SPARTIUM® origins trace back to 1962 by joining the European Air Conditioning industry. At that time the U.S.A. was the only available source of knowhow and equipment supply. In 1967 the company joined the new formed cluster of European manufacturers of HVAC equipment by establishing its own factory in Thessaloniki, Greece. To safeguard the integrity of its equipment performance, was one of the first 32 companies in 1993 to participate in Eurovent’s originally established Certification Programme.

During the turn of the century the company made an innovative breakthrough in designing, manufacturing and testing the SPARTIUM® Adiabatic Cooler and Condenser. The prototype Adiabatic Fluid Cooler won the Innovation Award at the 2006 Interclima Exhibition in Paris and it was selected as a top innovation product for its impressive water saving features, combined with a unique safety operational concept. The greatest success feature however of those new product lines was the hygienic characteristics and the ability to contain the risk of Legionellosis associated with water systems in buildings and, therefore, fully complied with the strict legislation enforced in France, the United Kingdom and Spain.

SPARTIUM® achieved reliable manufacturing excellence every time and all the times through a vertically integrated manufacturing process, allowing quick response and adaptations to market’s needs. Manufacturing applies a strict Quality Management System as per EN ISO 9001:2008 in accordance with the procedures of the Certification Body at TÜV NORD CERT GmBH and a Quality System for Pressure Equipment Manufacturer according to the EU Directive.
Why Adiabatic Cooling

The Adiabatic Process

SPARTIUM® Adiabatic Cooling units incorporate engineering solutions for water or glycol cooling, or for condensing refrigerants. The water is evaporated into the air stream which through an engineered pad is chilled with heat taken from it, thus in an adiabatic state. The colder air as it passes in turn through a finned heat exchanger cools the hot process fluid to a much lower temperature or pressure level, increasing its heat rejection capacity of up to 40% more than what is achieved by a dry cooler or air cooled condenser.

FEATURES OF THE SPARTIUM® ADIABATIC COOLING

Water Saving

The SPARTIUM® Adiabatic coolers and condensers do not use re-circulated water and therefore no bleed-off is required. This advantage in addition to the adiabatic cooling of the entering air, depending on the local climatic conditions, may result to more than 80% annual water saving compared to cooling towers, closed circuit cooling towers and evaporative condensers.

Furthermore the chance of water droplets entrained in the air stream is totally eliminated with the SPARTIUM® Cooler because during the humidification of the air no aerosols are produced since the transfer of humidity takes place at molecular level.

During the annual operation of an Adiabatic Cooler, but even during the daily load requirements, the entering ambient dry bulb air temperature is often below the depressed dry bulb temperature coming out of the pad section of the unit. During all such periods the unit’s software modulates the speed of the fans through their electronically commutated (EC) motors according to the load demands, before the pad wetting is energized. This fan speed modulation results to significant energy consumption savings.

Electricity Saving

The SPARTIUM® units controller’s software modulates the speed of the fans through their electronically commutated (EC) motors according to the load demands, before the pad wetting is energized. This fan speed modulation results to significant energy consumption savings.

Operational Safety - Legionella and the prevention of legionellosis.

Legionellosis infections were identified in the second half of the 20th century, caused by the legionella bacteria. The severity of the infections varies from mild febrile illness to a potential fatal form of pneumonia (Legionnaires’ disease) that can affect anyone in the vicinity.

Water is the major natural reservoir for legionellae and the bacteria are found worldwide in many different natural and artificial aquatic environments such as water systems in hotels, hospitals, ships and factories. Water temperature above 25°C is a crucial factor for the bacteria colonization, when stagnant in equipment and in water distribution systems.

Cooling towers and evaporative condensers have historically been implicated in numerous outbreaks of Legionnaires’ disease. The major risk factor for legionellae proliferation in these systems appear to be neglect or insufficient maintenance. Surveillance for Legionnaires’ disease is now a statutory notifiable disease in most industrialized countries.

