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CellASIC® ONIX Y04T-04 Microfluidic Plate

For research use only. Not for use in diagnostic procedures.

Introduction

The CellASIC® ONIX Y04T Microfluidic Plate is a 4-chamber cell culture plate designed for use with the CellASIC® ONIX2 Microfluidic System and ONIX2 Manifolds, enabling single cell trapping and generational monitoring in real time. This bio-inspired plate provides a controlled and dynamic microenvironment for cells, which when used in conjunction with the ONIX2 system, permits perfusion-based, long-term, live-cell analysis with automated solution switching. The easy-to-use format and superior technology redefine the standard for microfluidics-based experimentation.

Applications

- Single cell trapping and monitoring
- Time-lapse analysis of yeast cells including division tracking (follow mother/daughter cells over generations)
- Temperature and gas atmospheric control (temperature shift, anoxic conditions, etc.)
- Long-term continuous perfusion experiments
- Solution exchange experiments (induction, inhibition, drug dosing, etc.)
- Comparison of up to 4 different cell types or exposure conditions (media components) in parallel

Plate Description

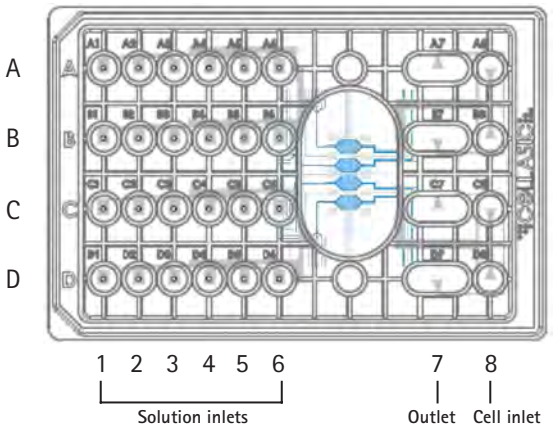


Figure 1. Plate configuration

The Y04T plate has 4 independent units (A–D), each with 6 inlet wells (1–6), a cell inlet (8), and a large outlet well (7). Each row of wells (A–D) addresses the corresponding culture chamber. The plate is shipped pre-primed with a PBS (phosphate-buffered saline) solution, which can be replaced with a buffer of choice prior to experiment. Each chamber has an array of 104 barrier trap pads 4.0 µm in height to hold cells in a single focal plane during long-term analysis. The plate is for single use only.

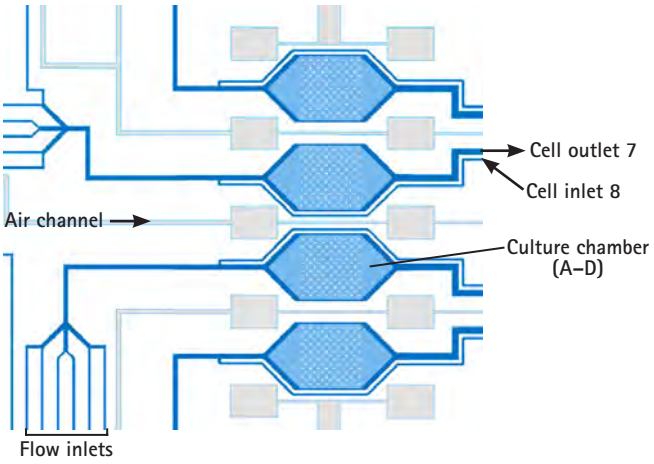


Figure 2. Chamber viewing window

All four culture chambers are located under a single viewing window to minimize travel distance for high-magnification phase objectives.

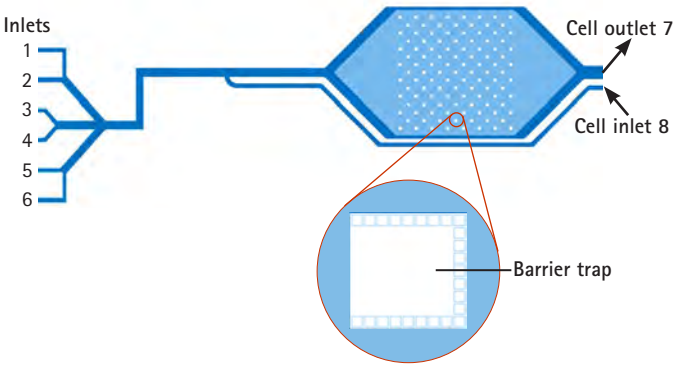


Figure 3. Culture chamber

The culture chamber hexagon marquise is 3.0 × 6.0 mm with a ceiling height of 15.5 µm. Within each chamber, the culture array area is 3.0 × 3.0 mm with barrier trap heights of 4.0 µm. Nine position markers indicate unit number and relative position.

Plate Description, continued

The inlet/outlet functions and minimum/maximum volumes for each culture unit are listed below.

