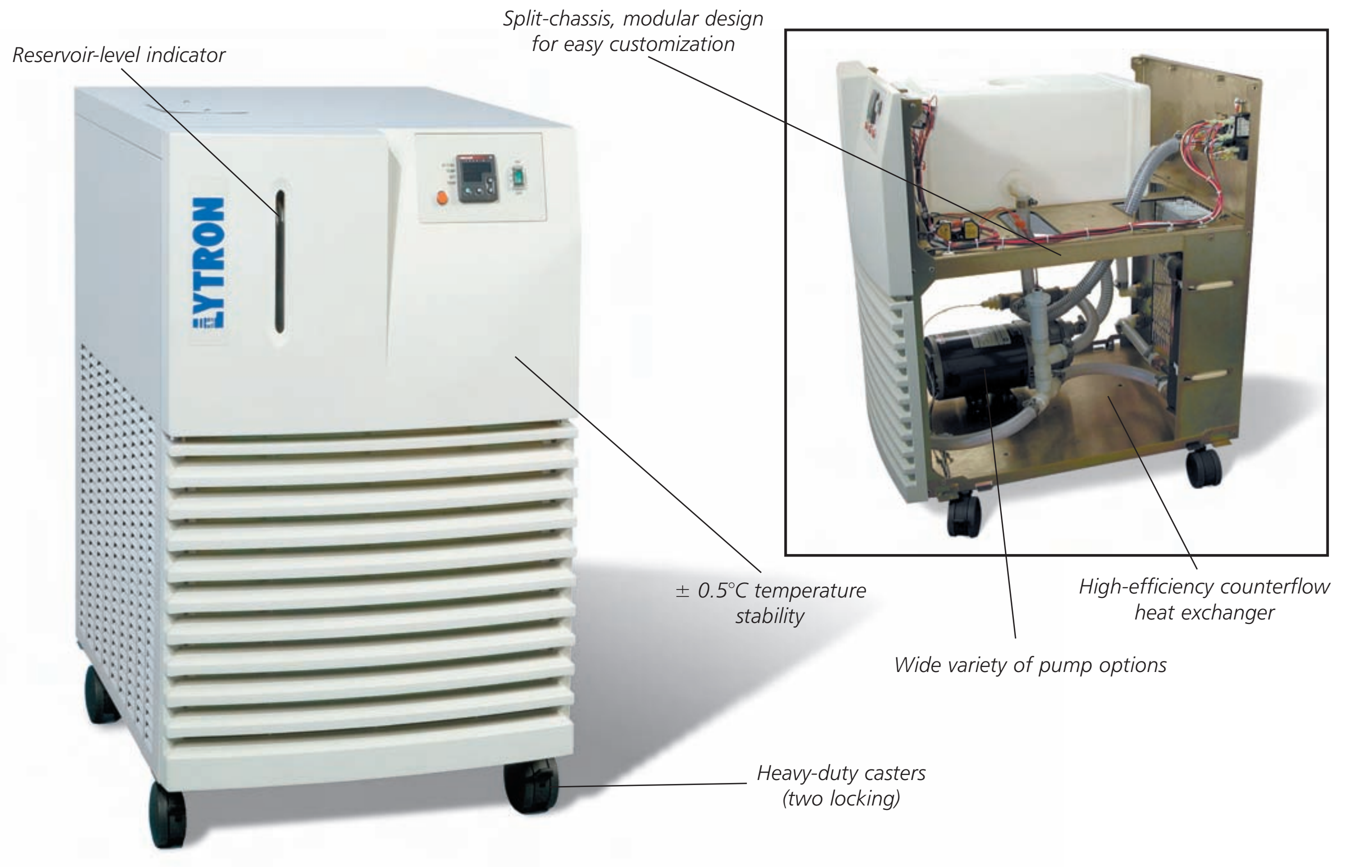
LCS20™ Liquid-to-Liquid Cooling Systems

Cooling capacities up to 20 kW



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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.
- **ITSNA tested to UL 61010A-1 and CE certified**

Custom Spotlight:

A customer had a total heat load of 25 kW and access to facility water. They needed to cool four 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 8 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 150 kW 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."[1]
- **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.
- **Energy efficient and quiet:** Liquid cooling the electronics cabinet is significantly more energy efficient than air cooling.
- **UL/CE/CSA and RoHS**

[1] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (2006). Liquid Cooling Guidelines for Datacom Equipment Centers. Atlanta.