The SPARTIUM® family of products are specifically designed to restrain legionella's colonization:

• unlike a cooling tower, it has no sump, where the legionella bacteria can proliferate at the commonly encountered temperatures in such equipment of 25°C and above.
• in the case the adiabatic process is interrupted the unit incorporates an intelligent control system that drains the water in its pre-cooling pad distribution system via an automatic operation of the valves, through the inclined gutter system, so that no stagnant water remains at any time in any part of the unit.
• because of the adopted low air velocity through the cooling pads and their design and construction, there is no water carry over, or aerosol generation.

Limited Maintenance Requirements.

Due to its concept, design and construction the SPARTIUM® equipment requires limited maintenance and there is no need for any main water supply pre-treatment. By its factory adjusted city water calibrated metering devices, the wetting of the pads is secured and a certain amount of excess water is continuously draining dirt and debris from the surface of the pads, prolonging their useful life. A tough and resilient edge treatment applied to the entering face of the pads allows frequent surface cleaning without damaging the pad and routine maintenance can be performed while the unit is still operating.

Choice of Operational Predominance

The SPARTIUM® family of products are ideal for installation in areas of water scarcity against other types of cooling equipment due to minimal water consumption and considerable higher thermal performance.

On the contrary in areas where water is no issue, the software of the units allow more extensive use of the pre-cooling of the air and thus operation at lower fan speeds at considerable reduced electricity consumption.

The control system also allows night operation during which the maximum allowable speed of the fans is reduced by energizing pre-cooling earlier achieving also a lower noise level.

Limited Maintenance Requirements.
Technical Data of Adiabatic Coolers

Heat Exchangers in “V” Configuration

<table>
<thead>
<tr>
<th>Configuration</th>
<th>&quot;V&quot; - 5W coil arrangement</th>
<th>&quot;V&quot; - 4W coil arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomenclature</td>
<td>SPV-FC-5W-06-EC91-P-04-14</td>
<td>SPV-FC-4W-06-EC91-P-04-14</td>
</tr>
<tr>
<td>Nominal Capacity(*)</td>
<td>380 kW to 1050 kW</td>
<td>370 kW to 1000 kW</td>
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<tr>
<td>Number and Type of Fans</td>
<td>4 to 14 &quot;EC&quot;</td>
<td>4 to 14 &quot;EC&quot;</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Length / Width / Height</td>
<td>2.73 m / 2.22 m / 7.74 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.73 m / 2.22 m / 7.74 m</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>1,600 kg to 4,930 kg</td>
<td>1,470 kg to 4,430 kg</td>
</tr>
<tr>
<td>Sound power</td>
<td>95 dB(A) to 100 dB(A)</td>
<td>95 dB(A) to 100 dB(A)</td>
</tr>
</tbody>
</table>

(*) Nominal capacities based on 35°C / 29°C inlet/outlet water temperature, and ambient entering air 35°C db / 21°C wb

Heat Exchangers in Vertical Configuration

<table>
<thead>
<tr>
<th>Configuration</th>
<th>&quot;H&quot; - 4W coil arrangement</th>
<th>&quot;H&quot; - 4W coil arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomenclature</td>
<td>SPV-FC-4W-06-EC91-P-05-07</td>
<td>SPV-FC-4W-06-AC125-P-05-05</td>
</tr>
<tr>
<td>Nominal Capacity(*)</td>
<td>330 kW to 800 kW</td>
<td>380 kW to 970 kW</td>
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<tr>
<td>Number and Type of Fans</td>
<td>2 to 7 &quot;EC&quot;</td>
<td>2 to 5 &quot;EC&quot;</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Length / Width / Height</td>
<td>2.73 m / 8.83 m / 6.87 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.04 m / 8.53 m / 6.87 m</td>
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<tr>
<td>Shipping Weight</td>
<td>1,300 kg to 3,090 kg</td>
<td>1,930 kg to 4,330 kg</td>
</tr>
<tr>
<td>Sound power</td>
<td>87 dB(A) to 93 dB(A)</td>
<td>97 dB(A) to 101 dB(A)</td>
</tr>
</tbody>
</table>