	Function	Minimum Volume (µL)	Maximum Volume (µL)
Inlet 1	Inlet for solution switching	50	300
Inlet 2	Inlet for solution switching	50	300
Inlet 3	Inlet for solution switching	50	300
Inlet 4	Inlet for solution switching	50	300
Inlet 5	Inlet for solution switching	50	300
Inlet 6	Inlet for solution switching	50	300
Outlet 7	Accepts flow-through from culture chamber	50	795
Inlet 8	Cell inlet for loading cells into culture chamber/Accepts flow-through from culture chamber	50	265

Cell Trapping Mechanism

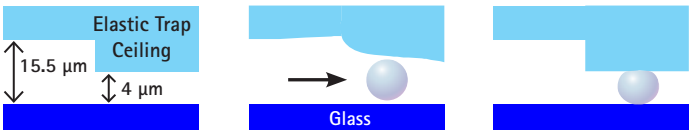
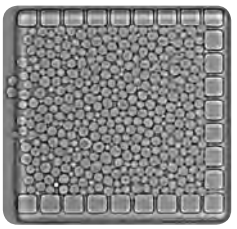


Figure 4. Cell trapping mechanism

The microfabricated chamber and polydimethylsiloxane (PDMS) barrier gently hold cells against the glass viewing surface to maintain a single focal plane during perfusion analysis experiments. The traps of the Y04T plate are 100 × 100 µm in size and 4.0 µm in height. Small pillars bracket each trap pad's perimeter on three sides and act to retain resulting daughter cells during long-term culture. To maximize capture efficiency, each trap is "open" on the side facing the direction of flow during cell loading.



Manifold Description

The CellASIC® ONIX2 heated (CAX2-MXT20) or basic (CAX2-MBC20) manifolds connect the microfluidic plate to the CellASIC® ONIX2 Microfluidic System.

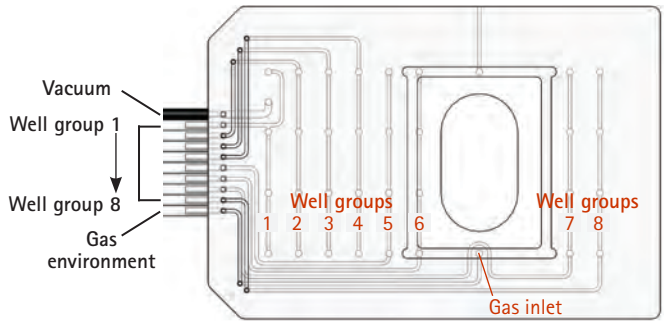


Figure 5. Lines to CellASIC® ONIX2 Microfluidic System

Flow control is achieved using air pressure above the liquid in each well. Multiple wells on a plate are grouped together and addressed by a single pneumatic line via the manifold. Each set of wells is called a "well group". A vacuum line is used to seal the plate to the manifold, and a gas line enables atmospheric control.

Flow Properties

Flow properties of wells 1–6 are shown in Figure 6. The figure shows the flow rate out of the well as a function of pressure. If more than one channel is pressurized, multiply the well flow rate by the number of pressurized channels to derive the overall flow rate.

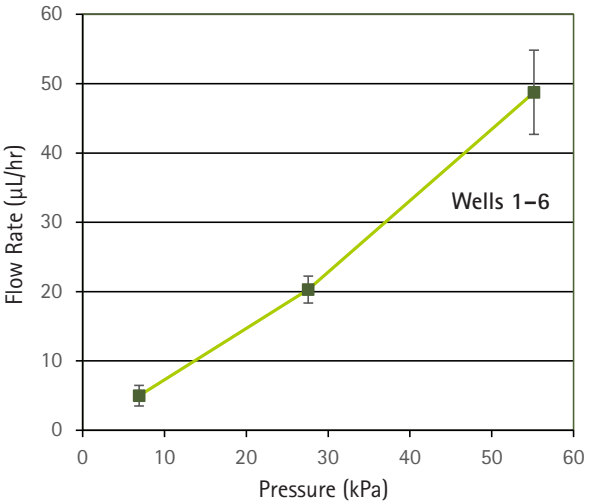


Figure 6. Flow rate for wells 1–6

Plate Storage

Store at room temperature. Do not store in direct sunlight.

Limitations

The plate is incompatible with acetic acid and organic solvents such as acetone, ethanol, and methanol. Plates should be tested for compatibility with other acids or organic solvents prior to use.

Plate Operation

If temperature control is needed, use the CellASIC® ONIX2 Manifold XT (CAX2-MXT20). Refer to the CellASIC® ONIX2 Microfluidic System User Guide for setup instructions.

