted, attach a sensor to the end of the Scepter™ unit with the electrode sensing panel facing toward the front of the instrument, and you'll see detailed instructions for each step of the counting process.
- Pipette once to draw sample into the sensor. 50 µL of your cell suspension is drawn into the microfabricated, precision-engineered channel embedded in the sensor. The cell sensing zone detects each cell drawn into the sensor and thus cell concentration is calculated.
- The sensing zone also measures cell sizes and cell volumes with sub-micron and sub-picoliter resolution, enabling the Scepter™ cytometer to display a histogram distribution of cell size or cell volume.

Intuitive analysis software

From simple counts to complex volume measurements used to assess cell health parameters, Scepter™ Software Pro provides an intuitive, intelligent platform to perform high-level cell analysis based on the size measurements captured with the Scepter™ cell counter.

A VIEW OF SCEPTER™ SOFTWARE PRO



DATA: data files from your Scepter™ cell counter

CURRENT PLOT: working plot and data file

GROUP STATS: customizable statistics from your selected data files

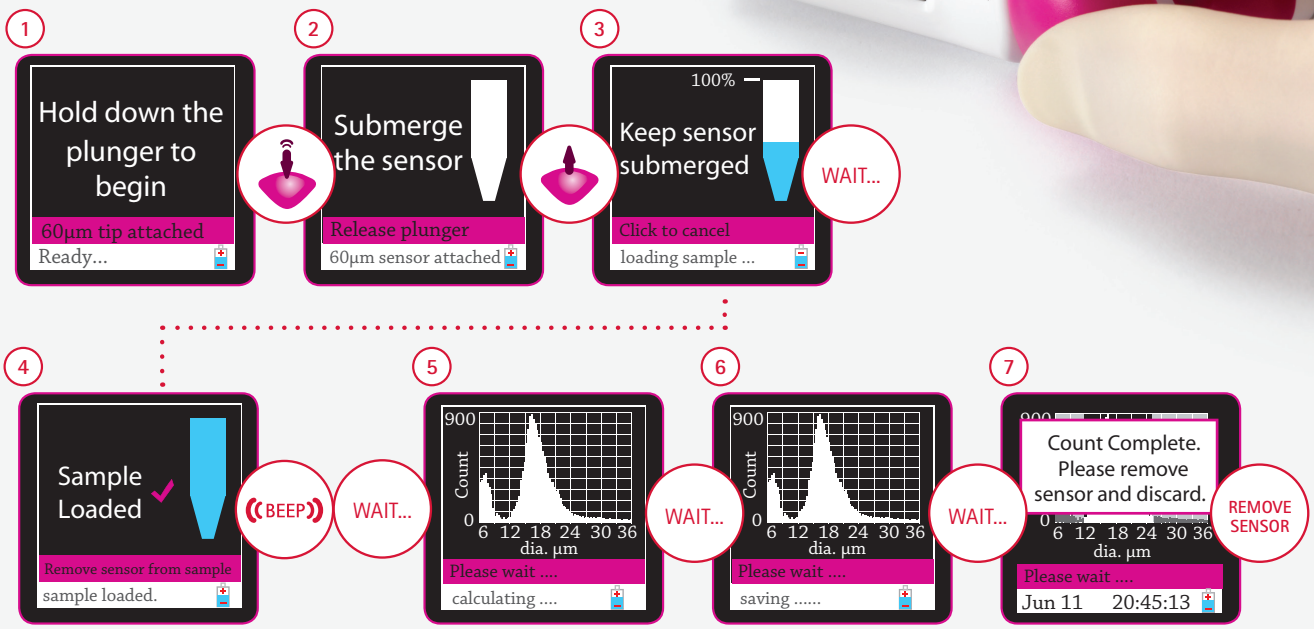
MULTIFUNCTIONAL PLOT: multiple data sets/histogram overlays

REPORTS: export, print selected graphs/files, cut and paste

ANALYSIS TEMPLATES: saved gating parameters

Using the Scepter™ Software Pro on your computer, you can:

- Compare several samples and data sets side by side using histogram overlay and multipara-metric tables
- Create and save gates to be used from one experiment to the next
- Create attractive graphical presentations and reports with your data



APPLICATIONS

EMD Millipore continues to expand the capabilities of Scepter™ technology. And the latest generation, Scepter™ 2.0, features enhanced analytical powers, enabling you to count even more cell types and sizes.

Scepter™ 2.0 for cell health

Instantly gauge the health of your cell cultures without even leaving the culture hood. Because the Scepter™ cell counter displays high-resolution histograms of entire cell populations, you can differentiate live cells from dead cells and debris by simply gating on the histogram peak corresponding to larger-diameter cells. No staining is required! The resulting calculation for % viable cells agrees with viability calculations obtained using flow cytometry (ViaCount® reagent) and Trypan blue staining/hemocytometry (shown here with MDMA231 and NIH 3T3 cells).

