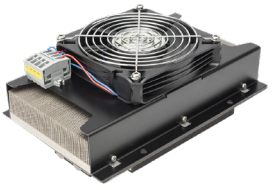
Laird™
THERMAL SYSTEMS

Thermoelectric Cooler Assemblies & Temperature Controllers

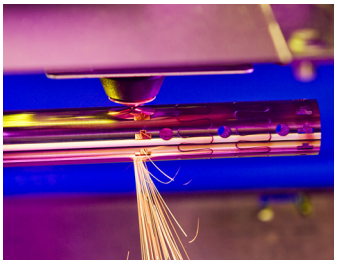


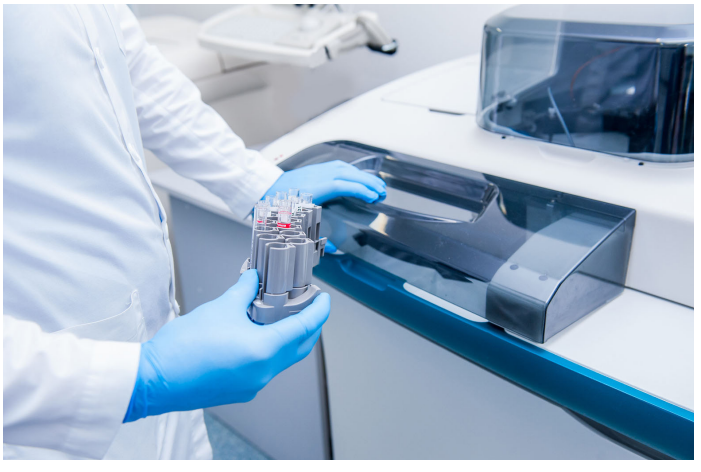
About Laird Thermal Systems

Laird Thermal Systems develops thermal management solutions for demanding applications across global medical, industrial, transportation and telecommunications markets. We manufacture one of the most diverse product portfolios in the industry ranging from active thermoelectric coolers and assemblies to temperature controllers and liquid cooling systems. Our engineers use advanced thermal modeling and management techniques to solve complex heat and temperature control problems. By offering a broad range of design, prototyping and in-house testing capabilities, we partner closely with our customers across the entire product development lifecycle to reduce risk and accelerate their time-to-market. Our global manufacturing and support resources help customers maximize productivity, uptime, performance and product quality. Laird Thermal Systems is the optimum choice for standard or custom thermal solutions.

Laird Thermal Systems partners with its customers to design custom thermal solutions for applications in many industries including:

- Medical Diagnostics
- Battery Cooling
- Industrial Laser Systems
- Optoelectronics
- Analytical Instrumentation
- Semiconductor Fabrication
- Aerospace Defense
- Food & Beverage
- Automotive





Introduction

Thermoelectric cooler assemblies are compact units that control the temperature of a wide variety of applications, such as laser diode packages in active optics, lasers in medical and industrial instrumentation, electronic enclosures, sample storage chambers in medical diagnostics and analytical instruments and batteries in various automotive and telecom applications. Thermoelectric cooler Assemblies serve a cooling capacity spectrum from approximately 10 to 400 Watts, and can cool by removing heat from control sources through convection, conduction, or liquid means.

Advantages

Thermoelectric cooler assemblies offer several advantages over other cooling technologies. For example, conventional fan trays do not cool to below ambient and require an air exchange with the outside environment. On the other hand, thermoelectric cooler assemblies can cool to well below ambient and protect electronics inside enclosures from outside contaminants, and also limit moisture exposure from the outside environment. Thermoelectric cooler assemblies also offer precise temperature control and accuracies to within 0.01˚C are achievable under steady-state conditions.

Thermoelectric cooler assemblies have several advantages over conventional compressor-based systems:

- Compact size and lower weight than conventional compressor-based systems
- Mountable in any orientation and have lower noise and vibration
- Environmentally friendly, as thermoelectric cooler assemblies do not use CFCs and are RoHS compliant
- Low to no field maintenance requirement, which lowers the total cost of ownership.