Plate Priming (Optional)

1. Aspirate the PBS solution from wells that will be used for the experiment and add 250 µL of your solution/medium to these wells. Make sure that the unused solution inlet wells are filled with buffer.
2. **Steps 2–4 are optional:** If your experiment requires complete removal of PBS, replace the PBS in the solution (1–6) and cell inlet (8) wells with 150 µL of your desired priming solution.
3. Seal the microfluidic plate to the ONIX2 manifold according to the CellASIC® ONIX2 Microfluidic System User Guide.
4. Open the CellASIC® ONIX2 Software, select one of the **New Experiment** options, and find the Y04T plate on the drop down list. On the **Manual Mode** tab (Figure 7), click on the **Run liquid priming sequence** button. The recommended pressure and flow times for well groups 1–6 are 55.2 kPa (8 psi) and 15 seconds, respectively. For more information on creating protocols, refer to the CellASIC® ONIX2 Microfluidic System User Guide.

Cell Loading

Pressure-Driven Method Using the CellASIC® ONIX Microfluidic System

1. Prepare a yeast/cell suspension of 0.1–2.0 × 10^6 cells/mL. This concentration may need optimization depending on the yeast strain and desired trapping density.
2. Aspirate solution from cell inlet wells 1–8 without disturbing the cutouts.
3. Pipette 100 µL of cell suspension into cell inlet well 8 and 300 µL of culture broth into solution inlet wells 1–6, making sure to cover the hole at the bottom of the well.

Specifications

Culture Plate Dimensions	
Length × width	127.3 × 85.2 mm (5.0 × 3.4 in.)
Height without lid	14.3 mm (0.6 in.)
Culture Chamber Dimensions	
Length	6.0 mm (0.24 in.)
Width	3.0 mm (0.12 in.)
Trap height	4.0 µm
Glass bottom thickness (#1.5 slide)	170 µm
Plate materials of construction	Polycarbonate, PDMS, acrylic, glass

Product Ordering Information

This section lists catalogue numbers for the CellASIC® ONIX products. See Technical Assistance section for contact information. You can purchase these products and find the most up-to-date software, plate maps, and user guides at www.millipore.com/cellasic.

Description	Catalogue Number	Qty/pk
Microfluidic Plates		
CellASIC® ONIX Plate for Bacteria Cells (4-chamber, trap heights of 0.7, 0.9, 1.1, 1.3, 2.3, and 4.5 µm)	B04A-03-5PK	5
CellASIC® ONIX Gradient Plate for Mammalian Cells (4-chamber)	M04G-02-5PK	5
CellASIC® ONIX Open-top Plate for Mammalian Cells (4-chamber)	M04L-03-5PK	5
CellASIC® ONIX Switching Plate for Mammalian Cells (4-chamber)	M04S-03-5PK	5
CellASIC® ONIX Plate for Haploid Yeast Cells (4-chamber, trap heights of 3.5, 4.0, and 4.5 µm)	Y04C-02-5PK	5
CellASIC® ONIX Plate for Diploid Yeast Cells (4-chamber, trap heights of 5.0, 6.0, and 7.0 µm)	Y04D-02-5PK	5
CellASIC® ONIX Pad Trap Plate (4-chamber, trap height of 4.0 µm)	Y04T-04-5PK	5
CellASIC® ONIX2 Microfluidic System and Manifolds		
CellASIC® ONIX2 Microfluidic System	CAX2-S0000	1
CellASIC® ONIX2 Manifold XT (temperature controlled)	CAX2-MXT20	1
CellASIC® ONIX2 Manifold Basic (no temperature control)	CAX2-MBC20	1
Replacement Parts/Accessories		
CellASIC® ONIX2 Filter Multiconnector (includes filters)	CAX2-AMC00	1
CellASIC® ONIX2 Software USB Drive	CAX2-SSW01	1
CellASIC® ONIX2 Gasket	CAX2-AGK20	1
CellASIC® ONIX2 Self Check Plate	CAX2-ASP20	1
CellASIC® ONIX2 Cleaning Plate	CAX2-ACP20	1
CellASIC® ONIX2 Replacement Filter Pack (9 × 4 mm and 1 × 13 mm Millex® 0.45 µm PTFE filters)	CAX2-AFP00	1
CellASIC® ONIX2 Accessory Fittings (quick-connect gas fitting, 2/pk)	CAX2-ABF00	1
CellASIC® ONIX2 Temperature Calibration Plate	CAX2-ACT20	1

Product Ordering Information, continued

Description	Catalogue Number	Qty/pk
Replacement Parts/Accessories		
CellASIC® ONIX2 Premixed Gas Regulator (for use with 103 L or 112 L gas cylinders with a C10 connection)	CAX2-ABR00	1
CellASIC® ONIX2 Microfluidic Services		
CellASIC® ONIX2 Essential Service Plan	CAX2-ESVC	1
CellASIC® ONIX2 Total Service Plan	CAX2-TSVC	1
CellASIC® ONIX2 Installation	CAX2-INST	1

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