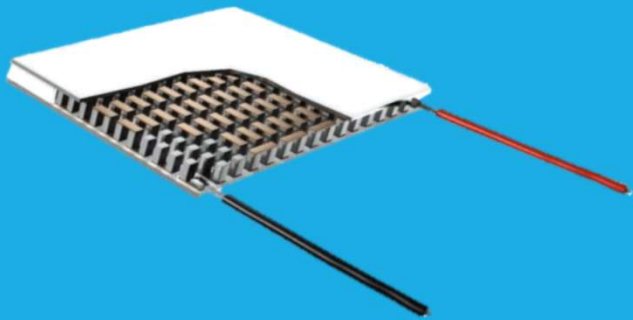


THERMOELECTRIC COOLER (TEC)

Technology & Product Solution



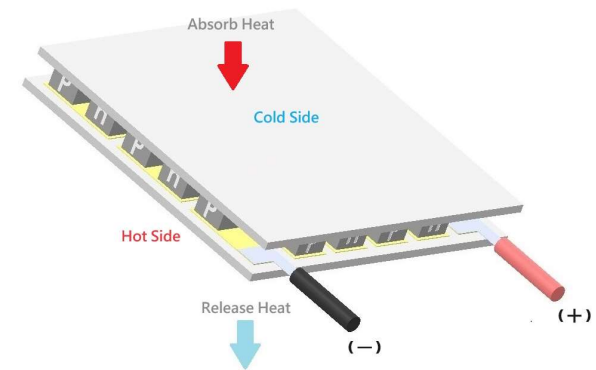
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TEC Introduction

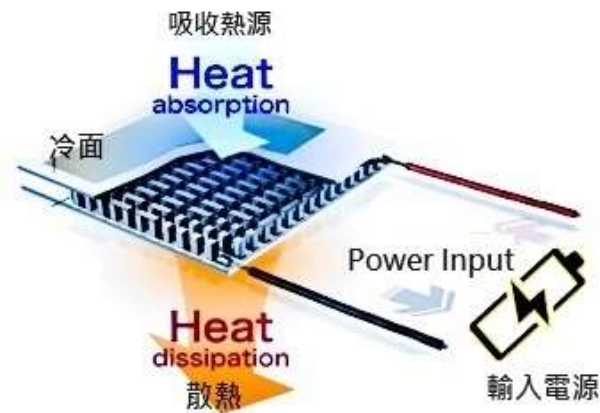
- Thermoelectric coolers (TEC) are devices that utilize the thermoelectric effect to achieve cooling or heating.
- They consist of multiple thermocouples, typically made of different conductive materials.
- When electric current is passed through the TEC, it absorbs heat at one end while releasing heat at the other end, resulting in a temperature difference for cooling or heating purposes.



Thermoelectric Effect

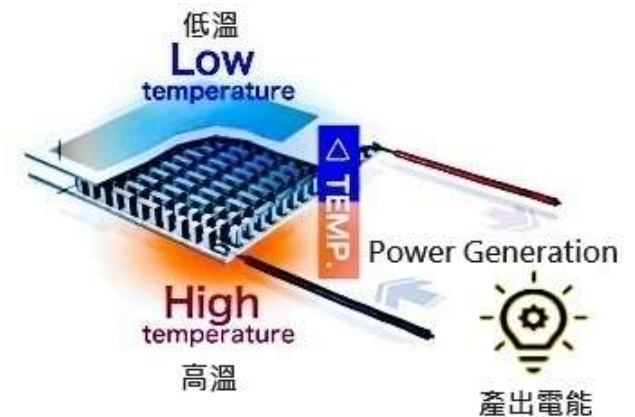
- Peltier Effect
- Seebeck Effect

Peltier Effect Thermoelectric Cooling



- When electric current passes through two different conductive materials (thermocouples), heat is transferred between the two contact points. This causes one end to absorb heat while the other end releases heat, achieving cooling or heating effects.

Seebeck Effect Thermoelectric Generation



- When two different conductive materials form a closed loop, a voltage difference is generated between the materials when heat is applied to one end. This phenomenon results in the flow of electric current in the loop, thereby producing electrical energy.