(*) Nominal capacities based on 35°C / 29°C inlet/outlet water temperature, and ambient entering air 35°C db / 21°C wb

Technical Data of Ammonia Adiabatic Condensers

Halocarbon Refrigerants

<table>
<thead>
<tr>
<th>Configuration</th>
<th>&quot;V&quot; - 4Z coil arrangement</th>
<th>&quot;H&quot; - 4Z coil arrangement</th>
<th>&quot;H&quot; - 4Z coil arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomenclature</td>
<td>SPV-CH-4Z-06-EC91-P-04-14</td>
<td>SPV-CH-4Z-06-EC91-P-06-07</td>
<td>SPV-CH-4Z-06-AC125-P-06-05</td>
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<tr>
<td>Refrigerant</td>
<td>R134a</td>
<td>R134a</td>
<td>R134a</td>
</tr>
<tr>
<td>Nominal Capacity(*)</td>
<td>390 kW to 1380 kW</td>
<td>320 kW to 1110 kW</td>
<td>540 kW to 1220 kW</td>
</tr>
<tr>
<td>Number and Type of Fans</td>
<td>4 to 7 &quot;EC&quot;</td>
<td>2 to 7 &quot;EC&quot;</td>
<td>2 to 5 &quot;EC&quot;</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Length / Width / Height</td>
<td>2.73 m / 8.33 m / 7.74 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.82 m / 8.33 m / 7.74 m</td>
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<td></td>
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<td>2.04 m / 8.33 m / 7.74 m</td>
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<tr>
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<td></td>
<td>2.04 m / 8.33 m / 7.74 m</td>
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<tr>
<td></td>
<td></td>
<td>2.33 m / 8.33 m / 7.74 m</td>
<td></td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>1,470 kg to 4,410 kg</td>
<td>1,400 kg to 4,000 kg</td>
<td>1,930 kg to 4,330 kg</td>
</tr>
<tr>
<td>Sound power</td>
<td>93 dB(A) to 100 dB(A)</td>
<td>87 dB(A) to 93 dB(A)</td>
<td>97 dB(A) to 101 dB(A)</td>
</tr>
</tbody>
</table>

(*) Nominal capacities refer to R134a, based on 40°C condensing temperature, and ambient entering air 35°C db / 21°C wb

Technical Data of Ammonia Adiabatic Condensers

Ammonia Refrigerants

<table>
<thead>
<tr>
<th>Configuration</th>
<th>&quot;V&quot; - 5Z coil arrangement</th>
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</thead>
<tbody>
<tr>
<td>Nomenclature</td>
<td>SPV-CA-5Z-04-EC91-P-06-12</td>
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<tr>
<td>Refrigerant</td>
<td>Ammonia</td>
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<tr>
<td>Nominal Capacity(*)</td>
<td>470 kW to 1400 kW</td>
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<td>Number and Type of Fans</td>
<td>4 to 12 &quot;EC&quot;</td>
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<td>Dimensions</td>
<td>Length / Width / Height</td>
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<tr>
<td>Shipping Weight</td>
<td>1,580 kg to 4,800 kg</td>
</tr>
<tr>
<td>Sound power</td>
<td>95 dB(A) to 100 dB(A)</td>
</tr>
</tbody>
</table>

(*) Nominal capacities based on 40°C condensing temperature, and ambient entering air 35°C db / 21°C wb
Standard & Optional Components

Electrical Panels and Control Logic

The SPARTIUM® Cooler is a ‘plug-and-play’ cooling unit fully wired and programmed at the factory and only needs to be connected to the grid and its pad wetting piping to the city water supply. The factory installed Power and Control Panels in IP55 enclosure include main magnetic power switch, emergency stop, power failure reset, individual fan motor circuit breakers, microprocessor controller with display, wired to immersion temperature or pressure sensor, and ambient air sensor.

Internal Fan Compartment Partitions

supplied as standard, ensure a uniform and swirl free flow of the air to each individual fan, reducing noise vibration and eliminating flow obstacles. In case of an idle fan the partitions prevent air bypassing the heat exchangers.