Engineers must now consider thermal management early in the product design process. Simple thermal management solutions, such as adding a fan or heat sink, are no longer typically viable to meet required performance and reliability specifications.

A standard thermoelectric cooler assembly allows the designer to start with a basic set of building blocks that mate fans and thermoelectric coolers to heat exchangers. Laird Thermal Systems has conducted two decades worth of design and validation testing on various combinations of thermal components to optimize cooling power and efficiency at various heat loads. This results in engineers saving time with redesign and validation testing a thermoelectric cooler assembly that has already been perfected by Laird Thermal Systems.

Below is a summary of inherent benefits of initiating a thermal design with a standard thermoelectric cooler assembly versus a custom solution:

1. Reduce product development time by initiated product at thermoelectric cooler assembly level vs thermoelectric cooler level.
2. Reduce costs by utilizing components that are already established in the supply chain.
3. Long term history of products in field provide reliable field data of robustness of products in operation.
4. Product enhancements are captured through market evolution.

Product Portfolio

Laird Thermal Systems offers the widest selection of thermoelectric cooler assemblies on the market. Products are designed and manufactured to strict process control standards and pass/fail criteria, assuring that our customers receive the best possible thermoelectric cooler assemblies. Our standard product portfolio includes an extensive array of thermal management solutions that cover a wide range of cooling capacities with compact form factors and high coefficient of performance. Standard operating voltages are 12 and 24 VDC, and on some models 48 VDC. The standard product offering includes heat transfer mechanisms designed to absorb and dissipate heat by convection, conduction, or through liquid heat exchangers. All products are manufactured in an ISO 9001:2015 certified facility and are designed to meet the cooling needs of many thermal management applications in the medical, analytical, industrial and telecom markets.

There are seven distinct thermoelectric cooler product families that were designed for a specific cooling capacity range, temperature differential range or tight space constraint. The diagram below is a perceptual map of a cooling spectrum that can be used to guide designers to a particular product family that will have the desired attributes that the application requires.

Thermoelectric Applications

Thermoelectric cooler assemblies are used in a wide range of applications to stabilize the temperature of sensitive electronic components or to cool devices and compartments below ambient.

Analytical

Temperature control is vital in analytical instrumentation equipment to enhance reliability and improve test results.

- Sample Storage Compartments
- Liquid Chromatography
- Incubators

Medical

Temperature stabilization is required to obtain a high image resolution. Cooling reagent chambers below ambient is critical to extend life of reagents and keep replacement costs down. Rapid thermal cycling is crucial to speed up DNA amplification.