TEC Features

- No moving parts, noiseless operation, solid-state stable structure.
- Integrated chip design, small size and light weight.
- High performance, high reliability, no environmental pollution.
- Fast response, precise temperature control.
- Can achieve heating and cooling.



Parameter Comparison:

Item	Traditional: Single Thermoelectric	Traditional Improvement: Polycrystalline Thermoelectric	New Technology we use: Polycrystalline Thermoelectric
Technology	Zone melting	SPS hot pressing	Hot extrusion
ZT	0.9	0.7	≥1.2
ΔT (TH30°)	65°C	63°C	≥72°C
Pellet strength	20MPa	80MPa	100MPa
Minimum size of pellet	≥1mm	≥0.15mm	≥0.15mm
Material utilization	50%	≥70%	≥70%
Application	Mini refrigerator, beauty equipment, Dehumidifier		Optical communication (5G), medical equipment, unmanned driving Infrared detection, aerospace, military and high-end equipment

Our
New
Technology

TEC Production Process

Material Selection

- Choose suitable semiconductor materials, typically a combination of N-type and P-type semiconductors. Common materials include bismuth telluride (Bi_2Te_3).

Component Structure Design

- Design the structure of the thermoelectric module according to application requirements and performance specifications, including the number of thermoelectric couples, arrangement, dimensions, etc.

Manufacturing

- The manufacturing process involves cutting selected semiconductor materials into appropriate sizes and assembling them into thermoelectric couples. Subsequently, assemble the thermoelectric couples onto heat sinks and other structural components to form complete thermoelectric modules.

Testing

- After manufacturing, thermoelectric modules need to be tested to ensure their performance and quality. Testing may include measuring cooling or heating capacity, efficiency, temperature control accuracy, and other performance aspects.

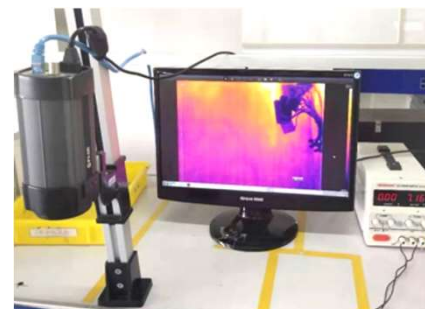
Application Integration

- Depending on specific application requirements, integrate thermoelectric modules into respective systems, such as electronic devices, medical equipment, laboratory instruments, etc.

Reliability Testing Equipment



Spectrum ROHS Analysis Instrument



Infrared test equipment



Temperature difference test instrument



ROD test instrument

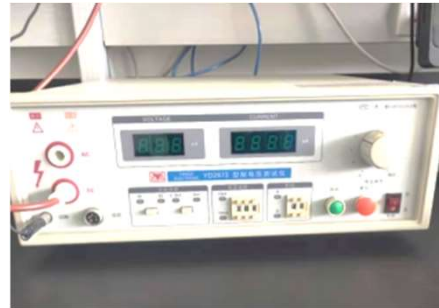


LCR test equipment



Fluorescence film thickness tester

Reliability Testing Equipment



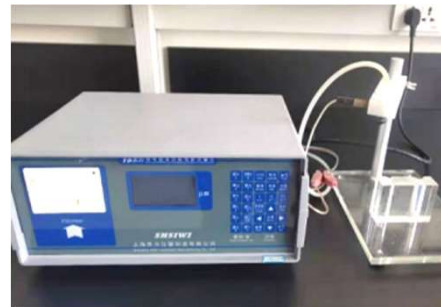
AC High Pressure Water
Leakage Test Equipment



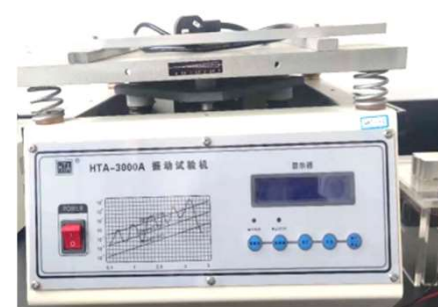
Voltage and current analysis instruments
for power generation products



Water Leakage Tester



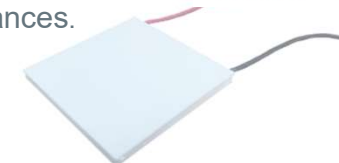
Coating analysis instrument



Vibration Test Equipment



Tensile testing equipment



It can meet the requirements of most medium to high power cooling or heating applications and is widely used in industries such as electronics, scientific instruments, medical and biotechnology equipment, and consumer appliances.

