Warner Instruments

Quick Exchange Heated/Cooled Platform for 35mm Petri Dishes

Model QE-1HC

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DESCRIPTION

The **QE-1HC** 35 mm Quick Exchange Heated/Cooled Platform from Warner Instruments is designed to conveniently provide rapid heating and cooling of Series 40 chambers and 35 mm culture dishes. This versatile system readily accommodates culture dishes from several manufacturers and will adapt to any microscope stage supported by Warner Instruments. An integral water jacket uses recirculating water from Warner's TCM-1 Thermal Cooling Module to remove excess heat from the **QE-1HC**'s Peltier electronics.

Peltier driven heating and cooling is a proven and direct method for providing temperature regulation to devices comprised of metal components. The quiet performance of the Peltier device, coupled with the high thermal conductivity of the metal components, makes for a robust and efficient system.

The efficiency of specimen heating and cooling is affected by the presence of condensation. Good thermal transfer efficiency also depends on a high quality mechanical attachment of the dish to its support. For this reason we provide several aluminum adapter rings to bring the chosen 35 mm culture dish into close apposition with the stage insert. The base of the **QE-1HC** also has a thermal barrier designed to reduce the occurrence of condensation when the unit is cooled to below the dew point.

Features of the **QE-1HC** include:

- ✓ Open design allows easy access
- ✓ Temperature control from 5°C to 50°C
- ✓ Designed for 40 Series chambers and 35 mm culture dishes
- ✓ Quick exchange of chamber or 35 mm culture dish
- ✓ Removable perfusion and suction tube holders
- ✓ Adapters for dishes by Willco Wells, IBIDI, WPI, Corning, MatTek, and Falcon
- ✓ Stainless steel plates for attachment of magnetic holders and dish clamps
- ✓ Fits all Series 20 stage adapters

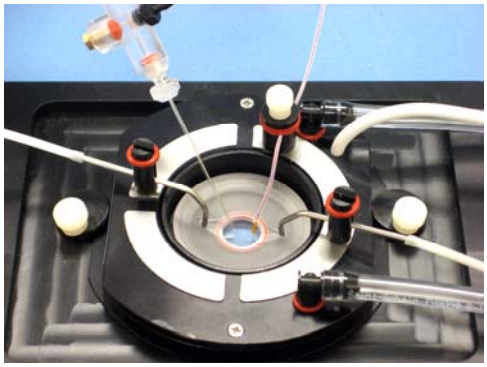
THIS EQUIPMENT IS NOT DESIGNED NOR INTENDED FOR USE ON HUMAN SUBJECTS

INTRODUCTION

The **QE-1HC** Quick Exchange Heated/Cooled Platform is a versatile base for Warner's Series 40 chambers as well as many popular 35 mm glass bottom cell culture dishes. The platform is at home on both upright and inverted microscopes and includes adjustable perfusion tubes, magnetic quick-release clamps, and Peltier heating and cooling elements. A complete system requires the addition of a temperature controller and heat exchanger (thermal cooling module). Temperature controllers and heat exchangers sold separately.

The **QE-1HC** is designed to be used with a CL-100 or CL-200 bipolar temperature controller and a TCM-1 thermal cooling module. The temperature controllers provide feedback-driven regulation of heating/cooling power and the TCM-1 quietly and effectively dissipates the excess heat generated by the operation of the **QE1-HC**'s integral Peltier device.

The **QE-1HC** base has magnetic stainless steel plates along the upper perimeter for use with magnetic attachments and a 25 mm diameter aperture for use with inverted microscope objectives. Stage adapters are available for all major microscopes.



Removable magnetic perfusion and suction tubes allow precise placement of perfusion lines into any dish or chamber. The magnets facilitate simple repositioning of both suction and perfusion lines following chamber exchange. A redesigned suction tube eliminates tidal action and fluid flutter in the bath for quiet aspiration.

Complementary, in-line temperature control of perfusate can be achieved using our SC-20 Dual In-Line Solution Heater/Cooler along with an associated temperature controller. The dual-channel CL-200 is particularly useful for this configuration since one channel can control the **QE-1HC** while the other controls the SC-20.

