Outsourcing your cooling loop to a company that builds thousands of cooling systems a year guarantees a quality product and enables you to focus your engineering efforts on your own area of expertise. Turnkey systems also accelerate the design process, reduce inventory levels, and simplify production. End users prefer integrated systems because they are easy to install and simple to operate.

Our three types of cooling systems can be tailored to your precise requirements with a range of standard options, or completely custom designed. Lytron’s cooling systems are used in a variety of applications including medical and industrial lasers, analytical instruments, oncology machines, data centers, electron microscopes, printing equipment, plasma etch systems, and solder reflow ovens.
Lytron offers three types of cooling systems—compressor-based chillers, liquid-to-liquid cooling systems, and ambient cooling systems. Each unit can be modified with a wide range of standard options, and for OEM volumes, we will design and manufacture total custom systems. Our cooling system technologies include:

**Recirculating Chillers (Kodiak®)**
*Cooling capacities up to 6 kW*
Kodiak compressor-based recirculating chillers are an ideal solution when you need precise temperature control (±0.1°C) or cooling below ambient temperature. Applications include medical equipment, medical and industrial lasers, electron microscopes, analytical instrumentation, semiconductor processing, and printing equipment.

**Liquid-to-Liquid Cooling Systems (LCS™)**
*Cooling capacities up to 150 kW*
Liquid-to-Liquid cooling systems offer precise temperature control of process water and transfer the waste heat to facility water. They are ideal for high heat load applications where precise temperature control (±0.5°C) is needed and chilled facility water is available. Applications include medical equipment, datacom equipment centers, industrial machine tools, printing equipment, and cabinet cooling.

**Ambient Cooling Systems (Modular Cooling System—MCS™)**
*Cooling capacities up to 3.5 kW*
Modular Cooling Systems are non-refrigerated cooling systems. They are a cost-effective alternative to recirculating chillers for applications where precise temperature control and cooling below ambient temperature are not required. Applications include analytical equipment, cabinet cooling, medical equipment, and laser systems.
This flow chart guides you through the process of selecting the most appropriate cooling system for your application. Start at the top and simply follow the yes/no prompts.

Next, select the most appropriate product size using the ‘how to select a product’ page at the end of each system section. Finally, modify it with your pump, controller, and additional option selections.

For assistance with product selection, call a Lytron applications engineer at +1-781-393-7300 or use our interactive product selector at www.Lytron.com.

Our on-line product selector at www.Lytron.com allows you to enter your system parameters, and the software determines the best product.
Kodiak® Recirculating Chillers

Cooling capacities up to 6 kW

Kodiak compressor-based recirculating chillers are the ideal solution when you need precise temperature control or cooling below ambient temperature. Kodiak chillers offer outstanding performance and high reliability as well as quiet operation and ease-of-use.

- **Precise temperature control:** Our custom PID controller, large thermal mass tank, and advanced refrigeration control circuit ensure that the Kodiak maintains ±0.1°C stability.

- **Quiet operation:** The components inside the Kodiak have been performance-matched for quiet operation. In addition, vibration-isolation of the pump and compressor, and foam interfaces between sheet metal panels minimize vibration noise.

- **Advanced ergonomic design:** Our chillers look as good as the equipment they cool. Our industry-leading industrial design is as functional as it is attractive.

- **Many options and features:** The Kodiak was designed for flexibility—a wide variety of pumps, controllers, and additional safety and monitoring features allow you to tailor a Kodiak to your specific application.

- **High reliability:** We are so confident that our Kodiak chillers will provide years of trouble-free operation that we offer a 2-year top-to-bottom warranty.

- **ETL tested to UL 61010A-1, CE certified, and WEEE compliant**

**Custom Spotlight:**

A customer required the cooling capacity of an RC045 but their application required reduced acoustic levels. Lytron enlarged the condenser and used variable speed fans to limit the noise. We also acoustically isolated the pump. These changes provided a chiller with lower sound levels to meet their requirements.

See page 54 for more custom cooling systems.
Cooling capacities up to 6kW

- Low flow
- Alarm
- Low level (optional)
- Tactile feedback buttons
- Pressure display (optional)
- Large alphanumeric display with temperature in °C or °F
- Over temperature (optional)
- Cooling on/off indicator
- Low temperature (optional)
- International fault symbols
- Alarm mute

- Pump options available for your specific application
- Split-chassis, modular design for easy customization
- High-efficiency evaporator
- Compressor
- Vibration-isolating feet on compressor and pump
- Large capacity tank improves temperature stability
- Coolant return
- System drain
- Circuit breaker
- Coolant supply
- IEC320 power inlet
- Fault condition interface (optional)
- RS232 port (optional)
- Manually adjustable flow valve (optional)
- Alarm
- Low level (optional)
- Tactile feedback buttons
- Pressure display (optional)
Thermal Performance Graphs

RC006-RC011 Performance

RC022-RC045 Performance

System Pump Graphs

Kodiak Positive Displacement Pumps

RC006-RC009 Centrifugal and Turbine Pumps

RC011-RC022 Centrifugal and Turbine Pumps

RC030-RC045 Centrifugal and Turbine Pumps

1 Temperature represents output temperature of water assuming 20°C ambient air conditions. Performance subject to change due to variations such as fluid type or operating conditions. 2 Includes pressure drop through chiller. See page 53 for guidance on selecting a pump. 3 Pressure relief is factory set at 90 psi (6.2 bar). Other settings available on request. 4 BG/CG pumps can be operated at flow rates as low as 0.5 gpm for the RC011 and RC022.
Specifications and Part Number Configuration

Kodiak

<table>
<thead>
<tr>
<th>Cooling capacity¹</th>
<th>RC006</th>
<th>RC009</th>
<th>RC011</th>
<th>RC022</th>
<th>RC030</th>
<th>RC045</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTU/Hr</td>
<td>825</td>
<td>1050</td>
<td>1650</td>
<td>2400</td>
<td>3450</td>
<td>5900</td>
</tr>
<tr>
<td>HP</td>
<td>2.8</td>
<td>3.6</td>
<td>5.6</td>
<td>8.2</td>
<td>11.8</td>
<td>20.1</td>
</tr>
</tbody>
</table>

