WCP Series
Liquid Cooled Cold Plates

User Guide



Table of Contents

Chapter 1 Introduction 1

Safety Information 1

Chapter 2 Contents of Package 2

Chapter 3 Safety 3

Chapter 4 Operation 4

Connections 4

Connecting to a tubing system 4

Connecting Thermistor 4

Mounting TEC Elements or Heaters on the Cold Plate 4

Mounting to an Optical Table 4

Chapter 5 Specifications 6

Chapter 6 Warranty and RMA Information 8

Return of Devices 8

Chapter 7 Thorlabs Worldwide Contacts 9

Chapter 1 Introduction

The WCP Liquid Cooled Cold Plates are general purpose cold plates suited for photonics applications. They feature a mounting surface with 1/4"-20 (M6), 8-32 (M4), 4-40, and 6-32 (M4) threaded holes, which can mount our optomechanical components. All cold plates also have a bottom surface with four 8-32 (M4) or 1/4"-20 (M6) mounting holes on the corners. Additionally, thermal conductive grease or adhesives may be applied to the bottom plate when using the cold plate with a thermoelectric cooler (TEC) or a flat surface heater.

All WCP Liquid Cooled Cold Plates have an embedded TH10K thermistor. Users can interface with the thermistor through the 2.5 mm Stereo Jack on the side of the cold plate.

The cold plates are compatible with the Thorlabs LK220 Liquid Chiller and are suitable for both cooling and heating applications. Thorlabs offers a series of accessories including tubes and quick connection fittings for customers to build their own heating and cooling systems

Safety Information

Please mind all safety information concerning the care, function, and operation of this product. This information may be found in the relevant sections of the manual or in Chapter 3.

Chapter 2 Contents of Package

The package of each WCP Liquid Cooled Cold Plate contains the following items:

1 Cold Plate
2 Ring Locks for Hoses
2 Polyurethane (PU) Hoses:

- 2" Long
- 1/4" Inner Diameter
- 3/8" Outer Diameter

Chapter 3 Safety

Caution

Due to the humidity of the work area, and the difference between the operating temperature of the board and the environmental temperature levels, there is a possibility that condensation (dew) may form on the board surface.

Operating Temperature and Condensation[a]	
Relative Air Humidity	**Temperature Difference (dT °C)**
95	1
90	2
85	2 – 3
80	3 – 4
75	4 – 5
70	5 – 6
65	6 – 8
60	7 – 9
55	9 – 12
50	10 – 13
45	12 – 14
40	13 – 17
35	16 – 19
30	18 – 21
25	21 – 23
20	24 – 27

Due to the humidity of the work area, and the difference between the operating temperature of the board and the environmental temperature levels, there is a possibility that condensation may form on the breadboard surface. This table shows the approximate temperature difference between the breadboard and the environment that would cause condensation to form at a specific relative humidity.

Chapter 4 Operation

Connections

Connecting to a tubing system

Connect the two PU hoses to the barbed fitting on the side of the cold plate.
Hold the ring locks open with a pair of needle-nose pliers while placing it over the hose. When the ring locks are over the barbed fitting, release the pressure from the pliers, locking the tube in place
Repeat Step 2 on the other hose and fitting.
Connect the open end of the hose to the QVF9 or QVM9 Valved In-Line Coupling Inserts (not included)
Connect the heating/cooling system to the In-Line Coupling Accessories so that the cold plate can be linked to the system.

Connecting Thermistor

On the side of the cold plate, there is a 2.5 mm stereo jack that allows users to interface with the TH10K thermistor embedded in the cold plate in order to measure temperature.

The pin assignment of the 2.5 mm stereo plug (not included) is shown below.

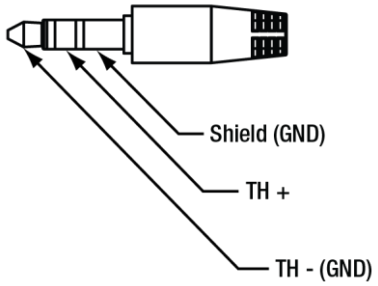


Figure 1 Pin Assignment of 2.5 mm Stereo Plug

Mounting TEC Elements or Heaters on the Cold Plate

The bottom surface of the cold plate is ideal for mounting a thermoelectric cooler or heater. We recommend using our TCDT1 or TCDT2 Thermally Conductive Double-Sided Tape (not included), or other similar thermally conductive adhesives to fix a TEC element or heater to the cold plate.

Mounting to an Optical Table

The WCP Liquid Cooled Cold Plates feature mounting holes both on the side and on the base of the plate. One slot on each side of the cold plates may be used for secure mounting as well. The cold plate can be mounted to an optical breadboard using our **standard posts** and **table clamps**.