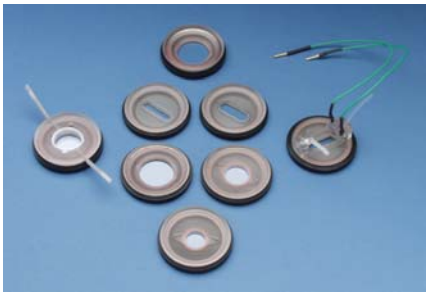
QE-1HC SETUP

General Comments

In addition to the Series 40 chambers, the **QE-1HC** is designed to accept any of the popular glass bottomed 35 mm culture dishes manufactured by Willco Wells, IBIDI, WPI, Corning, MatTek, and Falcon (*chambers and dishes sold separately*). Chambers and culture dishes are secured into place by the included magnetic retaining clips. AR-4 adapter rings may be needed to ensure a close fit between the culture dish and platform base (*see page 5*).

In all cases, however, solution flow is provided by the perfusion and suction tubes. The **QE-1HC** is supplied with removable perfusion tubes and magnetic retaining clamps. A short length of silicone tubing is included to facilitate the attachment to PE flow lines.

QE-1HC assembly with Series 40 chambers



Series 40 chambers are ideal inserts for use with the **QE-1HC** and the platform has been optimized for this application. Warner Series 40 chambers are available in several designs to accommodate different applications (a representative sampling is shown to the right).

1. Begin by removing any retaining clips, perfusion tubes, and installed chambers from the **QE-1HC** base.
2. Mount a coverslip into your Series 40 chamber and place into the **QE-1HC** base.

QE-1HC assembly with glass bottomed culture dishes

The **QE-1HC** provides an ideal environment for rapid screening of cell cultures grown in 35 mm culture dishes and culture dishes from several manufacturers are supported by the platform. Generally speaking, a culture dish adapter ring must be used to provide a secure, tight fit between the culture dish and the platform.

1. Begin by removing any installed chambers from the **QE-1HC** base. Also remove any retaining clips and perfusion lines. Do not, however, remove the TCM-1 heat exchanger lines.

   Note: If the heat exchanger lines are not currently attached to **QE-1HC**, then attach and fill them before proceeding further. *See page 6 for filling instructions*.

2. Fit your culture dish with an adapter ring. Use the table below as a guide in selecting the correct ring.

Adapter ring color codes		
Blue	Willco Wells	D3512, D3522
Red	Falcon	37 mm
Gold	Falcon	38 mm
Green	Corning	25000 Series, MatTek
Silver	Nunc, IBIDI	35 mm
Black	WPI	35 mm

Note: The inner wall of the adapter ring is chamfered to accommodate the culture dish. Therefore, it is important to place the ring so that the small notch is **facing down**, otherwise you'll not be able to remove the ring from the dish or the **QE-1HC**. (Notice that the photo above shows this notch facing up.)

3. Place your culture dish with adapter ring into the **QE-1HC** base.

QE-1HC SYSTEM SETUP (including TCM-1 and CL-100)

General comments

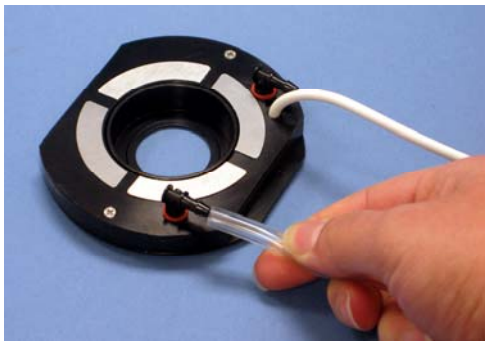
A fully assembled **QE-1HC**, including the CL-100 and TCM-1, is shown to the right. Instructions for use of the CL-100 and TCM-1 are left to their respective user's manuals.

The general system assembly procedure is to attach the heat exchanger to the **QE-1HC** and to check for a secure, leak-free connection. This is followed by placing the **QE-1HC** into an appropriate stage adapter. A connection is then made between the **QE-1HC** and the temperature controller. Finally, the dish or chamber is inserted into the platform, perfusion lines positioned, and the experiment begun.

Connecting the TCM-1 Thermal Cooling Module (heat exchanger)

Note: This step should be performed away from the microscope.

First review the assembly instructions for the TCM-1. We will use a modified procedure. The goal is to connect flow lines from the *fill reservoir* of the TCM-1, to the **QE-1HC**, and back to the fill reservoir.