- Medical Diagnostics
- Medical Lasers
- Centrifuges

Industrial

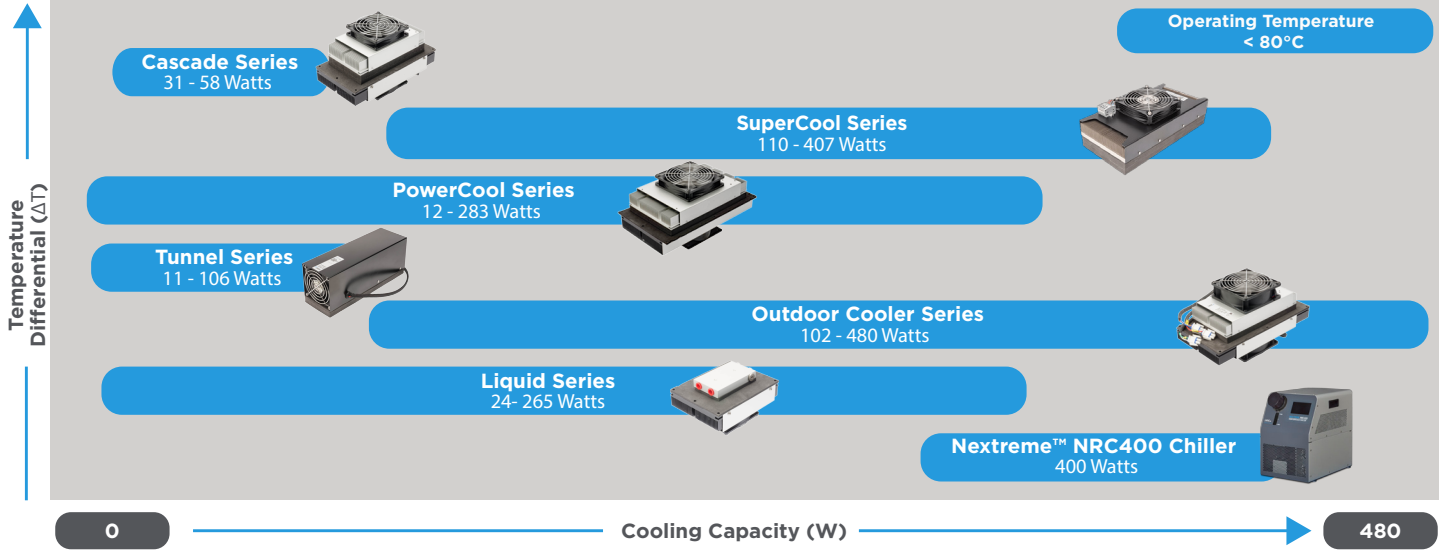
Temperature stabilization is critical to maintain industrial lasers at peak performance and allows high end printing systems to produce high quality prints at high run rates.

- High Powered Projectors
- Kiosks
- Metrology Instrumentation
- Digital Color Printing Systems
- Industrial Laser Systems

Telecom

Cooling below ambient is necessary to extend life of batteries in wireless base stations. Temperature stabilization is required to maintain peak performance of laser diodes.

- Telecom Enclosures
- Battery Backup Systems
- High Powered Laser Diodes



SuperCool Series

The SuperCool Series of thermoelectric cooler assemblies is a high performance thermoelectric based air conditioner available in air-to-air, direct-to-air, and liquid-to-air versions. These units are designed to control temperature in medical diagnostics chambers or sample storage compartments in analytical instrumentation. The unique, **patented** design offers a high performance hot side heat dissipation mechanism that convects heat more efficiently than conventional heat exchanger technologies, enhancing the cooling performance up to 90%. Custom configurations available upon request.

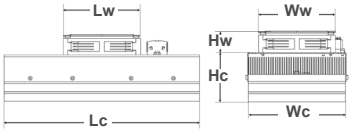
US Patent US2016/0255746 A1

SLA-400

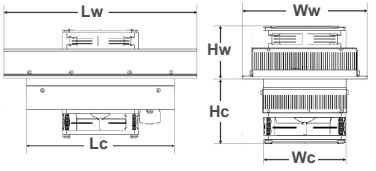
SDA-195

SAA-170

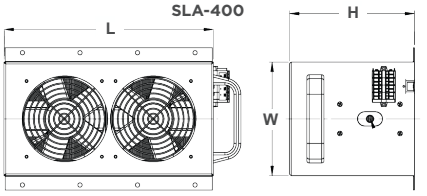
SDA



SAA, SLA-140/205



SLA-400



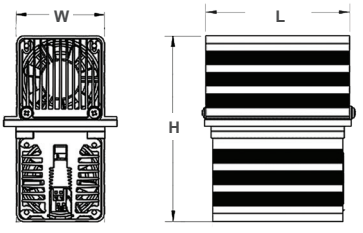
MFG PART NUMBER	DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	WEIGHT (kg)	DIMENSIONS (mm)					
						Lw	Lc	Ww	Wc	Hw	Hc
387003324	SAA-110-24-22-00-00	110	24	4.9	2.7	230	180	150	92	65	74
387000612	SAA-170-24-22-00-00	166	24	6.9	4.5	300	230	180	119	70	93
387003325	SDA-130-24-02-00-00	130	24	5.0	2.3	119	230	119	120	25	72
387000624	SDA-195-24-02-00-00	193	24	6.9	4.1	119	300	119	153	25	72
387003326	SLA-140-24-02-00-00	140	24	5.0	2.3	230	180	150	100	65	33
387000639	SLA-205-24-02-00-00	202	24	6.9	4.1	300	236	180	120	74	33
387004253	SLA-400-24-02-00-00	407	24	13.3	9.2	291.2		157.2		173.6	

