



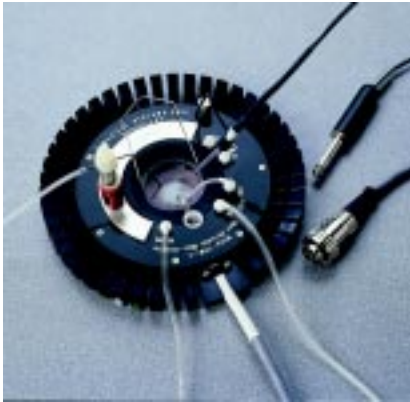
Micro-Incubators Systems

Harvard Apparatus, Inc. offers a comprehensive line of versatile micro-incubators and cell/tissue holding chambers for use on the stages of microscopes. These units provide the means to control temperature, PO₂ and pH, thus significantly increasing the viability of the culture. Depending on the system configuration specified. It is possible to achieve media heating and/or cooling under static or perfused conditions also to operate on either upright or inverted microscopes; and under open or closed environmental conditions.

Three different micro-incubators and three different companion chambers are described below. In addition we offer a fourth micro-incubator system, our model PSMI, for customers in need of the shallow depths and low angles of attack typically required for patch slice studies. A temperature controller (model TC202A) is perfectly matched to the heating and cooling requirements of the micro-incubator systems.

Our application specialists are available to help you configure a system which is exactly right for your needs. Just call.

Open Perfusion Micro-Incubator



This Micro-Incubator can heat as well as cool. It operates equally well under static or dynamic conditions. When operated under dynamic conditions. The Micro-Incubator's unique design places flexible tubes carrying in-flowing perfusate in contact with a temperature driven Peltier plate, thus heating or cooling the incoming fluid to a

command temperature and thereby eliminating the need for auxiliary preheating or cooling. The same temperature controlled ring will heat or cool the cell carrying central chamber uniformly when no perfusate is flowing.

The operating temperature range of the Open Perfusion Micro-Incubator (model PDMI-2) is dependant on ambient conditions due to its air cooled Peltier devices. Normally controlled temperatures range from 25° C above ambient to 10 - 15° C below. Lower temperatures can be achieved by using an optional cool water carrying coil which attaches to the perimeter of the PDMI-2. Temperatures stabilize quickly throughout the operating range; temperature uniformity across the chamber is excellent.

Two perfusion fluids can flow independently or simultaneously through the micro-incubator into the chamber at rates up to 3 ml per/min. each. Fluid level is maintained by placing an aspirator (model LU-ASP) in the chamber. Fluid height is easily adjusted via a simple screw mechanism; a cleverly designed suction port eliminates fluid flutter thus making aspiration quiet; a magnetic base secures the aspirator to the micro-incubator at a users selectable convenient location.

The PDMI-2 also supports gas flow over the top of the tissue chamber for PO₂ or pH control and improved temperature uniformity. The open design provides excellent mechanical and optical access to the media.

A teflon well is provided with an Ag/AgCl electrode at its base to allow for the formation of a salt bridge when making low noise electrophysiological recordings.

Patch Slice Micro-Incubator



The Patch Slice Micro-Incubator System is comprised of a versatile Micro-Incubation Chamber (PSMI), an innovative Cover Slip Dish (PS-CSD), and a Bipolar Temperature Controller (TC-202A). This system provides a complete solution to the challenge of electrophysiological study of synaptic slice connections at physiologi-

cal temperatures using low noise whole cell patch recording either with or without water immersion of the microscope objective in the recording medium.

This micro-incubator is a shallow, annular assembly which surrounds the central slice holding dish. Room temperature perfusate is delivered to the incubator which in turn delivers it to the dish at a precisely controlled temperature you select. The perfusate is removed by an included, height adjustable aspirator (PS-ASP) (via user supplied suction). Two independent channels of perfusate flow through the PSMI into the chamber via replaceable plastic tubing of low volume (<100 µL) to allow rapid switching of media via an upstream valve for pharmacological studies.

A separate gas inlet provides temperature controlled gas across the dish. A TC-202A, connected electrically to the micro-incubator, provides control of the desired system temperature (0° to 50° C).

The cover slip dish (PS-CSD) consists of two 22 mm diameter cover slips held in a circular frame. The slice sits on the top cover slip with the immersion objective reaching the fluid surface. The bottom cover slip prevents condensation that would otherwise deteriorate illumination by the microscope condenser below. To enable placement of the patch electrode, entry angles as small as 15° C (with respect to the horizontal) can be achieved for slice access.