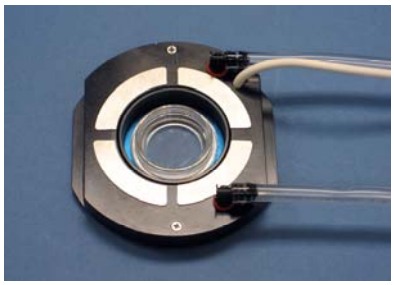


1. Begin by connecting the two **WATER JACKET CONNECTING TUBES** (supplied with the TCM-1) to the upper and lower flow ports on the rear of the TCM-1 as shown to the upper right.
2. Now cut the Tygon tubing (supplied with the TCM-1) into two equal length pieces. This tubing will run from the **QE-1HC** to the TCM-1. Make the length as short as is needed.
3. Attach one end of the two Tygon tubes to the **QE-1HC** perfusion flow ports as shown to the lower right.
4. Join the open ends of the Tygon tubes (from step 3) to the two **WATER JACKET CONNECTING TUBES** (from step 1) on the rear of the TCM-1.
5. You should now have a complete and closed tubing loop from the TCM-1 to the **QE-1HC** and back.
6. Next, remove the screw from the top of the TCM-1 to reveal the internal fluid reservoir fill port. Using the supplied fill bottle, add the algaecide (included with the TCM-1) to the fill reservoir. Refill the fill bottle with clean water and add to the reservoir. Repeat until the reservoir is full.

7. Leave the fill port open and power the TCM-1. Allow the pump to prime and wait for the circulating water to fill the **QE-1HC**. You can check filling status by watching for bubbles in the tubes. Once all bubbles are gone, apparatus is filled. Add water to the reservoir until it remains full and then seal with the screw.
8. Allow the pump to run and check for leaks.

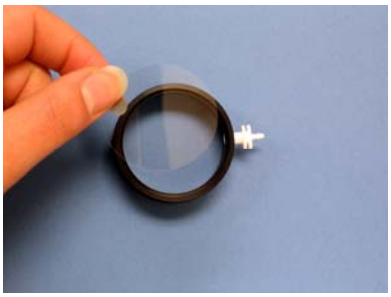
Loading the chamber or dish

9. Skip step 9 if using a Warner Series 40 chamber. Select an appropriate adapter ring for your Petri dish. Place the ring, *notch side down*, into a flat surface and gently press the dish into the ring. The dish is now ready to mount into the **QE-1HC** platform.
10. Place the chamber or dish into the **QE-1HC**. The image to the right shows a Willco Wells dish properly placed within the **QE-1HC**.



When using the dish cover

11. If needed, attach a clean cover glass onto the dish cover. This is done by removing the rubber o-ring and old cover glass from the dish cover. Replace the cover glass and secure it into place using the o-ring. A replacement o-ring is supplied with the **QE-1HC**.
12. Mount the dish cover over the Petri dish and onto the **QE-1HC**. The dish cover press-fits into place.

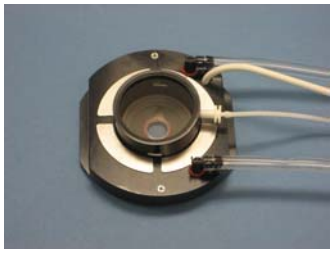


Condensation issues when using the cover

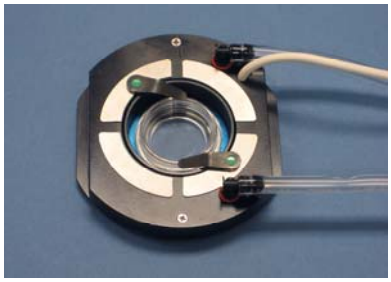
Condensation can occur on the coverglass window of the dish cover. If needed, an optional air line may be attached to the cover to mitigate this artifact.

1. Attach one end of the supplied 1/16 ID tubing to your air source and the other to the white input port on the dish cover.
2. Place the dish cover into place on the stage insert and turn on the air flow. Set the flow rate to the minimum value needed to keep the viewing window clear.
3. Excess air will escape from the **QE-1HC** from underneath the installed Petri dish.

A completed assembly with water and air flow lines attached is shown to the right.



When not using the dish cover



11. When using RC-40 Series chambers or 35 mm culture dishes without the benefit of a dish cover, then care should be taken to secure the dish into the platform. This is achieved by use of the supplied magnetic hold-downs.
12. An example of these hold-downs in use is shown to the right.

Continuing with general assembly

13. Using the supplied magnetic holder, place the TA-29 thermistor into the bath to monitor the bath temperature. The TA-29 can be connected directly to your Warner temperature controller or to the input of a voltmeter.

    Note: If using a voltmeter, then calibration is required. Place the thermistor into two solutions at known temperatures between 5-50°C and record the voltmeter reading for each temperature. Graphing a straight line between the two points will generate an interpolation curve giving the temperature at all voltages in between.