Tunnel Series

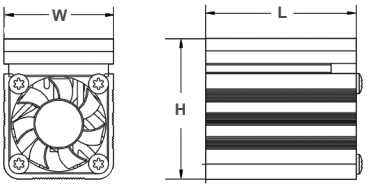
The Tunnel Series thermoelectric cooler assemblies are designed with a patented, high-performance cross flow technology that maximizes heat transfer when pulling air through a heat exchanger. The number of airflow paths required to operate is reduced when compared to traditional impingement flow thermoelectric cooler assemblies. This product series is offered in 12 or 24 volt configurations and can cool by either convection or conduction means.

AAT-027

Air-to-Air



Direct-to-Air



DA-025

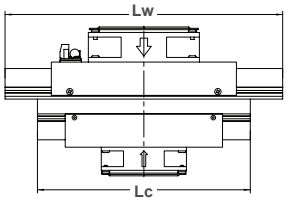
MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	DIMENSIONS (mm)		
				Height	Length	Width
DA-011-05-02-00-00	11	5	2.2	56	60	44
DA-033-12-02-00-00	32	12	3.1	82	99	66
ATT-027-12-22-00-00	27	12	2.3	142	115	84
AAT-032-12-22-00-00	33	12	2.8	141	155	84
AAT-055-12-22-00-00	56	12	5.3	142	180	84
ATT-055-24-22-00-00	55	24	2.6	142	180	84
AAT-085-12-22-00-00	82	12	8.1	154	248	83
AAT-085-24-22-00-00	85	24	4.2	154	248	83
DAT-029-12-02-00-00	29	12	2.6	87	96	65
DAT-040-12-02-00-00	40	12	2.7	85	155	65
DAT-065-12-02-00-00	65	12	5.1	85	180	65
DAT-065-24-02-00-00	64	24	2.6	85	180	65
DAT-105-12-02-00-00	103	12	8.5	98	248	83
DAT-105-24-02-00-00	106	24	4.4	98	248	83

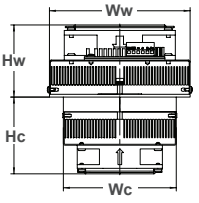
PowerCool Series

The PowerCool Series offers the widest selection of cooling capacities ranging from 20 to 283 Watts. The thermoelectric cooler assemblies use impingement flow to dissipate heat on the hot side. The cold side heat transfer mechanism can absorb heat using convection (heat sink and fan), conduction (cold plate), or liquid (heat exchanger) means. This product series is offered in 12 or 24 VDC configurations. For 100 Watt systems and higher, 48 VDC is available. The PowerCool Series is designed for indoor use in the medical, analytical, and industrial markets.

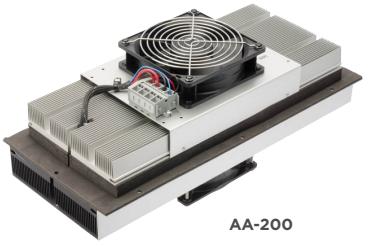
Air-to-Air (AA)

Air-to-Air Assemblies offer dependable, compact performance by cooling objects via convection. Heat is absorbed and dissipated by heat exchangers equipped with fans and ducted shrouds. Specifications apply to ambient temperature of 32°C and nominal voltage with tolerances ±10%.