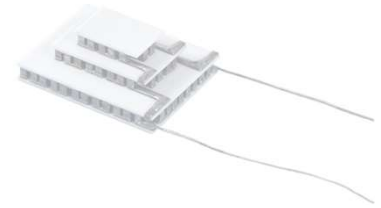
TEC PRODUCTION LINE
**Single-Stage
 Thermoelectric
 Modules**

P/N	I max (A)	V max (V)	ΔT Max (°C)	QC Max (W)	Dimension (mm)
JC-TEC1-00708	8	0.85	66	3.92	10*10*2.90
JC-TEC1-06308	8	7.64	65	35.28	40*20*4.15
JC-TEC1-09906	6	12	65	42.33	50*25*3.55
JC-TEC1-12704	4	16.6	77	37.6	40*40*4.3
JC-TEC1-12706	6	16.6	77	53.4	40*40*3.8
JC-TEC1-12708	8	16.6	77	75.2	40*40*3.5
JC-TEC1-12710	10	15.4	65	88.9	62*62*5.55
JC-TEC1-19903	3	26	77	44.2	40*40*4.3
JC-TEC1-19915	15	24.13	70	208.95	40*40*3.0

TEC PRODUCTION LINE

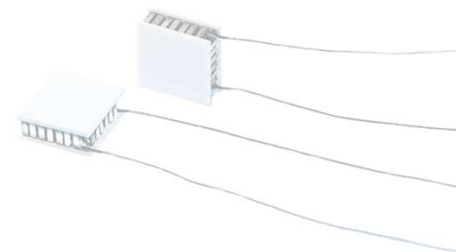
Multi-Stage Thermoelectric Modules

This design is intended to achieve a larger temperature difference than single-stage TEC, making it suitable for localized cooling at low temperatures. It is primarily used in applications such as infrared sensors, CCDs, optical instruments, and more.



P/N	I max (A)	V max (V)	ΔT Max (°C)	QC Max (W)	Dimension (mm)
JC-TEC2-25411	11	30.8	85	212.7	L1:30*30 / L2:40*40 / T6
JF-TEC2-19002	1.60	17.20	104	11.00	L1:15*30 / L2:30*30 / T8
JF-TEC2-03805	4.80	4.10	105	4.00	L1:12*12 / L2:15*15 / T5
JF-TEC2-11105	5.00	13.30	110	12.25	L1:14*14 / L2:14*27 / T4
JF-TEC2-08806	5.50	11.10	105	13.00	L1:15*15 / L2:30*30 / T7

Suitable for various low-power refrigeration or heating applications. Typically used in cooling or heating laser diodes, infrared devices, optoelectronics, electronic equipment and other low-power devices



TEC PRODUCTION LINE
**Miniature
 Thermoelectric
 Modules**

P/N	I max (A)	V max (V)	ΔT Max (°C)	QC Max (W)	Dimension (mm)
JC-TES1-07101	1	9.3	77	5.3	23*23*5.85
JC-TES1-07102	2	9.3	77	10.5	23*23*4.15
JC-TES1-12703	3	15.4	77	28.2	30*30*3.35

TEC PRODUCTION LINE

Environmentally Friendly Thermoelectric Modules

Use environmentally friendly solder, in line with ROHS requirements.
Widely used in scientific applications and the healthcare industry.
Can be used in environments up to 220° C.