14. Attach the control line of the **QE-1HC** base to the associated 15-pin D-connector on your temperature controller (CL-100 or CL-200; socket labeled “HEATER/COOLER”).
15. Place the **QE-1HC** into an appropriate stage adapter and place the assembled platform**/**adapter complex onto your microscope stage.
16. Insert the perfusion tubes into the magnetic holders and attach the perfusion (PE) flow lines to the perfusion tubes. The larger diameter tube is the aspirator.

    Note: PE tubing is coupled to the perfusion tubes via a small length (approx 1/2 in) of silicone tubing. Place the silicone tubing over the ends of the perfusion tubes and insert your PE flow lines to the silicone tubing.

17. Place the perfusion tubes into position on either side of your chamber.
18. Place the **QE-1HC** into an appropriate stage adapter and then place the assembly onto your microscope stage.
19. The completed assembly is ready for use.

OPERATION

1. Turn *on* the power to the TCM-1.
2. Turn *on* the power to the CL-100 or CL-200 (hereafter referred to as the temperature controller).
3. Set the temperature controller **MODE SELECTOR SWITCH** into *auto*, the **INTERNAL/EXTERNAL SELECTOR SWITCH** to *internal* (see the temperature controller User’s Manual), and the **LOOP SPEED SELECTOR SWITCH** to *medium*.

4. If desired, place the TA-29 thermistor into the bath to measure the temperature at a point of interest.
5. Adjust the **SET TEMP** on the temperature controller to the desired operating temperature. Allow the system to thermally stabilize. Monitor the temperature at the point of interest using the TA-29 thermistor.
6. Make any temperature adjustments on the temperature controller to compensate for heat loss to the surrounding area.

   Additional adjustment of the heater set point may be required if any of the following change substantially during an experiment: Efforts to minimize these factors will be rewarded.

   - Perfusion solution flow rate (if present)
   - Temperature of solution entering the chamber (if flowing solutions)
   - Ambient (room) temperature
   - Air currents around chamber

APPENDIX

Cleaning/Maintenance

The **QE-1HC** is constructed of anodized aluminum and stainless steel. It can be easily cleaned with common laboratory detergents. We do not recommend the use of solvents such as ethyl alcohol (EtOH) as this will likely dissolve the glue holding the stainless steel plates onto the base. For similar reasons, do not autoclave.

Warranty and service

Warranty

The **QE-1HC** is covered by our Warranty to be free from defects in materials and workmanship for a period of one year from the date of shipment. If a failure occurs within this period, we will either repair or replace the faulty component(s). This warranty does not cover failure or damage caused by physical abuse.

In the event that repairs are necessary, shipping charges to the factory are the customer's responsibility. Return charges will be paid by Warner Instruments.

Service

We recommend that all questions regarding service be referred to our Technical Support Department. Normal business hours are 8:30 AM to 5:00 PM (EST), Monday through Friday.

Our offices are located at 1125 Dixwell Avenue, Hamden, CT 06514.

We can be reached by phone at (800) 599-4203 or (203) 776-0664. Our fax number is (203) 776-1278. E-mail us at support@warneronline.com or through the web at http://www.warneronline.com/contact.html.

Specifications

Minimum Temperature:	0°C
Maximum Temperature:	50°C
Accuracy:	±0.1°C
Water Jacket Ports:	Delrin® barbed connectors (3.175 mm OD)
Controller:	CL-100 or CL-200 Bipolar Temperature Controller
Physical Dimensions:	64.0 x 92.2 x 10.5 mm (D x L x H)
Cable Length:	2.4 m
Connector Type:	15 pin Male “D”
Weight:	105 g
Warranty:	1 year

Parts and Accessories

Cat. No.	Model	Product
64-1659	QE-1HC	Quick Exchange stage incubator
64-0352	CL-100	Bipolar Temperature Controller
64-1633	TCM-1	Thermal Cooling Module
Accessories / Replacement parts		
64-0297	SA-20KZ	Stage Adapter for the (K) stage
64-0296	SA-20LZ	Stage Adapter for the Zeiss
64-0291	SA-NIK	Stage Adapter for the Nikon 108 Dia.
64-0295	SA-OLY/2	Stage Adapter for the Olympus 110 Dia.
64-0107	TA-29	Cable with Bead Thermistor
64-1404	PT-QE1	Perfusion Tube
64-1553	MAG-6	Mini Magnetic Clamp for 18 gauge tube
64-1403	ST-QE1	Suction Tube
64-1554	MAG-7	Mini Magnetic Clamp for 16 gauge tube