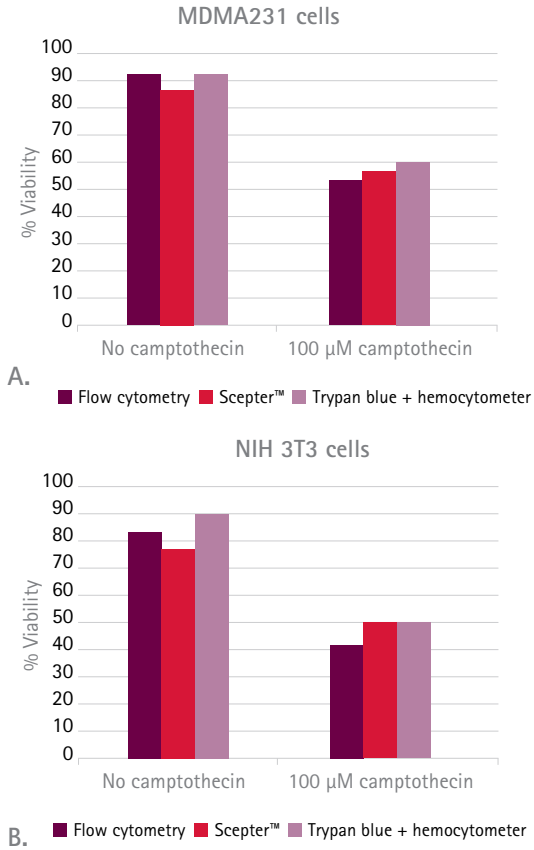


Figure 3. Rapid cell analysis using the Scepter™ 2.0 device provides reliable assessments of cell viability compared to flow cytometry (ViaCount® assay) and hemocytometry (using Trypan blue staining). MDMA231 cells (A) and NIH 3T3 cells (B) were treated with camptothecin 24 hours prior to analysis.

Scepter™ 2.0 for counting heterogeneous cell populations

Count blood cells and other cells with small diameters with the highest precision. Biological samples such as primary isolates or cultured cells are often heterogeneous mixtures of cells that differ by type and/or function. Such differences in cellular attributes are most commonly determined by multicolor fluorescent antibody detection of cell type specific surface marker(s) using flow cytometry. Notably, in addition to variations in protein expression, many cell types and physiological states are also uniquely distinguishable on the basis of size alone. The ability to identify population subsets on the basis of phenotypic differences and further determine their relative frequencies (and concentrations) is critical to many aspects of research.

Distinguishing lymphocytes from monocytes in freshly isolated PBMCs. The assessment of immune profiles of the various immune cell subsets can help identify molecular signatures that may facilitate research. The Scepter™ cell counter, when used in combination with Scepter™ Software Pro, provides a tool for rapid determination of lymphocyte and monocyte concentrations as well as the relative frequency of these cell types in PBMC isolates.

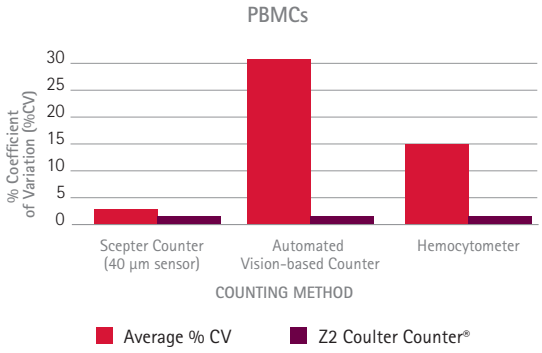


Figure 4. The Scepter™ 2.0 cell counter counts PBMCs with greater precision than other counting methods, as reflected by low coefficients of variation. % CVs were calculated using average cell counts of four replicate samples.

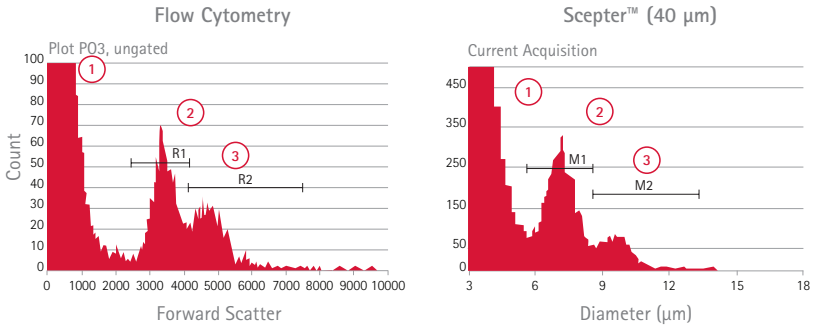


Figure 5. Representative comparison of histogram plots for human PBMC samples acquired on the Scepter™ cell counter (diameter histogram on right) and guava easyCyte™ flow cytometry (forward scatter histogram on left) platforms. Analysis plots derived from both platforms demonstrate three distinct peaks corresponding to 1) dead cell/debris, 2) lymphocyte and 3) monocyte fractions. The difference in counts displayed (Y-axis) is due to differences in sample dilution between the guava easyCyte™ flow cytometer and the Scepter™ cell counter.