Compressor capacity: HP ½ ½ ½ ½ 1 1½

Temperature stability²: ± 0.1°C

Fluid connections: ¼'' FNPT

Reservoir capacity: 1 gal/4 liters 2 gal/8 liters 6 gal/23 liters

Coolant temperature range: 40°F to 95°F/5°C to 35°C

Ambient temperature range: 50°F to 95°F/10°C to 35°C

Dimensions (W x D x H): inches 12.5 x 19.0 x 22.0 14.8 x 24.5 x 26.5 21.4 x 27.8 x 31.9

Weight: dry lbs (kg) 97 (44) 100 (45) 122 (55) 166 (75) 260 (118) 270 (122)

Electrical configurations and full load amperage³:

G03: 115V, 60 Hz, 1ph 9.9 12.2 14.3 n/a n/a n/a

H03: 230V, 50 Hz, 1ph 4.5 5.3 6.3 9.5 13.7 17.2

J03: 208/230V, 60 Hz, 1ph n/a 5.8 7.4 10.0 14.5 19.6

Pump options (refer to 'Selecting a pump' page 53 and system pump graphs, page 36):

BB: PDP4, Brass, 1.3 gpm/4.9 lpm

BC: PDP4, Brass, 1.8 gpm/6.8 lpm

BE: PDP4, Brass, 2.3 gpm/8.7 lpm

BG: PDP4, Stainless Steel, 4.3 gpm/16.3 lpm

CB: PDP4, 5, Stainless Steel, 1.3 gpm/4.9 lpm

CC: PDP4, 5, Stainless Steel, 1.8 gpm/6.8 lpm

CE: PDP4, Stainless Steel, 2.3 gpm/8.7 lpm

CG: PDP4, Stainless Steel, 4.3 gpm/16.3 lpm

AA: Centrifugal, ½ HP

DA: Centrifugal, ⅔ HP

EC: Turbine, ⅔ HP

EB: Turbine, ½ HP

Controller options (see page 39):

Package 1: Digital temperature display, calibration offset, low flow shut-off, auto-restart, °C/°F toggle.

Package 2: Package 1 plus digital pressure sensing, low level, low/high temperature, pressure display, audible alarm and alarm mute, fault shut-off (toggel off), relay contacts.

Package 3: Package 2 plus RS232.

Available options (full description of these options can be found on page 39):

External flow valve

External pressure relief valve

Anti-siphon system

Air filter

5 micron coolant filter⁶

Heater⁹

Internal insulation package

Low temperature operation

Water-cooled condenser

0.1°C set point

DI water cartridge⁸

High purity plumbing

PAD compatibility

Remote start

= standard  ● = available option  ¹ At 20°C setpoint, 20°C ambient, 60Hz input supply  ² Assumes stable load  ³ With standard pump  ⁴ PDP = Positive Displacement Pump  ⁵ Only available with high purity plumbing  ⁶ Actual flow rate depends on system pressure drop. See page 53 for information on how to calculate flow rate  ⁷ 5 piece min order  ⁸ Not available with AA and DA pump  ⁹ Not available in G03 electrical configuration  ¹⁰ Recommended when selecting high purity option

RC011 G03 BB 2 M RC011 chiller with G03 (115V, 60 Hz, 1ph) electrical configuration, a BB pump, and controller package 2

Customization options (A 4 digit option code will be assigned at time of order, based on selected options. Leave blank if no additional options selected.)

Use our on-line product selector at www.Lytron.com to automatically select the right chiller based on your specifications.

www.Lytron.com  •  +1-781-933-7300
## Kodiak Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection Options</strong></td>
<td></td>
</tr>
<tr>
<td><strong>External flow valve</strong>: HIGHLY RECOMMENDED. A manually adjustable globe valve installed on the back of the chiller in parallel with the chiller coolant supply/return.</td>
<td>Allows the operator to control the flow rate to the application. As the external flow valve is opened, more of the flow bypasses the application.</td>
</tr>
<tr>
<td><strong>External pressure relief valve</strong>: A manually adjustable pressure relief valve (50 to 100 psig) installed on the back of the chiller in parallel with the chiller coolant supply/return.</td>
<td>Allows the chiller to continue to run and maintain temperature if the flow to the application is interrupted. When flow to the application is stopped, the pressure relief valve opens and bypasses flow to the chiller’s return. It can also be used to prevent the chiller supply from exceeding a predetermined pressure setting.</td>
</tr>
<tr>
<td><strong>Anti-siphon system</strong>: Check and solenoid valves installed internal to the chiller on the supply and return lines, respectively.</td>
<td>Allows the chiller to be installed at an elevation below the application. Prevents backflow and subsequent overflowing of the chiller’s vented tank (if not installed, fitting leaks in the application can allow air to displace the coolant, resulting in backflow to the tank).</td>
</tr>
<tr>
<td><strong>Air filter</strong>: Internally mounted on the air inlet to the condenser coil.</td>
<td>Filters incoming air to the chiller’s condensing coil, preventing dust build up which can lead to decreased performance. The easy-access filter is simple to replace, reducing the need to clean the condensing coil and refrigeration components.</td>
</tr>
<tr>
<td><strong>5 micron coolant filter</strong>: Externally mounted on the supply from the chiller.</td>
<td>Filters process coolant being supplied to the application, protecting equipment from blockage or damage due to particulate buildup and extending pump life.</td>
</tr>
<tr>
<td><strong>Special Applications Options</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Heater</strong>: Submerged 2,000 Watt electric resistance heater with built-in over temperature shut-off (non-adjustable).</td>
<td>Allows chiller to reach elevated set points faster (useful for applications in cold start-up situations or where the coolant set point is frequently cycled). This feature does not extend the coolant temperature range of the chiller.</td>
</tr>
<tr>
<td><strong>Internal insulation package</strong>: Insulated tank, pump head, and coolant lines.</td>
<td>Eliminates condensation forming on the components in contact with the fluid when operating chiller at set points below the ambient dew point.</td>
</tr>
<tr>
<td><strong>Low temperature operation</strong>: Chiller coolant temperature range is -5°C to +25°C. (Note: internal insulation package must also be selected.)</td>
<td>Optimizes performance for low temperature operation and provides additional low temperature cooling capacity compared to standard chillers. Contact Lytron’s applications engineering department for performance graphs.</td>
</tr>
<tr>
<td><strong>Water-cooled condenser</strong>: Refrigerant is condensed using water (rather than ambient air) via a liquid-to-liquid heat exchanger.</td>
<td>Heat that would normally be rejected to the ambient environment is transferred to an external liquid coolant source, avoiding room warming and possible air conditioning overload. Also, water-cooled chillers are quieter because there is no condenser fan. Contact Lytron for required facility liquid coolant flow rate and temperature requirements.</td>
</tr>
<tr>
<td><strong>0.1°C set point</strong>: Allows 0.1°C increments of the set point and display temperatures.</td>
<td>Allows more precise control of the coolant delivery temperature. Available in °C only.</td>
</tr>
<tr>
<td><strong>Fluid Compatibility Options</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Deionization (DI) water cartridge</strong>: Externally mounted DI cartridge (no indicator light) on the return to the chiller.</td>
<td>Filters ions from coolant to maintain a fluid resistivity level between 1 and 3 megohm/cm by partial flow through the resin bed. This feature does not include a resistivity indicator light. High purity plumbing is recommended with the DI water cartridge.</td>
</tr>
<tr>
<td><strong>High purity plumbing</strong>: Includes nickel-brazed evaporator and nickel-plated or nylon fittings compatible with DI water. Not compatible with brass pumps.</td>
<td>All wetted materials are fully compatible with DI water to prevent component corrosion.</td>
</tr>
<tr>
<td><strong>PAO compatibility</strong>: Includes pump, fittings, hose, and oil filter compatible with polyalphaolefin (PAO). Anti-siphon system and internal insulation packages are included in this option.</td>
<td>All wetted materials are fully compatible with PAO. Contact Lytron for PAO performance curves.</td>
</tr>
<tr>
<td><strong>Convenience Options</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Remote start</strong>: Chiller power can be cycled through a computer or relay.</td>
<td>Allows an external circuit to control the chiller on/off function via dry contacts on the rear of the chiller.</td>
</tr>
</tbody>
</table>