Custom Spotlight:

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

See page 8 for more custom cooling systems.

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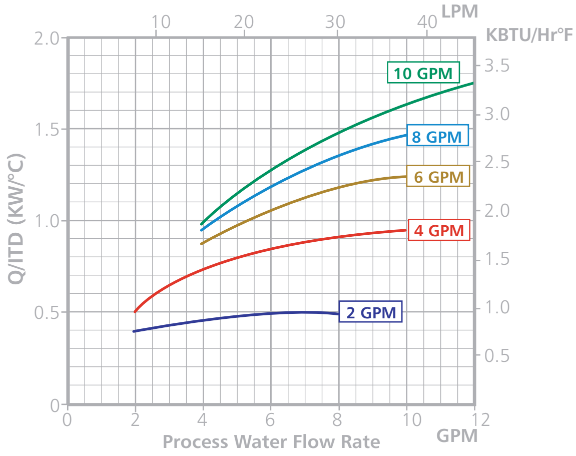
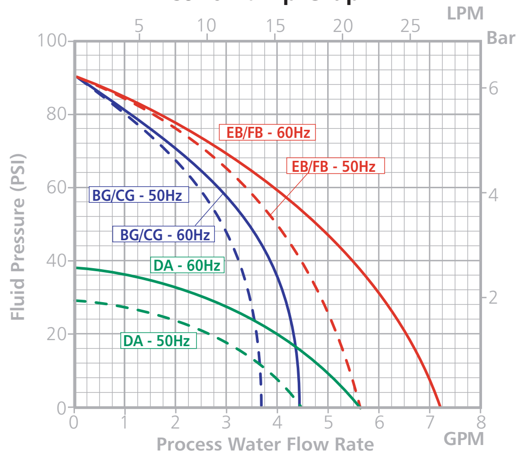
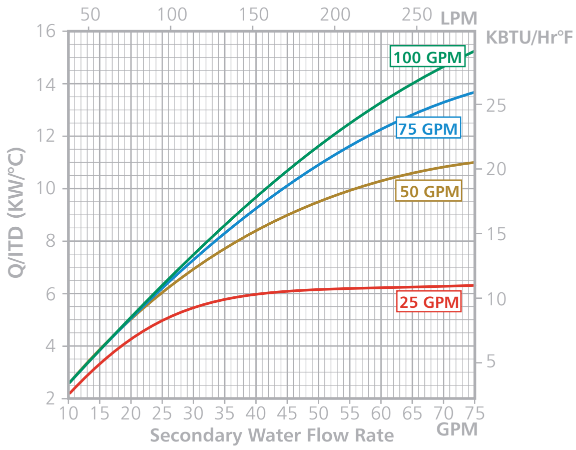
LCS20 Thermal Performance Graph[1]



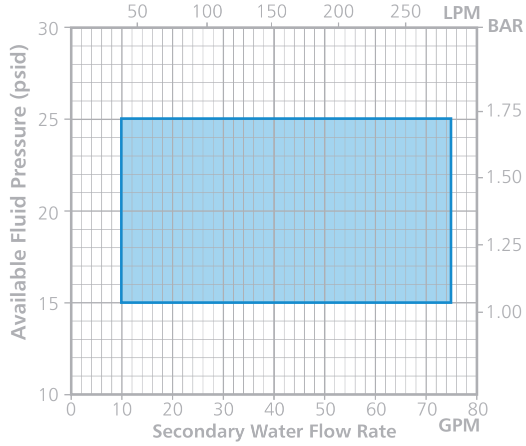
LCS20 Pump Graph[2,3]



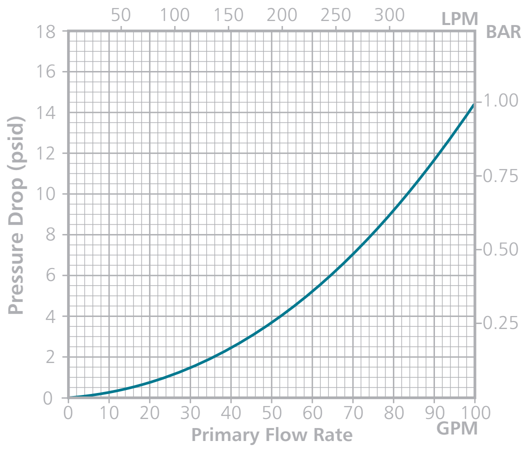
LCS50 Thermal Performance Graph[1]