P/N	I max (A)	V max (V)	ΔT Max (°C)	QC Max (W)	Dimension (mm)
JC-TER1-03104	4	3.76	75	8.68	20*20*4.05
JC-TER1-07108	8	8.61	75	41.75	60*15*3.45
JC-TER1-03216	16	4.2	77	37.8	28.4*25.4*3.6
JC-TER1-07115	15	9.3	77	77.8	40*40*4.7
JC-TER1-07217	17	9.3	77	89.4	34*30*2.3
JC-TER1-10809	9	14.2	77	71.9	40*20*3.1
JC-TER1-12708	8	16	77	75	40*40*3.8
JC-TER1-15208	8	19.9	77	90	76.7*16.8*2.8
JC-TER1-28006	6	36.7	77	124.3	76*35*4.1

TEC PRODUCTION LINE

Customized Thermoelectric Modules

We can design and produce TEM series with different sizes, shapes, materials and powers according to customer requirements.



P/N	I max (A)	V max (V)	ΔT Max (°C)	QC Max (W)	Dimension (mm)
JC-TEM1-12601	1.53	15.28	74	13.39	12.6*12.6*1.6
JC-TEM1-03502	2.5	4.5	74	5	6.05*12.2*1.65
JC-TEM1-03302	2.25	4	73	5.2	4*11*2
JC-TEM1-00801	1	0.97	73	0.56	1.6*1.6*0.9
JC-TEM1-01501	1.3	1.8	73	1.64	1.8*2.6*0.8
JC-TEM1-03001	1	3.63	73	2.1	3*6*1
JC-TEM1-04504	4	5.4	74	12.4	6*16.5*1.63
JC-TEM1-02401	1	2.9	73	1.6	2.5*4*1.2
JC-TEM1-04103	3.7	5	74	10.3	6*6*1.1

TEC PRODUCTION LINE

Power Generation Thermoelectric Modules

TEG power generation thermoelectric modules can directly convert heat into electricity without moving components as long as there is a temperature difference between the two ends of the thermoelectric chip. It can be widely used in small generators that utilize waste heat or in remote areas with high reliability requirements



P/N	Max Output Power (W)	Resistance (Ω)	Max Operating Temp. ($^{\circ}\text{C}$)	Conversion Efficiency (%)	Dimension (mm)
JF-TEG1-127-1.0-2.0	1.3	8.0	210	3	30*30*4.2
JF-TEG1-127-1.0-1.6	1.6	6.5	210	3	30*30*3.8
JF-TEG1-127-1.0-1.3	2.1	5.0	210	3	30*30*3.6

Thermoelectric Assembly

© **Product Overview:**
 Providing reliable refrigeration capabilities for cooling applications through the use of air cooling and heat dissipation. Widely employed in scenarios such as maintaining constant temperature in communication battery compartments and cooling control boxes for industrial equipment.

- © **Applications:**
- . Enclosure Heat Dissipation
 - . Cooling for Food and Beverages
 - . Heat Dissipation for Mobile Base Stations and Signal Tower Battery Cabinets
 - . Outdoor Power Distribution Station Cooling



TEC
**Industrial
Application**



- **Consumer products:**
Dehumidifiers, Cooling Boxes,
Warm and Cold Jackets, Beauty Equipment.



- **Industry:**
Waste Heat Power Generation,
Field Power Generation



- **Aerospace:**
Isotope Power Generation Science, Cooler,
Temperature Circulator, Spectrophotometer

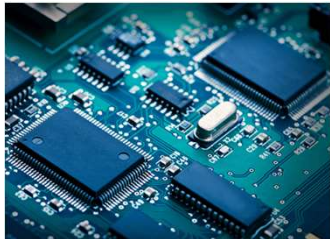
TEC
**Industrial
Application**



- **Medical:**
Blood Sample Analyzer, PCR Nucleic Acid Detector,
Sample Temperature Cycle