1 Please refer to the chiller technical manual at www.Lytron.com for further discussion of these features.
Kodiak Controllers

<table>
<thead>
<tr>
<th>Controller Option</th>
<th>Functionality</th>
<th>Controller Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital temperature display</td>
<td>Easy-to-read display in either °C or °F.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Calibration offset</td>
<td>Allows temperature display to be offset to represent the temperature at a different point within the cooling circuit.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Low flow shut-off fault</td>
<td>Alerts user to a lack of coolant flow and shuts down the chiller to prevent the refrigeration system from freezing.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Auto-restart</td>
<td>Automatically returns chiller to its operating status prior to interruption of power, e.g., if the chiller was on, it will turn back on when power is restored.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>°C/°F toggle</td>
<td>Enables temperature display to be viewed in °C or °F.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Audible alarm</td>
<td>Audible warning of all fault conditions.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Alarm mute</td>
<td>Silences audible alarm until the alarm is cleared or the chiller turned off.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Digital pressure sensing</td>
<td>Displays pump output pressure (psig or bar) and allows it to be transmitted through RS232.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Low level fault</td>
<td>Alerts user that the coolant level in the reservoir is at a critically low level (approaching the level of the pump's suction line). Switches chiller off if 'fault shut-off' is on.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Low/high temperature fault</td>
<td>Alerts user that the coolant temperature is outside of the user's defined set-point limits. Switches chiller off if 'fault shut-off' is on.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Fault shut-off (toggle on/off)</td>
<td>Allows chiller to be programmed to shut down on fault (on) or continue to run during fault conditions (off). The chiller will always shut down on the low flow shut-off alarm.</td>
<td>● ● ●</td>
</tr>
<tr>
<td>Relay contacts (normally open or normally closed)</td>
<td>Fault conditions of the chiller can be monitored by applying a low voltage power signal across dry contacts at the rear of the chiller. (Power loss to the chiller is not a fault condition.³) Mating connector—AMP part number 350715-1 and 350547-1</td>
<td>● ● ●</td>
</tr>
<tr>
<td>RS232 communications</td>
<td>Allows complete control of all the chiller's controller features (changing/monitoring coolant set point, monitoring pressure, and fault alarms, etc.) from a remote computer for monitoring, control, and data logging.</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

Kodiak Accessories

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant Filter Kit:</td>
<td>½˝ fluid connections. Contains 5 micron filter, filter housing, mounting bracket ,1´ hosing, base clamps, and assembly instructions.</td>
<td>200-0441</td>
</tr>
<tr>
<td>Plumbing package:</td>
<td>½˝ fluid connections. Contains 50' Nylabraid™ hose, 50' Armorflex™ insulation, male NPT to barb fittings, hose clamps.</td>
<td>200-0193</td>
</tr>
<tr>
<td>External pressure relief valve:</td>
<td>½˝ fluid connections. For applications requiring reduced pressure. This kit contains a pressure relief valve, 2 tees, hose clamps, and plumbing instructions. Assembly required.</td>
<td>200-0196</td>
</tr>
<tr>
<td>External manually adjustable flow valve:</td>
<td>½˝ fluid connections. For applications requiring flow control. Kit contains flow valve, 2 tees, hose clamps, and plumbing instructions. Assembly required.</td>
<td>200-0298</td>
</tr>
<tr>
<td>115V power cord:</td>
<td>25´</td>
<td>250-0092</td>
</tr>
<tr>
<td>230V power cord:</td>
<td>25´</td>
<td>250-0093</td>
</tr>
<tr>
<td>RS232 cable:</td>
<td>10´</td>
<td>250-0091</td>
</tr>
<tr>
<td>Dry contact cable:</td>
<td>10´</td>
<td>250-0159</td>
</tr>
<tr>
<td>5 micron replacement coolant filters²</td>
<td></td>
<td>330-0022</td>
</tr>
<tr>
<td>Deionization cartridge</td>
<td></td>
<td>430-0330</td>
</tr>
</tbody>
</table>

¹Package 2 is the standard package ²10 piece minimum
Selecting the proper recirculating chiller is a function of four factors:

1. The heat load generated by the device being cooled (Q)
2. The maximum acceptable temperature of the fluid exiting the heat source (T\text{OUT})
3. Available fluid flow rate (\dot{v})
4. Ambient operating conditions

Often, an equipment manufacturer will specify the set point temperature and flow rate of the required chiller. In this case, selecting a chiller is simple. Simply mark the intersection of the desired cooling capacity and the set point temperature on the chiller graph. Any chiller with a performance curve above or equal to this point will provide enough capacity. Next, use the pump graph to select a pump that meets the desired flow rate.

**Example 1:**
A chiller needs to supply 2 gpm at 20°C to an x-ray tube that generates 2,000 W of heat. The power supply is 60 Hz. Marking this point on the chiller graph we can see that an RC022 would be an appropriate choice. From looking at the pump curves we see that a BE pump would provide the necessary flow rate.