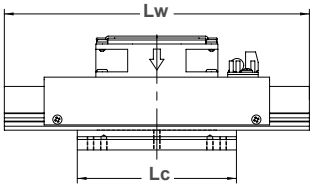
AA-040

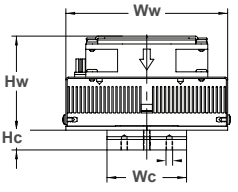

AA-200

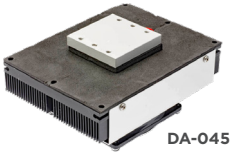
MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	WEIGHT (kg)	DIMENSIONS (mm)					
					Lw	Lc	Ww	Wc	Hw	Hc
AA-019-12-22-00-00	20	12	2.3	0.3	80	60	62	40	57	48
AA-024-12-22-00-00	24	12	2.4	0.6	100	80	82	62	60	62
AA-024-24-22-00-00	24	24	1.5	0.6	100	80	82	62	60	62
AA-034-12-22-00-00	33	12	3.5	0.9	120	100	102	82	60	64
AA-040-12-22-00-00	41	12	6.3	1.8	160	120	122	102	68	79
AA-040-24-22-00-00	39	24	2.6	1.8	160	120	122	102	68	78
AA-060-12-22-00-00	58	12	6.2	2.5	230	180	122	102	68	78
AA-060-24-22-00-00	58	24	3.1	2.5	230	180	122	102	68	78
AA-070-24-22-00-00	71	24	3.8	2.5	230	180	122	102	68	84
AA-100-24-22-00-00	102	24	5.6	4.0	300	230	152	122	75	86
AA-150-24-22-00-00	143	24	7.9	4.1	300	250	153	152	80	86
AA-200-24-22-00-00	195	24	11.3	7.0	400	350	153	152	85	93
AA-200-48-22-00-00	195	48	5.7	7.0	400	350	153	152	85	93

Direct-to-Air (DA)

Direct-to-Air Assemblies offer dependable, compact performance by cooling objects via conduction. Heat is absorbed through a cold plate, pumping the heat through the thermoelectric cooler and dissipating it into the air through a heat sink equipped with fan and shroud. Specifications apply to an ambient temperature of 32°C and nominal voltage with tolerances ±10%.






DA-045

DA-280

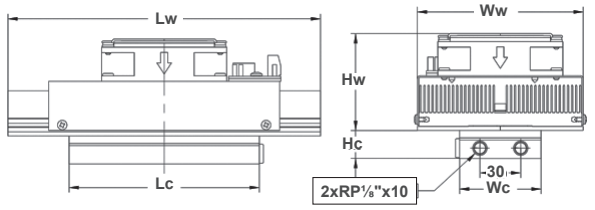
MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	WEIGHT (kg)	DIMENSIONS (mm)					
					Lw	Lc	Ww	Wc	Hw	Hc
DA-014-12-02-00-00	12	12	1.8	0.2	60	50	40	30	44	11
DA-024-12-02-00-00	24	12	2.4	0.3	80	60	60	40	56	14
DA-024-24-02-00-00	24	24	2.4	0.3	80	60	60	40	56	14
DA-034-12-02-00-00	34	12	2.6	0.5	100	60	80	40	59	14
DA-034-24-02-00-00	34	24	1.9	0.5	100	60	80	40	59	14
DA-044-12-02-00-00	42	12	3.8	0.6	120	60	100	40	60	14
DA-044-24-02-00-00	44	24	2.2	0.6	120	60	100	40	60	14
DA-045-12-02-00-00	48	12	6.1	1.2	160	60	122	60	71	15
DA-045-24-02-00-00	45	24	2.5	1.2	160	60	122	60	71	15
DA-075-12-02-00-00	71	12	7.2	1.7	230	120	122	60	71	15
DA-075-24-02-00-00	71	24	3.7	1.7	230	120	122	60	71	15
DA-115-24-02-00-00	113	24	5.8	2.9	300	220	152	60	78	16
DA-135-24-02-00-00	135	24	6.9	2.9	300	220	152	60	78	16
DA-160-24-02-00-00	160	24	7.4	3.5	300	180	152	130	84	16
DA-280-24-02-00-00	283	24	1.3	6.124	400	354	180	154	135	31
DA-280-48-02-00-00	281	48	0.7	6.194	400	354	180	154	135	31