Test	Cell Fraction	Scepter™[1]	Forward Scatter[2]	Staining[3]
1	Lymphocyte	58	65	63
	Monocyte	42	35	37
2	Lymphocyte	68	72	71
	Monocyte	32	28	29
3	Lymphocyte	66	69	71
	Monocyte	34	31	29

Table 2. Lymphocyte and monocyte subset frequencies from three individual PBMC samples. Aliquots from each sample were analyzed using the guava easyCyte™ flow cytometry and Scepter™ platforms. [1]Values were derived from the diameter histogram plot. [2]Values were derived from the forward scatter histogram plot based on total events measured on guava easyCyte™ flow cytometry platform. [3]Staining frequencies derived as follows: % Lymphocytes = (% CD3+ T cells) + (%CD16/56+ NK cells) + (%CD19+ B cells); % Monocytes = % CD14+ cells

Precise and accurate bead counting with Scepter™ 2.0

Micron-sized beads are used in a variety of biological applications, ranging from daily validation of flow cytometer performance to purification of fusion protein constructs from cell lysates. Accurate determination of bead counts at the onset of each assay allows for standardization of bead concentrations across multiple samples and minimizes errors and variation in downstream results. The Scepter™ cell counter is well suited for precise counting for beads of numerous types and can improve reproducibility of bead-based assays, such as immunoprecipitation and multiplexed detection.

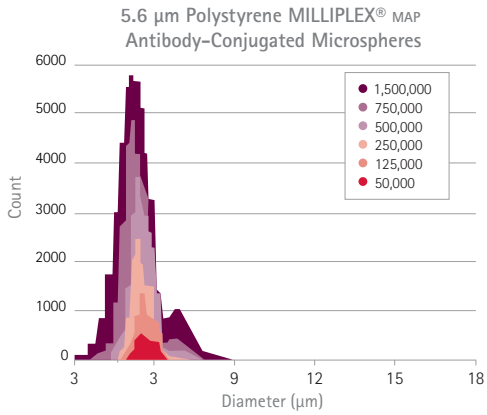


Figure 6. Scepter™ Software Pro displays imported size distribution histograms as either a single sample histogram or as overlaid histograms for multiple samples. Shown is an overlaid histogram for serially diluted 5.6 µm MILLIPLEX® MAP microspheres.

Scepter™ counting can facilitate yeast cell counting for brewing and wine industries

Introduction of a consistent yeast cell concentration is required for successful beer and wine fermentation as well as to maintain batch-to-batch reproducibility and ensures consistent fermentation over many cycles. Scepter™ counting can be used to monitor yeast size and concentration by yielding interpretable histograms that could be gated to provide this depth of information.

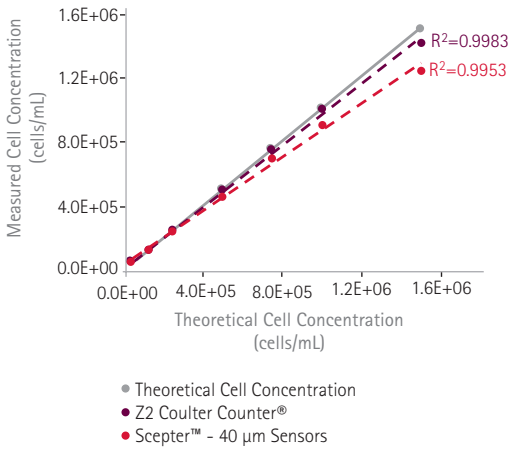


Figure 7. The Scepter™ cell counter counts yeast cells with good accuracy and linearity. Measured yeast cell concentrations were compared to theoretical concentrations. The solid gray line represents the theoretical values. Dotted lines represent best linear fit to data. Both the Scepter™ and Coulter Counter® platforms show a loss of linearity and accuracy upon an increase in cell concentration.

Ordering Information

Description	Qty	Catalogue No.
Scepter™ 2.0 Handheld Automated Cell Counter		
with 40 µm Scepter™ Sensors (50 Pack)	1	PHCC20040
with 60 µm Scepter™ Sensors (50 Pack)	1	PHCC20060
Includes:		
Scepter™ Cell Counter	1	
Downloadable Scepter™ Software	1	
O-Rings	2	
Scepter™ Test Beads	1	PHCCBEADS
Scepter™ USB Cable	1	PHCCCABLE
Scepter™ Sensors, 60 µm	50	PHCC60050
	500	PHCC60500
Scepter™ Sensors, 40 µm	50	PHCC40050
	500	PHCC40500
Universal Power Adapter	1	PHCCPOWER
Scepter™ O-Ring Kit, includes 2 O-rings and 1 filter cover	1	PHCCOCLIP

Are you an existing Scepter™ user interested in upgrading your device to Scepter™ 2.0? It's easy. Visit **www.millipore.com/scepterupgrade** to upgrade your Scepter™ today!

For technical assistance, contact Millipore:
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