If the Heat Load (Q) is known, but the Flow Rate is unknown, the following equation can be used to determine the required flow rate.

\[
\dot{v} = \frac{Q}{(\rho \cdot C_p \cdot (T\text{OUT} - T\text{IN}))}
\]

where:
- \dot{v} = fluid flow rate
- Q = heat load
- \rho = fluid density
- C_p = fluid specific heat
- T\text{OUT} = max. fluid temp. exiting the heat source
- T\text{IN} = fluid temp. exiting the chiller

**Example 2:**
A laser head generates 2,000 Watts (6,824 BTU/Hr) of heat. The fluid temperature must not exceed 20°C (68°F). With a cooling fluid of water, 60 Hz power, at 20°C ambient, what is the appropriate Lytron recirculating chiller?

Using the thermal performance graphs (fig 1), draw a horizontal line at the required heat load (2000 W). As shown, the RC022 would match this requirement at 13°C (55°F). This is T\text{IN} (the temperature exiting the recirculating chiller). Therefore, the calculation then becomes:

\[
\dot{v} = \frac{2000 \text{ W}}{990 \text{ kg/m}^3 \cdot 4180 \text{ J/kg°C} \cdot (20°C - 13°C)}
\]
\[
\dot{v} = 6.9 \times 10^{-5} \text{ m}^3/\text{s or 1.1 gpm}
\]

\[
\rho = 990 \text{ kg/m}^3, \quad C_p = 4180 \text{ J/kg°C}
\]

Next, determine if the recirculating chiller can meet the required flow rate. As shown on the system pump graph (fig 2), the 1.3 gpm positive displacement pump (standard on the RC022) would more than satisfy the flow requirement.

---

**Fig 1: RC022-RC045 Performance**

**Fig 2: Kodiak Positive Displacement Pumps**

*To avoid thermal calculations, use the cooling system product selector at www.Lytron.com.*
Lytron’s Liquid-to-Liquid Cooling System (LCS20) offers precise temperature control of process water and transfers the waste heat to your facility water via a liquid-to-liquid heat exchanger. It is an excellent solution for high heat-load or high ambient temperature applications where chilled facility water is available.

- **Large cooling capacity in a compact package**: An LCS is a great solution for high heat loads where space is at a premium. With 20 kW of cooling, our LCS20 provides over three times the capacity of a comparably-sized recirculating chiller.

- **Tight temperature control**: We maintain the fluid temperature to within ±0.5°C, despite fluctuations in the facility water temperature and flow rate. Our PID controller varies the facility water flow rate through the heat exchanger based on the process water temperature to achieve this stability.

- **Contamination-free**: The process cooling loop of the LCS is isolated from the facility water. This separation protects your equipment, keeping it free from facility water contaminants. It also eliminates the risk of condensation near your equipment if the facility water is below the dew point.

- **Reliable, quiet, and energy efficient**: The LCS system contains very few moving parts—this makes it inherently reliable and quiet. The only components requiring power are the pump, motor, and controller, so it is also extremely energy efficient.

- **ETL tested to UL 61010A-1, CE certified, and WEEE compliant**

**Custom Spotlight:**

A customer had a total heat load of 25 kW and access to facility water. They needed to cool 4 independent heat sources and wanted the cooling system integrated into their machine. Lytron provided a fully-engineered skinless system that included integrated temperature and pressure sensors and was designed for serviceability.

*See page 54 for more custom cooling systems.*
The increasing heat load densities in datacom equipment centers require ever more sophisticated approaches to cooling, including liquid cooling. Designed for data center cooling, the LCS50 is a 150kW liquid-to-liquid cooling system that supplies precise temperature-controlled coolant to your liquid cooled racks and transfers the waste heat to facility water.

- **High reliability** The LCS50 is designed to be extremely reliable. Redundant pumps ensure the system always provides coolant to your racks. The controller tracks the actual operation hours for each pump and the backup pump is tested periodically to guarantee its operation if needed. The controller warns you of any system problems via various alarms and offers lockout protection and communication packages for remote monitoring.

- **Protection and isolation of datacom equipment:** According to ASHRAE, the benefits of an LCS for liquid cooling include “preventing condensation by delivering coolant to the rack, equipment, or electronics above the dew point,” “isolating the electronics from the harsher facility water,” and “minimizing the coolant volume near the technology so that a coolant leak would be less catastrophic.”

- **Easy to install:** The unit is equipped with casters for easy mobility and leveling feet that disengage the casters. The inlets and outlets of the facility (primary) and process (secondary) coolant loops can be configured for a raised floor or overhead plumbing. The flow rate is adjustable using an internal manually adjustable flow control valve.

- **Energy efficient:** Liquid cooling the electronics’ cabinet is significantly more energy efficient than air cooling.

- **UL/CE/CSA, RoHS, and WEEE compliant**


**Custom Spotlight:**
A customer needed a liquid-to-liquid cooling system for medical imaging equipment. This custom unit contains four separate cooling loops, three liquid cooling and one air cooling, all managed by the unit's controller.

See page 54 for more custom cooling systems.
Specifications

LCS

**LCS20 Thermal Performance Graph**

- Q/ITD (kW/°C) vs. Process Water Flow Rate (GPM)
- Curves for 2 GPM, 4 GPM, 6 GPM, 8 GPM, 10 GPM

**LCS20 Pump Graph**

- Fluid Pressure (PSI) vs. Process Water Flow Rate (GPM)
- Curves for DE 50 Hz, DE 60 Hz, EB/FB 50 Hz, EB/FB 60 Hz, BG/CG 50 Hz, BG/CG 60 Hz

**LCS50 Thermal Performance Graph**

- Q/ITD (kW/°C) vs. Process Water Flow Rate (GPM)
- Curves for 25 GPM, 50 GPM, 75 GPM, 100 GPM, 125 GPM, 150 GPM

**LCS50 Pump Graph**

- Fluid Pressure (PSI) vs. Process Water Flow Rate (GPM)
- Curves for DE 50 Hz, DE 60 Hz

**LCS50 Facility Side Pressure Drop**

- Pressure Drop (psid) vs. Facility Flow Rate (GPM)

**LCS50 Plumbing Diagram**

1. Facility side flow rates are represented by curves
2. Pressure relief is factory set at 90psi (6.2 bar). Other settings available on request.
3. Includes pressure drop through system. See LCS specifications and options for pump descriptions.
**Specifications and Part Number Configuration**