Pad Edge Treatment

supplied as standard, a tough and resilient pad edge treatment applied to the air entering face of the pads. It has been constructed to withstand repeated cleaning without damaging the pad and prevents algae and minerals from anchoring into the substrate of the pad.

Sloping Fully Drainable Gutter

Any excess city water after wetting the pads cleans them from any debris and drains itself through fully drainable sloping gutters ensuring that no stagnant water remains behind.

Pre-cooler Frame in Stainless Steel

As an option, the pre-cooler frames can be furnished in heavy gauge stainless steel construction.

Pad Wetting Metering Devices

The anticipated city water flow for the wetting of the pads is strictly controlled by a metering device with calibrated water scale in l/min. The devices can be re-adjusted in the field depending on local conditions.

Service Switch

If local regulations warrant it, a Service Switch can be installed next to each fan, as an optional item, allowing the interruption of the power supply before any intervention is needed to a particular fan. The switch is supplied in an IP65 enclosure.

Fin Epoxy Coating

If resistance to corrosion in aggressive environments is needed, then the heat exchangers can be constructed with aluminium finstock coated with epoxy lacquer.
The SPARTIUM® Adiabatic Cooler and Condenser is an integral combination of five major components: the adiabatic cooling pad section; the heat exchangers section; the air movement package; the electrical and control installation; and the steel supporting frame.

**ADIABATIC PRE-COOLER**

The cooling pad section serves as an adiabatic saturator to cool the incoming air. It consists of specially impregnated and corrugated cellulose paper sheets with flute angles that have been bonded together, with high evaporation efficiency while still operating with a very low pressure drop. The impregnation procedure for the cellulose paper ensures a strong self-supporting product, with high absorbance, which is protected against decomposition and rotting. A pipe circuit supplies the evaporative fluid, such as city water, to a distribution manifold and the rate of the water flow is initially regulated by a special metering device which treats the correct flow rate. An inlet air edge coating developed specially for harsh and tough conditions prevents the pad surface from extreme environment such as dust, sand storm, and risk of bacterial and algae growth.

A distribution pad on the top of the cooling pad ensures an even water distribution and minimizes the risk of dry spots. The water flows down the corrugated surface of the evaporative cooling pad. The incoming warm and dry air that passes through the pad evaporates most of the water. Any remaining water assists in washing the pad, and is drained to the gutter through a sloping pan. The air that leaves the pad is therefore cooled and humidified simultaneously without any external energy supply, thus adiabatically.

**HEAT EXCHANGER**

The Finned Coil Heat Exchangers of the Coolers and Halocarbon Refrigerant Condensers consists of SF-Cu seamless tubes and aluminum fins. Staggered tube construction provides substantially higher capacity since more tubes are exposed to the air stream. The advanced rippled-corrugated fin design creates a state of continuous turbulence, which effectively reduces the boundary layer formation that could otherwise reduce the rate of heat exchange. Fins have full drawn collars to maintain fin spacing and provide a continuous surface cover over the entire tube. The tubes are mechanically expanded into the fin collars to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Headers are made of seamless copper tubing and the coils arecircuited for counter-flow heat transfer to provide the maximum mean effective temperature difference. The entire coil block is air pressure tested under warm water.

The Finned Coil Heat Exchangers of the Adiabatic Ammonia Condensers consists of Grade TP304L stainless steel tubes and aluminum fins. Headers are made of stainless steel Grade TP304L tubes and the coils are circulated for cross-flow heat transfer to provide the maximum mean effective temperature difference. The headers have stainless steel flanged connections, as standard. The entire coil block is air pressure tested submerged in warm water.

The Condenser Finned Coil Heat Exchangers are manufactured in strict accordance to the Quality System Manufacturer of the EU Directive for Pressure Equipment under the inspection of TÜV NORD.