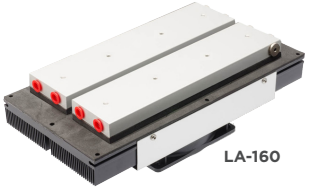
Liquid Series

Liquid Series Thermoelectric cooler assemblies are used to cool or heat a coolant flowing through a liquid heat exchanger. The heat exchanger is designed for a recirculating system and needs to be accompanied by a pump. The heat is absorbed by the heat exchanger and custom designed thermoelectric modules pump heat to mating heat transfer mechanism on heat dissipation side. The heat dissipation side can be convection (Liquid to Air), conduction, (Direct to Liquid) or via liquid (Liquid to Liquid).

Liquid-to-Air (LA)

Liquid-to-Air assemblies offer dependable, compact performance by cooling objects via liquid to transfer heat. Heat is absorbed through a liquid heat exchanger and dissipated thru a high density heat sink equipped with an air ducted shroud and brand name fan.

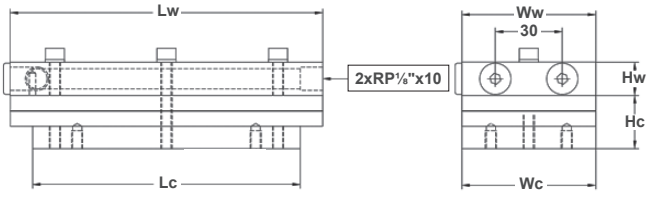


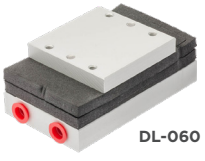


MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	WEIGHT (kg)	DIMENSIONS (mm)					
					Lw	Lc	Ww	Wc	Hw	Hc
LA-024-12-02-00-00	24	12	2.4	0.4	80	80	60	60	64	15
LA-024-24-02-00-00	24	24	2.0	0.4	80	80	60	60	64	15
LA-045-12-02-00-00	43	12	4.1	1.3	160	100	122	60	71	20
LA-045-24-02-00-00	47	24	2.8	1.3	160	100	122	60	71	20
LA-075-24-02-00-00	71	24	3.7	1.8	230	140	122	60	71	20
LA-115-24-02-00-00	113	24	5.8	3.0	300	240	152	60	78	20
LA-160-24-02-00-00	160	24	7.4	3.5	300	200	152	136	84	20

Direct-to-Liquid (DL)

Direct-to-Liquid Assemblies offer dependable, compact performance by cooling objects via liquid to transfer heat. Heat is absorbed through a cold block and dissipated thru a second liquid heat exchanger.

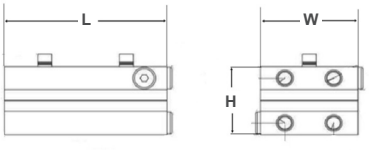




MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	WEIGHT (kg)	DIMENSIONS (mm)					
					Lw	Lc	Ww	Wc	Hw	Hc
DL-060-12-00-00	59	12	4.2	0.4	100	60	60	60	15	24
DL-060-24-00-00	59	24	2.1	0.4	100	60	60	60	15	24
DL-120-24-00-00	122	24	4.2	0.7	140	120	60	60	15	24
DL-210-24-00-00	207	24	8.1	1.3	240	120	60	60	15	24

Liquid-to-Liquid (LL)

Liquid-to-Liquid Assemblies offer dependable, compact performance by cooling objects via liquid to transfer heat. Heat is absorbed through one liquid heat exchanger and dissipated thru a second liquid heat exchanger.

