Green air conditioning

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What is a thermoelectric unit?

A thermoelectric unit is a device for the transfer of heat. Such units come ready for fitting and cool using electrical energy only. Thermoelectric units achieve the same results as traditional compressor systems without the use of gas or moving components (except fans, if applicable).

HOW DO THERMOELECTRIC UNITS WORK?
Thermoelectric units are simply small static heat pumps, which use the so-called “Peltier” effect. Heat is transferred as a result of a flow of electrical current through thermoelectric modules, which are the main components in the system. Heat is absorbed by one side of the unit (the cold side) and as a result the temperature drops. The other side dissipates the heat into the surrounding environment (hot side). The process can be reversed by simply inverting the direction of the current flow.

WHAT ARE THE ADVANTAGES COMPARED TO A COMPRESSOR SYSTEM?
Thermoelectric units have no moving mechanical parts (except fans, if applicable) and are therefore extremely reliable, have an almost unlimited life span and require no maintenance. The fact that they are “static” makes them immune to vibration meaning they can be used in any position, which makes them particularly suitable for applications where they are mounted on systems in motion. They contain no pollutants such as CFC or other gases, which can harm the environment ambient and have simpler and more compact structure than compressor systems.

Thermoelectric cooling units are used to cool and dehumidify the air inside electrical cabinets and to separate the internal and exterior environments. Air conditioners are usually used when outside temperatures are unfavorable i.e. over 35°C and the atmosphere is contaminated by oil or dust.
Cooling Units Introduction

THERMOELECTRIC UNITS
Thermoelectric unit is a solid-state device, which can operate as a heat pump to transfer heat utilizing the Peltier effect. These thermoelectric air conditioners represent a cost-effective solution for cooling electronic equipment housed in small enclosures to provide reliable performance without the use of CFC’s.

DC THERMOELECTRIC UNITS

DOUBLE EFFECT
Heating and cooling conversion by reversing polarity

QUIET OPERATION
Compressor-free and no moving parts, except for the fan

REFRIGERANT FREE
No dangerous fluids thanks to Peltier effect cooling system

IP55
High protection against wet and dusty conditions

Details that make the difference

Efficient heat sink
Peltier module
Custom design
AC THERMOELECTRIC UNITS

Designed for enclosure in industrial settings, the AC cooling unit fit an integrated AC power supply system on the outer cover, saving internal space and avoiding additional thermal load inside the unit.

Model numbering system for DC Thermoelectric units

<table>
<thead>
<tr>
<th>description</th>
<th>TCU</th>
<th>200</th>
<th>AC</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAMILY TCU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOLING POWER 200 W</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model numbering system for AC Thermoelectric units

<table>
<thead>
<tr>
<th>description</th>
<th>TCU</th>
<th>100</th>
<th>24</th>
<th>40</th>
<th>IP55</th>
<th>-7035</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAMILY TCU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOLING POWER 50 W</td>
<td></td>
<td>100 W</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>VOLTAGE 12 Vd.c.</td>
<td></td>
<td>24 Vd.c.</td>
<td>48 Vd.c.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SERIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLOR 7035 = Grey RAL 7035</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>IP protection degree</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SERIES</td>
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<tr>
<td>40 = standard S*** = custom</td>
<td></td>
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</tr>
</tbody>
</table>
General specifications

- Panel through mounting, see mounting cut-out. Fixing with M5 ISO screws (not supplied).
- Suitable for any plate thickness
- Plastic parts in PC/ABS alloy, self-extinguishing, according to UL 94V-0
- Sealing gasket made of closed cell polyethylene foam
- Shielded and self-lubricating ball bearing fans
- Standard color grey RAL 7035

Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling Power</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
<th>Max Current</th>
<th>Operating Temp. Range</th>
<th>Rated Voltage Range</th>
<th>Weight</th>
<th>Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCU501240IP55-7035</td>
<td>57 W</td>
<td>12 V d.c.</td>
<td>5.0</td>
<td>5.8</td>
<td>-20 ~ +70°C</td>
<td>7 ~ 13 V</td>
<td>5.39 Kg</td>
<td>CE;</td>
</tr>
<tr>
<td>TCU502440IP55-7035</td>
<td>57 W</td>
<td>24 V d.c.</td>
<td>2.4</td>
<td>2.8</td>
<td>-20 ~ +70°C</td>
<td>10 ~ 27.6 V</td>
<td>5.41 Kg</td>
<td>CE;</td>
</tr>
</tbody>
</table>

Technical drawing

Mounting cut-out

Technical drawing

Mounting cut-out

Technical data

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</tr>
<tr>
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<td>24 V d.c.</td>
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<td>2.8</td>
<td>-20 ~ +70°C</td>
<td>10 ~ 27.6 V</td>
<td>5.41 Kg</td>
<td>CE;</td>
</tr>
</tbody>
</table>
General specifications

- Panel through mounting, see mounting cut-out. Fixing with M5 ISO screws (not supplied). Suitable for any plate thickness
- Plastic parts in PC/ABS alloy, self-extinguishing, according to UL 94V-0
- Sealing gasket made of closed cell polyethylene foam
- Shielded and self-lubricating ball bearing fans
- Standard color grey RAL 7035

- No chlorofluorocarbons (CFC)
- Ability to heat and cool
- Precise temperature control
- Operation in any orientation
- Long life
- Not sensitive to vibration
- No moving parts except the fans

Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling Power</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
<th>Max Current</th>
<th>Operating Temp. Range</th>
<th>Rated Voltage Range</th>
<th>Weight</th>
<th>Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>V</td>
<td>A</td>
<td>A</td>
<td>°C</td>
<td>V</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>TCU1002440IP55-7035</td>
<td>101</td>
<td>24 Vd.c.</td>
<td>4.7</td>
<td>5.7</td>
<td>-20 – +70</td>
<td>17 – 27</td>
<td>7.39</td>
<td>CE;</td>
</tr>
<tr>
<td>TCU1004840IP55-7035</td>
<td>101</td>
<td>48 Vd.c.</td>
<td>2.4</td>
<td>3.0</td>
<td>-20 – +70</td>
<td>34 – 54</td>
<td>7.37</td>
<td>CE;</td>
</tr>
</tbody>
</table>

Technical drawing

Mounting cut-out

![Diagram of TCU 100 100W Thermoelectric units DC air-air](image-url)
General specifications

- Panel through mounting, see mounting cut-out. Fixing with M5 ISO screws (not supplied).
- Suitable for any plate thickness.
- Plastic parts in PC/ABS alloy, self-extinguishing, according to UL 94V-0.
- Sealing gasket made of closed cell polyethylene foam.
- Shielded and self-lubricating ball bearing fans.
- Standard color grey RAL 7035.

- No chlorofluorocarbons (CFC).
- Ability to heat and cool.
- Precise temperature control.
- Operation in any orientation.
- Long life.
- Not sensitive to vibration.
- No moving parts except the fans.

Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling Power</th>
<th>Rated Voltage</th>
<th>Rated Current</th>
<th>Max Current</th>
<th>Operating Temp. Range</th>
<th>Rated Voltage Range</th>
<th>Weight</th>
<th>Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCU2002440IP55-7035</td>
<td>201</td>
<td>24 Vd.c.</td>
<td>9.5</td>
<td>11.5</td>
<td>-20 – +70</td>
<td>17-27 Vd.c.</td>
<td>14.06</td>
<td>CE;</td>
</tr>
<tr>
<td>TCU2004840IP55-7035</td>
<td>201</td>
<td>48 Vd.c.</td>
<td>4.8</td>
<td>6.0</td>
<td>-20 – +70</td>
<td>34-54 Vd.c.</td>
<td>14.01</td>
<td>CE;</td>
</tr>
</tbody>
</table>

Technical drawing

Mounting cut-out

![Diagram of TCU 200 200W Thermoelectric units](image)
General specifications

- Panel through mounting, see mounting cut-out. Fixing with M5 ISO screws (not supplied).
- Suitable for any plate thickness
- Stainless steel external cover
- Sealing gasket made of closed cell polyethylene foam
- Shielded and self-lubricating ball bearing fans
- Terminal block connection
- AC/DC power supply integrated
- No chlorofluorocarbons (CFC)
- Precise temperature control
- Operation in any orientation
- Long life
- Not sensitive to vibration
- No moving parts except the fans

Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling Power</th>
<th>Rated Voltage</th>
<th>Input Power</th>
<th>Max Input Power</th>
<th>Operating Temp. Range</th>
<th>Weight</th>
<th>Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCU200AC40-SIP</td>
<td>201 W</td>
<td>88-264 Va.c.</td>
<td>245 W</td>
<td>306 W</td>
<td>-20 ~ +50°C</td>
<td>16.61 Kg</td>
<td>CE;</td>
</tr>
</tbody>
</table>

Technical drawing

Mounting cut-out

Technical data chart

Cooling Power [W] vs. Temperature Difference [°C]

\[ Q_c = -6.5797 \Delta T + 201.09 \]
THERMOELECTRIC MODULES
Thermoelectric modules are semiconductor-based electronic components that work as a small heat pump. These modules are the core system of thermoelectric units and combine low energy requirements with the ability to provide both cooling and heating from the same element, by reversing the polarity of DC voltage.

DOUBLE EFFECT
Heating and cooling conversion by reversing polarity

REFRIGERANT FREE
No dangerous fluids thanks to Peltier effect cooling system
General specifications

The thermoelectric module (or Peltier module) is an electronic component which works as a small heat pump. This is the core system of the cooling unit and it is made up of a certain number of couples of semiconductor material with different electric charge. These couples are laid down between two ceramic plates, like a “sandwich”, that act as a mechanical support and also as an electrical insulator. Applying a DC electric current to the module, the system starts to work cooling a side of the module and warming the opposite one.

- Lead wires length: standard 150mm
- Tinned lead wires ends
- Lead wires insulation: PVC
- Sealing: silicone or epoxy resin

- No chlorofluorocarbons (CFC)
- Ability to heat and cool
- Precise temperature control
- Operation in any orientation
- Long life
- Not sensitive to vibration

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TM1-1273050-HXHP</td>
<td>5.0</td>
<td>15.2</td>
<td>47.1</td>
<td>66</td>
<td>125</td>
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<tr>
<td>TM1-1274060-HXHP</td>
<td>6.0</td>
<td>15.3</td>
<td>60.0</td>
<td>67</td>
<td>125</td>
</tr>
</tbody>
</table>

Technical specifications

TM1-1273050-HXHP

TM1-1274060-HXHP

Cooling power vs temperature difference

Cooling power vs current
General specifications

Drip trays are stainless steel accessories to be mounted on the thermoelectric units. They are used to collect the condensate generated on the cold heat sink inside the enclosure.

Suitable for vertical installation of the thermoelectric unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC-TCU100-1001</td>
<td>for TCU100</td>
</tr>
<tr>
<td>RC-TCU200-1001</td>
<td>for TCU200 / TCU200AC</td>
</tr>
<tr>
<td>RC-TCU50-1001</td>
<td>for TCU50</td>
</tr>
</tbody>
</table>

FOR TCU50 / TCU100

Technical drawing

FOR TCU200

Technical drawing
Cooling Units Introduction

TCU50 and TCU100 - max. height with drip tray

TCU200 / TCU200AC - max. height with drip tray