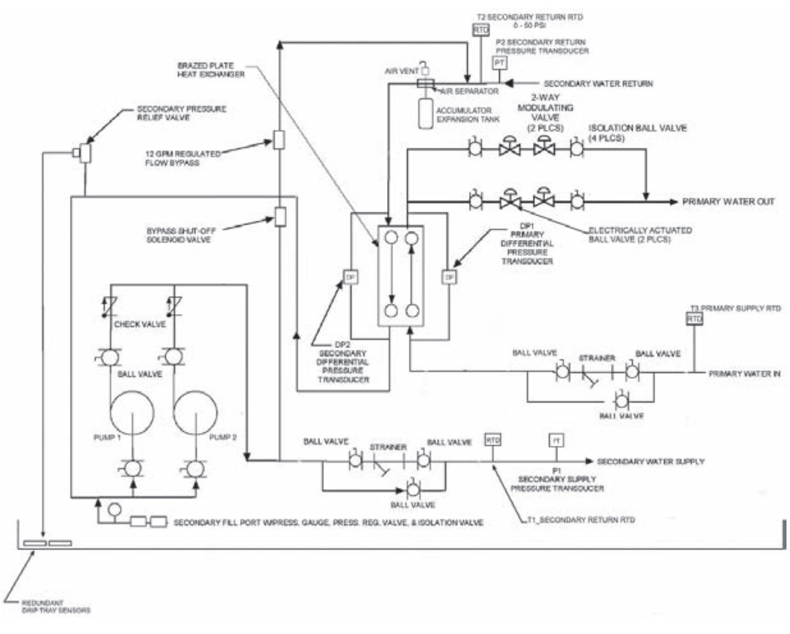
LCS50 Pump Graph[3]



LCS50 Primary Side Pressure Drop



LCS50 Plumbing Diagram[4]



[1] Facility side flow rates are represented by curves.

[2] Pressure relief is factory set at 90 psi (6.2 bar). Other settings available on request.

[3] Includes pressure drop through system. See LCS specifications and options for pump descriptions.

[4] See www.Lytron.com for larger plumbing diagram.

First select your model number

		LCS20	LCS50
Cooling capacity		20 kW (68 kBTU/Hr) at 4.3 GPM process and 10 GPM facility and 20°C Initial Temperature Difference (ITD)	150 kW (512 kBTU/Hr) at 75 GPM process and 100 GPM facility and 10°C Initial Temperature Difference (ITD)
Temperature stability		± 0.5°C	± 1.0°C
Fluid connections		¾″ FNPT	2″ copper flange terminated at bottom of unit
Reservoir capacity		6 gal/22 liters	N/A
Coolant temperature range		50°F to 140°F/10°C to 60°C	41°F to 95°F/5°C to 35°C
Facility water temperature range		50°F to 95°F/10°C to 35°C	39°F to 54°F/4°C to 12°C
Ambient temperature range		41°F to 104°F/5°C to 40°C	
Facility flow rate		2 to 10 gpm/8 to 38 lpm	25 to 100 gpm/95 to 379 lpm
Facility pressure		100 psi/7 bar max	100 PSI/ 7 bar max
Facility pressure drop		15 psi/1 bar at max flow	See Pressure Drop Graph
Dimensions (W x D x H)	inches mm	21.4 x 27.8 x 31.9 543 x 705 x 810	24.0 x 48.0 x 76.3 610 x 1219 x 1938
Weight	lbs kg	140 64	900 408

Next, pick an electrical configuration

Electrical configurations and full load amperage[1]		LCS20	LCS50
G01: 100-120V, 50/60 Hz	Amps	7.2	N/A
J01: 200-240V, 50/60 Hz	Amps	3.6	N/A
L01: 208-230 VAC, 50/60 Hz, 3ph	Amps	N/A	18
P01: 460 VAC, 50/60 Hz, 3ph	Amps	N/A	9

Now, select a pump

Pump options (visit www.Lytron.com for guidance on selecting a pump; refer to page 22 for system pump graphs)	LCS20	LCS50
BG: PDP[2], Brass, 4.3 gpm/16.3 lpm	●	
CG: PDP[2,3], Stainless Steel, 4.3 gpm/16.3 lpm	○	
DA: Centrifugal, ¼ HP[4]	○	
EB: Turbine, ½ HP[4]	○	
FB: Turbine, Stainless Steel, ½ HP[3,4]	○	
DE: Centrifugal, 3 HP, 2 per system		●