Leiden Micro-Incubator



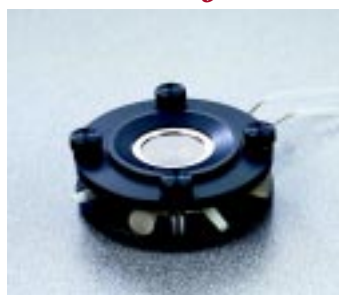
The Leiden Micro-Incubator (LU-CB1) provides stable culture conditions (temperature, pH, aseptic isolation and osmolarity) during continuous or intermittent observations when media temperatures between ambient and 50 °C are desired.

The LU-CB1 is used primarily for static chamber media applications. It features excellent mechanical and optical access to cells or tissue. Measuring probes (temperature, pH, etc.), recording electrodes, and micropipettes can easily be manipulated in and out of the chamber.

Aseptic isolation of the culture media can be provided by using a layer of nontoxic mineral oil. A gas flow is directed over the oil to control the microenvironment (including pH) and to minimize temperature gradients across the chamber.

It is possible to use the LU-CB1 as a perfused system by preheating the perfusate close to the desired temperature before it enters the chamber.

Closed Perfusion Micro-Incubator



This Micro-Incubator features a short optical path between coverslips to allow single cell fluorescence measurements under maximum objective magnification using either an inverted or upright microscope.

Media access is flexible. Four symmetrically placed ports are provided with plugs which are

designed so that direct streaming of perfusate onto the cells is avoided. Plug rotation creates different degrees of mixing.

There are four additional ports for inserting special purpose probes (e.g. temperature pO_2) or hypodermic needles to introduce reagents rapidly.

The Leiden Closed Perfusion Micro-Incubator is available in two versions. Temperature control of the model LU-CPC is achieved only by introducing fluids which have been independently preheated; the model LU-CPC-CEH adds a nichrome heating element which surrounds the chamber and, when a separately ordered temperature controller (model TC-202A) is added, heats the chamber thus augmenting temperature control when fluid flow rates are low.

Specifications

PDMI-2

Chamber Options

Corning 35 mm Petri dishes, Cover Slip Dishes, LU-CSD, MSC-TD or MSC-PTD

Recommended Gas Flow

0.5 to 2.0 L/min

Temperature Range

10° to 15°C below to 25°C above ambient when used with TC202A; 0° to 50°C with water cooler

Temperature Stability

±0.1°C with TC-202A, @ 37°C with 1 ml/min perfusion

Media Perfusion Rates

Up to 3.0 ml/min.

Overall Dimensions,

H x Dia 17 x 152 mm (0.67 x 6.0 in)

Weight 0.5 kg (17.9 oz)

Microscope Stage Mounting

Call Digitimer Ltd. for options

PSMI

Chamber Type

PS-CSD Cover Slip Dish

Temperature Range

10° to 15°C below to 25°C above ambient

Temperature Stability

±0.2°C with TC-202A, @ 37°C with 1 ml/min perfusion

Built In Temp. Sensor

Thermistor type, 100 kΩ @ 25°C

Media Perfusion Rates

Up to 3.0 ml/min

Dimensions, H x Dia

17 x 152 mm (0.67 x 6.0 in), overall

Weight

0.5 kg (17.9 oz)

LU-CB1

Chamber Options

Corning 35 mm Petri dishes, LU-CSD, MSC-TD or MSC-PTD

Recommended Gas Flow

0.5 to 2.0 L/min

Temperature Range

Ambient to 50°C when used with TC202A

Temperature Stability

±0.2°C when used with TC-202A

Heating Element

2.0 Ω Nichrome Coil

Dimensions, H x Dia

16 x 90 mm (0.63 x 3.54 in), overall

Weight

150 g (5.3 oz)

Microscope Stage Mounting

Call Digitimer Ltd. for options

LU-CPC/LU-CEH

Cover Slips

#1 or 2, 24/25 mm dia. (model # CS-GLASS-1 or CS-GLASS-2)

Distance Between Coverslips

14 mm (.55 in)

Heating Element (LU-CPC-CEH only)

2.0 Ω Nichrome heating coil

Fluid Inlets/Outlets

4 Male
4 Female Luer

Dimensions, H x Dia

21 x 60 mm (0.83 x 2.36 in)

Weight

60 g (2.1 oz)

Dish Material

Eriflon™ and Stainless Steel

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