**LCS20**

**LCS50**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>LCS20</th>
<th>LCS50</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cooling capacity</strong></td>
<td>11 kW (37 kBTU/Hr) at 4.3 GPM process and 10 GPM facility and 10°C</td>
<td>150 kW (512 kBTU/Hr) at 75 GPM process and 100 GPM facility and 10°C</td>
</tr>
<tr>
<td><strong>Temperature stability</strong></td>
<td>± 0.5°C</td>
<td>± 1.0°C</td>
</tr>
<tr>
<td><strong>Fluid connections</strong></td>
<td>¾” FNPT</td>
<td>2” copper (cup) terminated at bottom of unit</td>
</tr>
<tr>
<td><strong>Reservoir capacity</strong></td>
<td>6 gal/22 liters</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Coolant temperature range</strong></td>
<td>50°F to 122°F/10°C to 512°F</td>
<td>41°F to 95°F/5°C to 35°C</td>
</tr>
<tr>
<td><strong>Facility water temperature range</strong></td>
<td>50°F to 95°F/10°C to 35°C</td>
<td>39°F to 54°F/4°C to 12°C</td>
</tr>
<tr>
<td><strong>Ambient temperature range</strong></td>
<td>41°F to 104°F/5°C to 40°C</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Facility flow rate</strong></td>
<td>2 to 10 gpm/11 to 38 lpm</td>
<td>25 to 100 gpm/95 to 379 lpm</td>
</tr>
<tr>
<td><strong>Facility pressure</strong></td>
<td>100 psi/7 bar max</td>
<td>300 PSI/ 21 bar max</td>
</tr>
<tr>
<td><strong>Facility pressure drop</strong></td>
<td>15 psi/1 bar at max flow</td>
<td>See Pressure Drop Graph</td>
</tr>
<tr>
<td><strong>Dimensions (W x D x H)</strong></td>
<td>21.4 x 27.8 x 31.9 inches</td>
<td>29.0 x 36.0 x 76.0 inches</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>225 lbs</td>
<td>750 lbs</td>
</tr>
</tbody>
</table>

**Electrical configurations and full load amperage**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>LCS20</th>
<th>LCS50</th>
</tr>
</thead>
<tbody>
<tr>
<td>G01: 100-120V, 50/60 Hz</td>
<td>7.2 Amps</td>
<td>N/A</td>
</tr>
<tr>
<td>J01: 200-240V, 50/60 Hz</td>
<td>3.6 Amps</td>
<td>N/A</td>
</tr>
<tr>
<td>L01: 208-230 VAC, 50/60 Hz, 3ph</td>
<td>N/A Amps</td>
<td>18 Amps</td>
</tr>
<tr>
<td>P01: 460 VAC, 50/60 Hz, 3ph</td>
<td>N/A Amps</td>
<td>9 Amps</td>
</tr>
</tbody>
</table>

**Pump options**

- **BG**: PDP, Brass, 4.3 gpm/16.3 lpm
- **CG**: PDP, Stainless Steel, 4.3 gpm/16.3 lpm
- **DA**: Centrifugal, ½ HP
- **EB**: Turbine, ½ HP
- **FB**: Turbine, Stainless Steel, ½ HP
- **DE**: Centrifugal, 5 HP, 2 per system

**Controller options**

- **LCS20 Only Package 1**: Digital temperature display, °C/F toggle, over-temperature indicator, calibration offset
- **LCS20 Only Package 2**: Package 1 plus low level indicator, low flow indicator, analog output
- **LCS50 Only Package 3**: RS232 controller with digital temperature, flow, and pressure display; mixing valve status reporting; visual alarms for low/high temperature, low flow, pump, power, or sensor failure; relay contacts for each alarm; and lock-out protection.
- **LCS50 Only Package 4**: Package 3 plus visual alarm and relay contacts for dew point; option to control set point based on dew point offset or on fixed temperature with user defined dew point override.
- **LCS50 Only Package 5**: RS232 and Ethernet controller with digital temperature, flow, and pressure display; mixing valve status reporting; visual alarms for low/high temperature, low flow, pump, power, or sensor failure; relay contacts for each alarm; and lock-out protection.
- **LCS50 Only Package 6**: Package 5 plus visual alarm and relay contacts for dew point; option to control set point based on dew point offset or on fixed temperature with user defined dew point override.

**Available options**

- External flow valve
- External pressure relief valve
- 5 micron coolant filter
- DI water cartridge
- High purity plumbing
- Heater
- Internal insulation package
- Facility side monitoring
- Coolant filters
- Alternative fluid inlet and outlet location
- Internal insulation package (process side)
- Dual mixing valves

1 = standard  ○ = available option

*With standard pump = PDP = Positive Displacement Pump. Only available with high purity plumbing.

A 4 digit option code will be assigned at time of order, based on selected options.
### LCS20 Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection Options</strong></td>
<td></td>
</tr>
<tr>
<td>External flow valve: HIGHLY RECOMMENDED. A manually adjustable globe valve installed on the back of the LCS in parallel with the LCS coolant supply/return.</td>
<td>Allows the operator to control the flow rate to the application. As the external flow valve is opened, more of the flow bypasses the application.</td>
</tr>
<tr>
<td>External pressure relief valve: A manually adjustable pressure relief valve (50 to 100 psig) installed on the back of the LCS in parallel with the LCS coolant supply/return.</td>
<td>Allows the LCS to continue to run and maintain temperature if the flow to the application is interrupted. When flow to the application is stopped, the pressure relief valve opens and bypasses flow to the LCS’s return. It can also be used to prevent the LCS supply from exceeding a predetermined pressure setting.</td>
</tr>
<tr>
<td>5 micron coolant filter: Externally mounted on the supply from the LCS.</td>
<td>Filters process coolant being supplied to the application, protecting equipment from blockage or damage due to particulate buildup and extending pump life.</td>
</tr>
<tr>
<td><strong>Special Applications Options</strong></td>
<td></td>
</tr>
<tr>
<td>Heater: Submerged 2,000 Watt electric resistance heater with built-in over temperature shut-off (non-adjustable).</td>
<td>Allows LCS to reach elevated set points faster (useful for applications in cold start-up situations or where the coolant set point is frequently cycled). This feature does not extend the coolant temperature range of the LCS.</td>
</tr>
<tr>
<td>Internal insulation package: Insulated tank, pump head, and coolant lines.</td>
<td>Eliminates condensation forming on the components in contact with the fluid when operating LCS at set points below the ambient dew-point.</td>
</tr>
<tr>
<td><strong>Fluid Compatibility Options</strong></td>
<td></td>
</tr>
<tr>
<td>Deionization (DI) water cartridge: LCSs come with an externally mounted DI cartridge (no indicator light) on the return to the LCS.</td>
<td>Filters ions from coolant to maintain a fluid resistivity level between 1 and 3 megohm/cm by partial flow through the resin bed. This feature does not include a resistivity indicator light. High purity plumbing is recommended with the DI water cartridge.</td>
</tr>
<tr>
<td>High purity plumbing: Includes nickel-brazed heat exchanger and nickel-plated or nylon fittings compatible with DI water. Not compatible with brass pumps.</td>
<td>All wetted materials are fully compatible with DI water to prevent component corrosion.</td>
</tr>
</tbody>
</table>