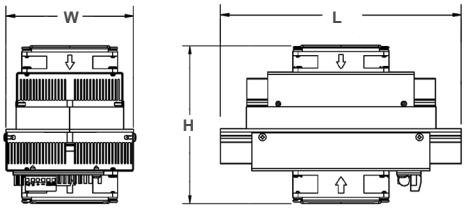


MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (V)	CURRENT (A)	WEIGHT (kg)	DIMENSIONS (mm)		
					Height	Length	Width
LL-060-12-00-00-00	66	12	3.9	0.5	44	100	60
LL-120-24-00-00-00	122	24	4.2	0.8	53	140	60
LL-210-24-00-00-00	208	24	7.9	1.4	53	240	60

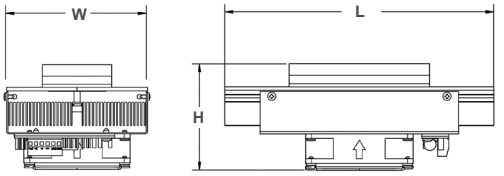
Cascade Series

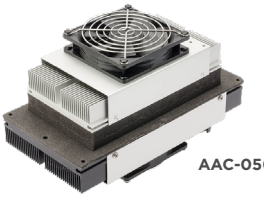
The Cascade Series is a thermoelectric cooler assembly that is specifically designed to reach colder temperatures than standard thermoelectric cooler assembly product offerings. The thermoelectric coolers are custom designed multistage cascades that achieve a high cooling capacity (Qc) at high temperature differentials (ΔT). The cold side mechanism can transfer heat using convective (sink and fan) or conductive (cold plate) means. This product series is offered in 12 or 24 volt configurations and is designed for indoor use in lab instruments.

Air-to-Air



Direct-to-Air





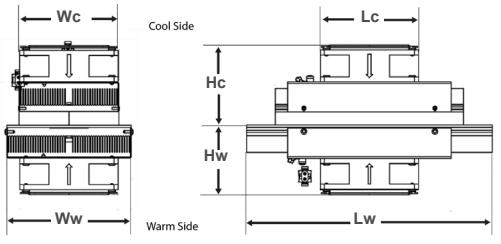
AAC-050

MFG PART NUMBER/ DESCRIPTION	COOLING POWER	NOMINAL VOLTAGE (V)	CURRENT (A)	DIMENSIONS (mm)		
				Height	Length	Width
AAC-050-24-22-00-00	49	24	4.7	152	230	122
DAC-035-12-02-00-00	31	12	4.8	91	160	122
DAC-060-24-02-00-00	58	24	4.6	91	230	122

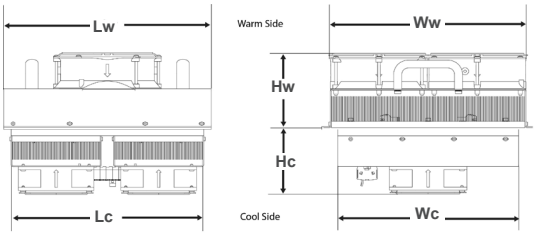
Outdoor Cooler Series

The Outdoor Cooler Series is designed for outdoor use to control the temperature of electronic cabinets. The product series has been designed to pass harsh environmental demands such as earthquake resistance, salt fog, wind-driven rain, high temperature exposure and dust. The cooling capacity ranges from 100 to 250 Watts. This product series is offered in 24 and 48 VDC configurations and is designed for outdoor use in the telecom and industrial markets. As a standard option products are also sold with bi-polar thermostatic control to heat and cool to specific temperature set points.

AA-100-, AA-150, AA-200, AA-250



AA-230, AA-480



AA-250

MFG PART NUMBER/ DESCRIPTION	COOLING POWER (W)	NOMINAL VOLTAGE (VDC)	CURRENT (A)	TEMPERATURE REGULATION	DIMENSIONS (mm)					
					Lw	Lc	Ww	Wc	Hw	Hc
AA-100-24-44-00-XX	102	24	5.6	Open Loop	300	200	152	122	81	99
AA-100-48-44-00-XX	102	48	2.8	Open Loop	300	200	152	122	81	99
AA-150-24-44-00-XX	143	24	7.9	Open Loop	300	250	153	152	80.4	98.5
AA-150-48-44-00-XX	143	48	3.9	Open Loop	300	250	153	152	80.4	98.5
AA-200-24-44-00-XX	193	24	11.3	Open Loop	400	350	153	152	85	98
AA-200-48-44-00-XX	193	48	5.6	Open Loop	400	350	153	152	85	98
AA-230-24-D44-00-XX	230	24	12.1		400	350	153	152	105	86
AA-230-48-D44-00-XX	230	48	6.1		400	350	153	152	105	86
AA-250-24-44-00-XX	244	24	12.1	Open Loop	350	400	153	152	99	105
AA-250-48-44-00-XX	244	48	6.1	Open Loop	350	400	153	152	99	105
AA-480-24-44-00-XX	480	24	19.3		171	330	303	280	122	103
AA-480-48-44-00-XX	480	48	6.1		171	330	303	280	122	103