- **5G Communication:**
Optical Module Constant Temperature Control

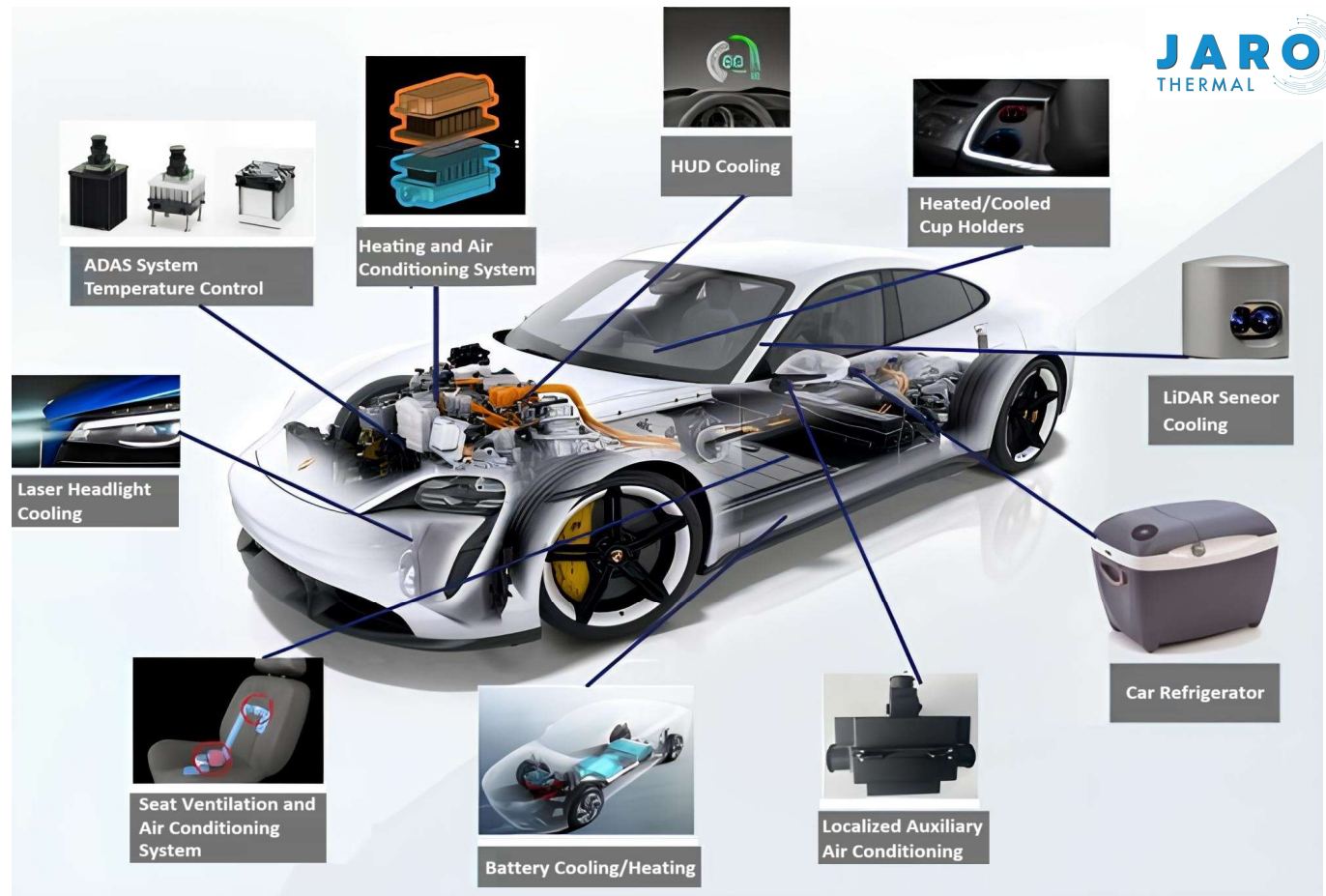


- **Electronics:**
Wafer Inspection Equipment,
Photolithography Equipment

TEC Industrial Application

• Automotive:

The advanced driving assistance image sensor has a constant temperature, reducing AI errors caused by heat. The temperature management of electric vehicle batteries, where high temperatures affect battery life and low temperatures affect battery endurance performance.



THANK YOU.



JARO THERMAL

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