### LCS20 Controllers

<table>
<thead>
<tr>
<th>Controller Option</th>
<th>Functionality</th>
<th>Controller Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital temperature display</td>
<td>Easy-to-read display in either °C or °F.</td>
<td>✓</td>
</tr>
<tr>
<td>°C/F toggle</td>
<td>Enables temperature display to be viewed in °C or °F.</td>
<td>✓</td>
</tr>
<tr>
<td>Over-temperature indicator</td>
<td>Alerts user that the coolant temperature is over the user’s defined set point limits.</td>
<td>✓</td>
</tr>
<tr>
<td>Calibration offset</td>
<td>Allows temperature display to be offset to represent the temperature at a different point within the cooling circuit.</td>
<td>✓</td>
</tr>
<tr>
<td>Low level indicator</td>
<td>Alerts user that the coolant level in the reservoir is at a critically low level (approaching the level of the pump’s suction line).</td>
<td>✓</td>
</tr>
<tr>
<td>Low flow indicator</td>
<td>Alerts user to a lack of coolant flow.</td>
<td>✓</td>
</tr>
<tr>
<td>Analog output</td>
<td>Allows user to monitor pump discharge temperature remotely</td>
<td>✓</td>
</tr>
</tbody>
</table>
## LCS50 Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection and Special Applications Options</strong></td>
<td></td>
</tr>
<tr>
<td>Facility side monitoring</td>
<td>Provides temperature and flow monitoring of facility side loop. Facilitates troubleshooting.</td>
</tr>
<tr>
<td>Coolant filters</td>
<td>Filters on both the facility and process side loops. Protects LCS and customer equipment from blockage or damage due to particulate buildup and extends pump life.</td>
</tr>
<tr>
<td>Dual mixing valves</td>
<td>Incorporates a second mixing valve. In the unlikely event of a failure, the controller automatically switches over to the redundant valve.</td>
</tr>
<tr>
<td>Alternative fluid inlet and outlet location</td>
<td>Allows for piping to terminate at the upper back of the LCS for overhead piping configurations.</td>
</tr>
<tr>
<td>Internal insulation package (process side)</td>
<td>Eliminates condensation on process side components when operating the LCS at set points below the dew point.</td>
</tr>
</tbody>
</table>

## LCS50 Controllers

<table>
<thead>
<tr>
<th>Controller Option</th>
<th>Functionality</th>
<th>Controller Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital temperature set point</td>
<td>Displays process and set point temperatures in either °C or °F.</td>
<td>3 4 5 6</td>
</tr>
<tr>
<td>RS232 communications</td>
<td>Allows monitoring, control, and data logging of all the controller features using RS232 protocol.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Ethernet communications</td>
<td>Allows monitoring, control, and data logging of all the controller features using Ethernet protocol.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Flow, pressure, and mixing valve status reporting</td>
<td>Controller displays the current process side coolant flow and pressure as well as current position of the mixing valve.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Visual alarms for low/high temperature</td>
<td>Alerts user that the coolant temperature is outside of the user’s defined set-point limits.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Low flow alarm</td>
<td>Alerts user that the coolant flow is below the user’s defined limit.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Pump failure alarm</td>
<td>Alerts user of a pump failure. System automatically switches over to secondary pump</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Power failure alarm</td>
<td>Alerts user of a power failure. System automatically switches over to secondary power supply.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Relay contacts for each alarm (normally open or normally closed)</td>
<td>Fault conditions of the LCS can be monitored by applying a low voltage power signal across dry contacts.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Lockout protection</td>
<td>Allows user to lock-out the controller to prevent unauthorized use.</td>
<td>● ● ● ●</td>
</tr>
<tr>
<td>Control set point temperature based on dew point offset</td>
<td>Allows user to input dew point offset such that the coolant temperature will fluctuate based on the dew point fluctuation.</td>
<td>● ●</td>
</tr>
<tr>
<td>Control set point based on fixed temperature with user defined dew point override</td>
<td>Allows user to input set point temperature and a minimum dew point offset. If the set point temperature is above the dew point offset range, the LCS will deliver coolant at the set point temperature. If the set point temperature is within the dew point offset range, the LCS will deliver coolant based on the dew point.</td>
<td>● ●</td>
</tr>
</tbody>
</table>
In most LCS sizing applications, we know the temperature of the facility water (T_F), the desired process set point temperature (T_p), the flow rate through the process (v_p) and the heat load of the process, Q.

To determine the required capacity, Q/ITD, we first need to calculate the change in temperature, ΔT, through the process. We can do this either by solving the heat capacity equation:

\[ Q = \dot{m}C_p\Delta T \]

or by using the heat capacity graphs on pages 96 and 97.

Next, we calculate Q/ITD to find the required cooling capacity. Q is the process heat load. ITD, the initial temperature difference, is the difference in temperature between the warm return water, (T_p + ΔT) and the cold facility water (T_F).

So,

\[ \frac{Q}{ITD} = \frac{\dot{m}C_p\Delta T}{T_p + \Delta T - T_F} \]

Finally, refer to the LCS performance graph to determine the facility process flow rate required to achieve the calculated Q/ITD.

Example:

A solder reflow oven requires a process set point of 20°C. The heat load is 10 kW and the process water flow rate is 5 gpm. The facility water is at 10°C.

Using the heat capacity graphs, we find that the ΔT through the process is approximately 7.6°C for the condition 10 kW at 5 gpm.