Figure 1 Mounting a WCP2X2 to an Optical Breadboard

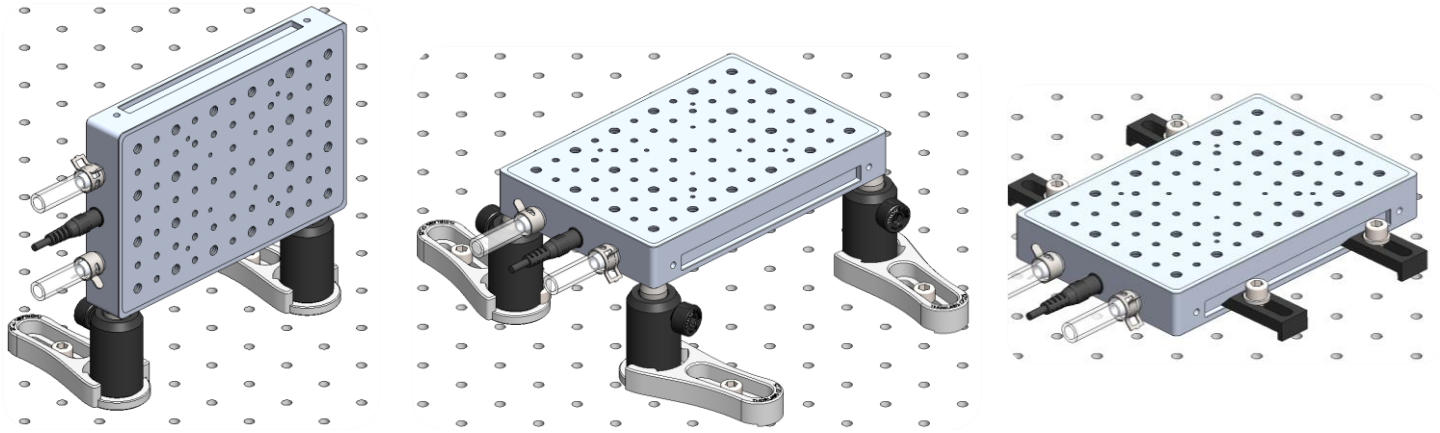


Figure 2 Mounting a WCP4X6 to an Optical Breadboard

Chapter 5 Specifications

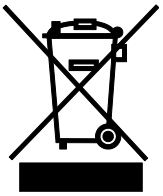
General Specifications	
Material	6063 T5 Aluminum
Finish	Clear Anodized
Flatness	±0.006" (0.15 mm) Over the Entire Surface
Operation Temperature Range	-15°C to 60°C
Sensor Type	TH10K Thermistor
Sensor Connector Type	2.5 mm Stereo Jack
Pressure Rating	80 psi
Push-Fit Pipe Fitting Inner Diameter	1/4" (6 mm)

Thermistor Specifications	
Resistance at 25°C ($R_{25°C}$)	10 kΩ
Temp. Accuracy	±1 °C @ 25°C
Dissipation Constant	1.4 mW/°C
Time Constant	15 s
Operating Range	-50 to 150 °C
Temperature Coefficient	-4.40 %/°C

Resistance as a Function of Thermistor Temperature, R_t				
Formula	$R_t = R_{25°C}(e^{(A+\frac{B}{T}+\frac{C}{T^2}+\frac{D}{T^3})})$ **T = Temperature in Kelvin (K)**			
Temp Range (°C)	**A**	**B**	**C**	**D**
-50 to -1	-1.6443767E+01	6.1080608E+03	-4.4141671E+05	2.4159818E+07
0 to 49	-1.5470381E+01	5.6022839E+03	-3.7886070E+05	2.4971623E+07
50 to 99	-1.4807463E+01	5.1550854E+03	-2.9717659E+05	2.2904187E+07
100 to 150	-1.4862658E+01	5.2676519E+03	-3.5374848E+05	3.1207901E+07

Thermistor Temperature as a Function of Resistance				
Formula	$$T = \frac{1}{a + b\ \ln\left(\frac{R_t}{R_{25°C}}\right) + c\ \ln\left(\frac{R_t}{R_{25°C}}\right)^2 + d\ \ln\left(\frac{R_t}{R_{25°C}}\right)^3}$$ **R_t = Actual Measured Thermistor Resistance**			
Temp Range (°C)	**a**	**b**	**c**	**d**
692,600 to 32,770	3.357042E-03	2.521485E-04	3.374328E-06	-6.495731E-08
32,770 to 3,599	3.354017E-03	2.561724E-04	2.140094E-06	-7.240522E-08
3,599 to 681.6	3.353048E-03	2.542023E-04	1.143116E-06	-6.938356E-08
681.6 to 187	3.353617E-03	2.537720E-04	8.543327E-07	-8.791226E-08

Chapter 6 Warranty and RMA Information



Annex I

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out "wheelie bin" logo (see right), were sold to and are currently owned by a company or institute within the EC and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. "End of life" units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the user's responsibility to delete all private data stored on the device prior to disposal.

Return of Devices

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

Chapter 7 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at **www.thorlabs.com/contact** for our most up-to-date contact information.



USA, Canada, and South America
Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

UK and Ireland
Thorlabs Ltd.
sales.uk@thorlabs.com
techsupport.uk@thorlabs.com

Europe
Thorlabs GmbH
europe@thorlabs.com

Scandinavia
Thorlabs Sweden AB
scandinavia@thorlabs.com

France
Thorlabs SAS
sales.fr@thorlabs.com

Brazil
Thorlabs Vendas de Fotônicos Ltda.
brasil@thorlabs.com

Japan
Thorlabs Japan, Inc.
sales@thorlabs.jp

China
Thorlabs China
chinasales@thorlabs.com



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www.thorlabs.com