Nextreme™ NRC400 Thermoelectric Chiller

The NRC400 Thermoelectric Chiller is a next generation benchtop recirculating chiller utilizing solid-state thermoelectric technology to deliver precise temperature control for analytical and industrial applications. It offers a higher coefficient of performance (COP), improved temperature stability and lower noise operation than previous models, all in a compact form factor. Equipped with a high-quality pump, the NRC400 offers high MTBF with low pulsation to accommodate highly sensitive imaging and test instruments. Users can simply control the unit via an easy-to-use LCD touch screen display.

NRC400

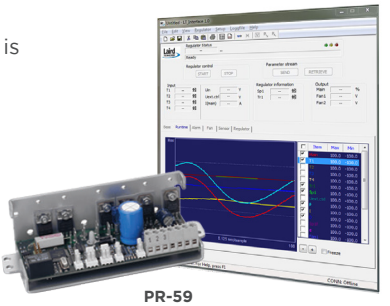
MFG PART NUMBER	MODEL	COOLING CAPACITY (W)	CONTROL TEMP RANGE (°C)	MAX FORWARD PRESSURE (BARS)	WEIGHT (kg)	HEIGHT (mm)	WIDTH (mm)	DEPTH (mm)
385901-001	NRC400-T0-00-PC1	400	-5°C to 40°C	1.18	21	400	274	413

Temperature Controllers

Laird Thermal Systems offers three types of controllers to drive thermoelectric cooler assemblies. The Q Series is designed for single directional thermostatic control. The PR Series is designed for PID control and comes with graphical user interface to make adjustments on the fly. Bi-polar thermostatic controllers are available, but sold with Outdoor Cooler Series units only.

SR-54

QE-50



PR-59

PART NO.	DESCRIPTION	REGULATION TYPE	TEMP RANGE (°C)	ACCURACY (°C)	INPUT VOLTAGE	MAX OUTPUT CURRENT	ALARM OUTPUTS
SR-54	Microcontroller based device	ON/OFF or PID	-20 to 100°C	±0.13°C	16 to 60 VDC	20 Amps, 28 VDC 12 Amps, 60 VDC	Yes
PR-59	Programmable PID Controller	PWM	Sensor Dependent	Sensor Dependent	11-30VDC	< 15A	Yes
QC-50	Single Directional Thermostatic	ON/OFF	Cool >5ºC Off <2 ºC	±1.0°C	11-58VDC	< 16A	Yes
QE-50	Single Directional Thermostatic	ON/OFF	Cool >35ºC Off <32 ºC	±1.0°C	11-58VDC	< 16A	Yes

Customization

Since there are so many unique attributes that need to be ascertained for each application, often a customized thermoelectric cooler assembly will yield a more optimal thermal solution. Laird Thermal Systems offers strong engineering services with a global presence that supports onsite concept generation, thermal modeling, thermal design and rapid prototyping. We also offer validation test services to meet unique compliance standards for each industry, such as Telcordia, MIL-STDs or unique standards specific to a medical, automotive or industrial account. Minimum order quantity (MOQ) applies for all custom thermoelectric cooler assembly designs and validation testing. Contact Laird Thermal Systems today to support your customization needs.

On Site Concept Generation

Mechanical Design Support

Thermal Modeling Analysis

Temperature Control Design

Prototype Development

Validation Testing

Regional Manufacturing Capabilities

Laird™ THERMAL SYSTEMS

www.lairdthermal.com

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