We can now solve for Q/ITD as follows:

\[ \frac{Q}{ITD} = \frac{10 \text{ kW}}{20°C + 7.6°C - 10°C} \]

\[ \frac{Q}{ITD} = 0.57 \text{ kW/°C} \]

Referencing the LCS performance graph, we can see that a facility flow rate above 2 gpm will meet the required performance.

---

*Use our interactive on-line LCS product selector - simply enter your process parameters and it will pick the right product for you.*
A Modular Cooling System (MCS) is a cost-effective and reliable alternative to refrigerated chillers for applications where precise temperature control and cooling below ambient temperature are not required. It consists of a high performance Lytron heat exchanger integrated with a fan, pump, and tank in a durable metal chassis.

**Extremely efficient:** All components are performance-matched for maximum cooling capacity. Lytron has 50 years of experience in thermal design, so you can be sure that the most critical component of the MCS, the heat exchanger, is designed for optimum performance.

**Easy-to-operate:** This easy-to-use, turnkey cooling package takes the guesswork and effort out of building a cooling loop. All you need to do is fill the tank and flip the switch!

**Compatible with a range of coolants:** We offer systems with copper heat exchangers for use with water, stainless steel heat exchangers for use with deionized water, or aluminum heat exchangers for use with oil or ethylene glycol/water mixture (EGW). This ensures that we have a product optimized for virtually any cooling fluid.

**19” rack mount version available:** Integration into your system is simple with our rack-mounted versions (MCS10, 20 and 30).

**Extremely reliable:** All components in the MCS have been designed for long life and high reliability—a Lytron MCS will provide years of trouble-free operation.

**ETL tested to UL 61010A-1, CE certified, and WEEE compliant**

**Custom Spotlight:**
A customer needed a tightly packaged MCS to integrate inside their system. Lytron engineers selected a high-efficiency OEM Coil heat exchanger, a long-life centrifugal pump, and a compact reservoir for the unit.

See page 54 for more custom cooling systems.
Modular Cooling Systems

Ambient cooling systems with cooling capacities up to 3.5 kW

MCS10, MCS20, MCS30

19” Rack Mount

MCS40, MCS50
MCS Performance Graphs

MCS10 and MCS20 Thermal Performance

MCS30 Thermal Performance¹

MCS40 and MCS50 Thermal Performance

MCS Positive Displacement Pumps

MCS10 Centrifugal Pumps²

MCS20 Centrifugal Pumps²

¹ Oil @ 70°F, 50/50 EGW ² Includes pressure drop through system. See page 53 for guidance on selecting a pump.
Specifications and Part Number Configuration

### MCS30 Centrifugal Pumps 1,2

<table>
<thead>
<tr>
<th>Fluid Pressure (PSI)</th>
<th>Flow Rate (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>6.2</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>25</td>
<td>9.5</td>
</tr>
<tr>
<td>30</td>
<td>11.4</td>
</tr>
</tbody>
</table>

### MCS40/50 Centrifugal Pumps 2

<table>
<thead>
<tr>
<th>Fluid Pressure (PSI)</th>
<th>Flow Rate (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>6.2</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>25</td>
<td>9.5</td>
</tr>
<tr>
<td>30</td>
<td>11.4</td>
</tr>
</tbody>
</table>

1 Oil @ 70°F, 50/50 EGW 2 Includes pressure drop through system. See page 53 for guidance on selecting a pump.

### Available electrical configurations and full load amperage

<table>
<thead>
<tr>
<th></th>
<th>G01</th>
<th>G02</th>
<th>H01</th>
<th>J02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps</td>
<td>5.2</td>
<td>n/a</td>
<td>2.5</td>
<td>n/a</td>
</tr>
<tr>
<td>Amps</td>
<td>5.3</td>
<td>n/a</td>
<td>2.5</td>
<td>n/a</td>
</tr>
<tr>
<td>Amps</td>
<td>5.3</td>
<td>n/a</td>
<td>2.5</td>
<td>n/a</td>
</tr>
<tr>
<td>Amps</td>
<td>n/a</td>
<td>n/a</td>
<td>5.6</td>
<td>n/a</td>
</tr>
<tr>
<td>Amps</td>
<td>n/a</td>
<td>n/a</td>
<td>5.6</td>
<td>n/a</td>
</tr>
</tbody>
</table>

### Pump options (refer to ‘Selecting a pump’ page 53 and system pump curves, at left)

- **BB**: PDP2, Brass, 1.3 gpm/4.9 lpm
- **BC**: PDP2, Brass, 1.8 gpm/6.8 lpm
- **BE**: PDP2, Brass, 2.3 gpm/8.7 lpm
- **CB**: PDP2, Stainless Steel, 1.3 gpm/4.9 lpm
- **CC**: PDP2, Stainless Steel, 1.8 gpm/6.8 lpm
- **CE**: PDP2, Stainless Steel, 2.3 gpm/8.7 lpm
- **AB**: Centrifugal, 1/4 HP
- **DA**: Centrifugal, 1/2 HP

### Package Options

- **Package 1**: Ambient Package
  - **M002**: Heavy duty casters
  - **M062**: Rack mount configuration
  - **M004**: High purity plumbing (stainless steel heat exchanger, nickel-plated bulkhead fittings)
  - **M063**: Rack mount configuration and high purity plumbing
  - **M055**: High purity plumbing and heavy duty casters

### To arrive at a part number

**MCS10 G01 BB 1**: MCS30, 115V, 60 Hz operation, with BB pump and no additional options

**MCS20 G01 CC 1 M063**: MCS40, 115V, 60 Hz operation, with CC (stainless steel) pump, and high purity plumbing in a rack mount configuration.
MCS performance is shown as $Q/\text{ITD}$ versus flow rate. $Q$ is the heat load, and ITD is the initial temperature difference, or the difference between the MCS liquid inlet temperature and the ambient air temperature.

To select the correct MCS system, you first need to determine $Q/\text{ITD}$. Then, using the MCS performance graph, draw a horizontal line at the calculated $Q/\text{ITD}$ value. Finally, check that the pump will provide sufficient flow rate.

**Example:**

A laser produces 700 W of waste heat. The water temperature exiting the laser should be less than 35°C. Ambient room temperature is 20°C. The laser equipment requires a flow rate of at least 1 gpm. Which MCS system should be selected?