**AIR MOVEMENT**

The Air Movement Package combines premium aerodynamic and acoustic performance with innovative design to offer a compact fan and motor as an integrated product. It heralds a new era in fan design and technology, extending and setting new standards of innovation, performance and reliability. Increased electricity savings is achieved by the use of fans motors with permanent-magnet rotors, due to their higher efficiency. Motors with this technology are primarily known as ‘EC motors’. The fans selected are labeled as ‘soft commutation’. This involves a combination of commutation strategy and motor design. The result for the customer is low-noise operation, without structure-borne noise. With the fans selected there is no motor noise variation across the entire speed range. The advantage is that when demand for cooling is low, such as operation at night, very low operating speeds can be selected, resulting to extremely reduced absorbed power.

**ELECTRICAL & CONTROL PANELS**

The SPARTIUM® Adiabatic Cooler is a ‘plug-and-play’ machine complete with an Electrical Power panel section and an Electrical Control panel section, all fully wired.

The complete electrical panel consists of an IP55 enclosure with a main magnetic power switch, an emergency cut-out switch, a circuit breaker for each fan and a 400V/230V/24V transformer with auxiliary fuses.

The electrical Control panel section is supplied with 24V and includes:
- Its own Main Switch
- A microprocessor controller with display, wired to an ambient air sensor and to an immersion leaving temperature or pressure sensor
- A Pad Maintenance Switch

**Control Logic**

The fan speed is controlled on the basis of the actual fluid leaving temperature, or pressure, at the exit from the heat exchanger of the unit, and the design process fluid temperature, or pressure, ensuring minimum electrical consumption and noise level. The adiabatic pre-cooling will be activated and stopped on the basis of a pre-programmed logical combination of the fan speed and the ambient temperature. If water saving is the predominant objective, default settings will not activate adiabatic pre-cooling unless the fans are running at maximum permissible speed and the dry-to-adiabatic switch point has been reached.

**STEEL SUPPORTING FRAME**

Structural elements and panel enclosure are constructed by using heavy gauge hot dip galvanised steel with an innovative metallic coating on both sides that offers protection in the harshest environments. The coating consists of a metallic chemical composition of zinc with aluminium and magnesium, which creates a stable and durable layer across the entire surface and gives a far more effective corrosion protection.

**General Specifications**

- **ADIABATIC PRE-COOLER**
  - Efficiency Grade N
  - Overall Efficiency
  - Continuous running from –40°C to +60°C
  - Insulation Class
  - Motor protection
  - Nominal voltage range
  - Nominal voltage
  - Phase

- **HEAT EXCHANGER**
  - Phase 3
  - Nominal voltage 400 VAC
  - Nominal voltage range 380...480 VAC
  - Frequency 50/60 Hz
  - Motor protection IP55
  - Insulation Class F
  - Continuous running from –40°C to +60°C
  - Overall Efficiency 51.0% [required 2015: 37.1%]
  - Efficiency Grade N 53.9% [required 2015: N=40]

- **AIR MOVEMENT**
  - Phase 3
  - Nominal voltage 400 VAC
  - Nominal voltage range 380...480 VAC
  - Frequency 50/60 Hz
  - Motor protection IP55
  - Insulation Class F
  - Continuous running from –40°C to +60°C
  - Overall Efficiency 51.0% [required 2015: 37.1%]
  - Efficiency Grade N 53.9% [required 2015: N=40]

- **ELECTRICAL & CONTROL PANELS**
  - Phase 3
  - Nominal voltage 400 VAC
  - Nominal voltage range 380...480 VAC
  - Frequency 50/60 Hz
  - Motor protection IP55
  - Insulation Class F
  - Continuous running from –40°C to +60°C
  - Overall Efficiency 51.0% [required 2015: 37.1%]
  - Efficiency Grade N 53.9% [required 2015: N=40]
SPARTIUM® has achieved 50 years of manufacturing excellence in the HVAC industry by applying vertically integrated methods in manufacturing using latest State-of-the-Art production machinery. It applies a strict Quality Management System as per EN ISO 9001:2008 in accordance with TÜV NORD CERT procedures, and applies a Quality System for Pressure Equipment Manufacturer according to the EU Directive, authorizing to affix the CE sign.