And select your controller

Controller options (visit www.Lytron.com for a full description of these options)	LCS20	LCS50
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; modulating 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; modulating 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.		○

Add any additional options

Available options (visit www.Lytron.com for a full description of these options)	LCS20	LCS50
External flow valve	○	
External pressure relief valve	○	
5 micron coolant filter[5]	○	
DI water cartridge[5]	○	
High purity plumbing	○	
Heater[6]	○	
Internal insulation package	○	●
80 mesh coolant filters on process and facility sides		●
Dual modulating valves		●

● = standard ○ = available option [1]With standard pump [2]PDP = Positive Displacement Pump (J01 only). [3]Only available with high purity plumbing. [4]Actual flow rate depends on system pressure drop. [5]Not available with DA pump. [6]Not available with G01 electrical configuration.

To arrive at a part number

LCS 20 G01 BG 1 M___ An LCS20, 100-120V, 50/60 Hz, with BG pump and controller package 1

└ 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.)

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Selecting a Recirculating Chiller

Selecting the proper recirculating chiller is a function of four factors:

1. Heat load generated by the device being cooled (Q)
2. Maximum acceptable temperature of the fluid exiting the heat source (T_{OUT})
3. Fluid flow rate ($\dot{v}$)
4. Ambient operating conditions

Often, an equipment manufacturer will specify the cooling capacity, set point temperature, and flow rate of the required chiller. In this case, selecting a chiller is easy. 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:
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 (Fig 1) we can see that an RC022 would be an appropriate choice. From looking at the pump curves (Fig 2) we see that a BE pump would provide the necessary flow rate. For more examples, please visit www.Lytron.com.

Fig 1: RC022-RC045 Performance

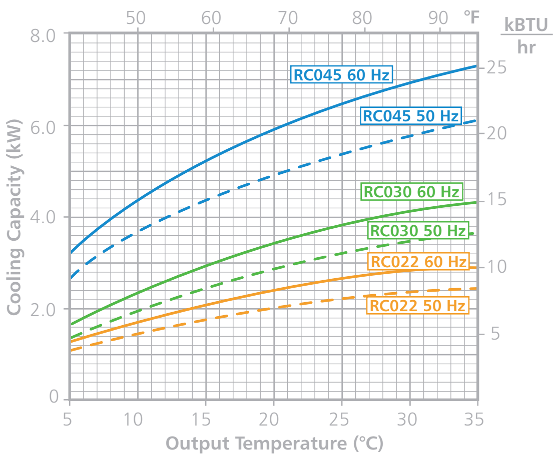
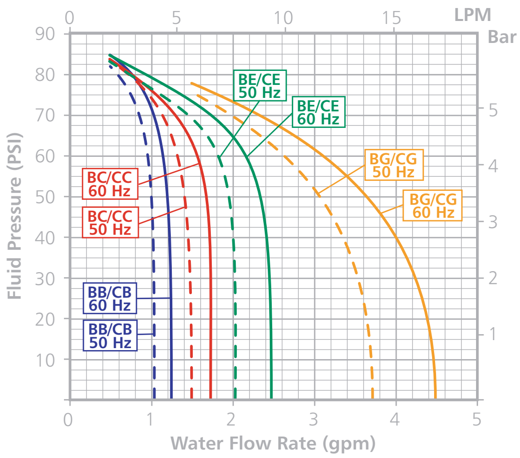
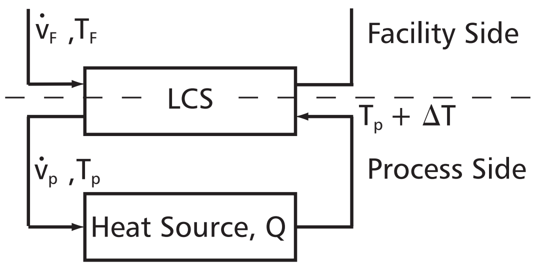


Fig 2: Kodiak Positive Displacement Pumps



Selecting a Liquid-to-Liquid Cooling System

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 ($\dot{v}_p$) 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 using the heat capacity graphs found on www.Lytron.com or by solving the heat capacity equation:



$$Q = \dot{m}C_p\Delta T$$

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, ($T_p + \Delta T$), and the cold facility water (T_F).

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

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 heat capacity graphs, which can be found on www.Lytron.com, we find that the ΔT through the process is approximately 7.6°C for the condition 10 kW at 5 gpm.