First, determine $Q/\text{ITD}$

$$Q/\text{ITD} = \frac{700 \text{ W}}{(35^\circ \text{C} - 20^\circ \text{C})} = 46.7 \text{ W/}^\circ \text{C}$$

Using the thermal performance graph, you can see that at flow rates above 0.5 gpm, the MCS20 will provide adequate performance. The standard BB pump offers a flow rate of 1.3 gpm so it will work well. If you are considering an alternative pump, use the pump flow rate calculation on page 53 to verify that with the given pressure drop, flow rate will be sufficient.

**To avoid thermal calculations, use the cooling system product selector at [www.Lytron.com](http://www.Lytron.com).**
The standard pump on all Lytron cooling systems is a positive displacement pump. Centrifugal and turbine pumps are also offered to precisely match your application needs.

**Positive Displacement Pumps (PD pumps)**
Positive Displacement pumps provide a constant flow rate regardless of pressure drop across the system. This makes them ideal if you have a high system pressure drop, require a constant flow rate regardless of changes in your system’s pressure drop, or are likely to use the cooling system with a variety of test set-ups. Lytron’s PD pumps are fitted with a pre-set 90 psi\(^1\) pressure relief valve to ensure safety cut-out in the event of blockages in the system. It is recommended that PD pumps are replaced approximately every 7,000 hours of operation to ensure reliable performance.

**Centrifugal and Turbine Pumps**
The output of a centrifugal or turbine pump varies considerably with pressure drop across the system. If the pressure drop across the system changes, the flow rate from the cooling system will also change. A centrifugal pump is suitable for small pressure drops; a turbine pump operates at higher pressure drops. If you are considering using a centrifugal or turbine pump you should verify that the flow rate is sufficient with your system’s pressure drop. It is recommended that centrifugal and turbine pumps are replaced approximately every 28,000 hours of operation to ensure reliable performance.

**Calculating Flow Rate**
To calculate the flow rate for a centrifugal or turbine pump, you need to know the pressure drop in your system. You then can use the appropriate pump graph to estimate flow rate.

**Example:**
You need a 60 Hz RC011 chiller with a flow rate of 1.5 gpm and you want to know if a centrifugal pump (the DA pump) will have sufficient flow rate. The pressure drop from the laser in your system is 30 psi at 2 gpm. Mark the graph at the intersection of these points. Draw a straight line from the origin to this point, and where it intersects the pump curve is your likely flow rate. Note that this is an approximation as flow rate is not strictly linear.

In this case, the likely flow rate with a DA centrifugal pump would be 1.9 gpm. This is higher than the 1.5 gpm required, so this pump would be a good choice. If a higher flow rate was required, a PD pump or the EB turbine pump could be considered.

The flow rate should be matched to your application to ensure that your overall system performs as expected. Pump graphs are located along side the performance graphs for each product.

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\(^1\) Other settings available on request
Custom cooling systems for demanding applications

When it comes to the expertise required to build custom cooling systems, Lytron is unrivaled. With 5 decades of heat transfer experience, including components as well as systems, our high performance, fully-engineered custom cooling systems are efficient and reliable.

Our dedicated systems engineering team works with our three cooling system technologies to arrive at the optimum solution for your application. Our component experience means that we can custom design and manufacture the heat exchanger—the heart of every cooling system. The result is better products, more flexibility, and a product that has been designed for your exact performance, size, and functional requirements.

For example, we can design for low noise, compact size, high performance, compatibility with specific coolants, special power requirements, etc. We can easily incorporate custom sensors and instrumentation, and add a variety of safety and monitoring options to protect both the cooling system and the equipment it is cooling. We can also secure any required certification or agency approval.

All our custom systems are built at Lytron in the same facility where they were designed. Our integrated approach to design and manufacturing enables us to control the entire manufacturing process, from the selection of components to assembly. This results in excellent quality. We build custom systems on dedicated assembly lines which are configured to manufacture and test a large number of different systems.
We are able to offer very competitive pricing on custom systems because we manufacture cooling systems in high volumes and standardize on common parts where possible.

Our systems are backed by outstanding service and support. We recognize that most custom systems are integrated into equipment that may end up anywhere in the world, so we offer support when and where you need it: 24/7 access to technicians and a worldwide network of service centers for installation support, service, and maintenance. Our support network is constantly expanding, and we partner with customers to set up additional service capabilities where needed.

We also offer customized training programs for our OEM customers, either on-site or at our facility in Woburn, MA. This empowers your own service engineers to provide front-line support where it is required.

We ship thousands of custom cooling systems every year, for applications as diverse as medical equipment, data centers, printing, imaging, lasers, semiconductor equipment, and analytical instrumentation. Let us put our thermal systems expertise to work for you—call us to discuss your custom chiller requirements today.

Customer Case Study: Meeting the challenge of a tight space requirement

A customer approached Lytron needing a custom cooling system with similar capacity to an RC022.

The challenge: It needed to be approximately half the usual size to fit within their existing design. Lytron’s engineers set to work, specially selecting compact components to fit the envelope and customizing the layout. Since it was to be integrated into a larger piece of equipment, a ‘frameless’ design was chosen. RS232 control was incorporated so that it could be monitored and controlled through the customer’s system. Manufacturability and serviceability were considered throughout the design process. Lytron engineers worked closely with the customer’s engineering team.

The result: A prototype which matched all the size and performance specifications.
Every cooling system that we sell is backed by our world-class service operation to provide rapid and affordable service, should the need arise.

Lytron offers service and support through a variety of channels:

- **Phone**: Lytron offers 24/7 access to in-house service engineers for troubleshooting assistance. Call +1-781-933-7300.

- **Email**: Email sent to service@Lytron.com will be automatically directed to one of our service engineers who will address your inquiry no later than the next business day.

- **Web**: The ‘Service’ section of [www.Lytron.com](http://www.Lytron.com) contains technical documentation, maintenance procedures, technical tips and service information for all of our systems.

- **World-Wide Service and Support**: Lytron has service depots in Europe, Asia, Canada, and the US. These repair centers stock a broad inventory of spare parts and are staffed by factory-certified technicians.

- **On-Site Service**: Lytron offers on-site service and service contracts. Contact our service department for details.

- **Factory Service/Repair**: System diagnosis is usually completed within 24 hours of receipt of the unit and repairs are carried out within 48 hours of service authorization.

- **OEM Training**: Since chillers are often sold as sub-systems in OEM equipment, Lytron offers OEMs customized training programs so they can provide front-line support. These training programs can be arranged either at your facilities or at Lytron’s Woburn, MA, USA facility.