

ATHENIA™ MKII ELECTRIC SERIES AND HEAT PUMP

— HVAC roof units for hybrid and electric buses —

More sustainable, lower energy consumption, zero emissions

Electric buses consume less energy and produce significantly fewer emissions. The Athenia™ MkII Electric and Electric Heat Pump are the greenest products in our portfolio and the most suitable for low and zero emissions zones. Both series comply with latest F-Gas regulations.

The Athenia™ MkII Electric series offers the highest ratio between cooling capacity and unit weight and size, featuring extra light aluminium frames and light weight covers. In addition, a reversible refrigerant circuit guarantees maximum passenger comfort in heating and cooling modes. The Heat Pump series can be equipped with an independent battery cooling connection to recycle the battery heat loss generated during the electric/hybrid bus operation.

In heating mode, the Athenia™ MkII Electric Heat Pump is able to transfer external air heat to the passenger area inside with a COP of up to 4. This means up to 4 kW of heating generated for each 1 kW of electricity consumed. In cooling mode, the unit operates just like the Athenia™ MkII Electric HVAC unit.

In HP heating mode the unit even offers waste heat pick up from the auxiliaries of the vehicle. Energy that would be lost to the environment is now fed back into the refrigerant circuit to raise the pressure which increases the efficiency in heating mode.

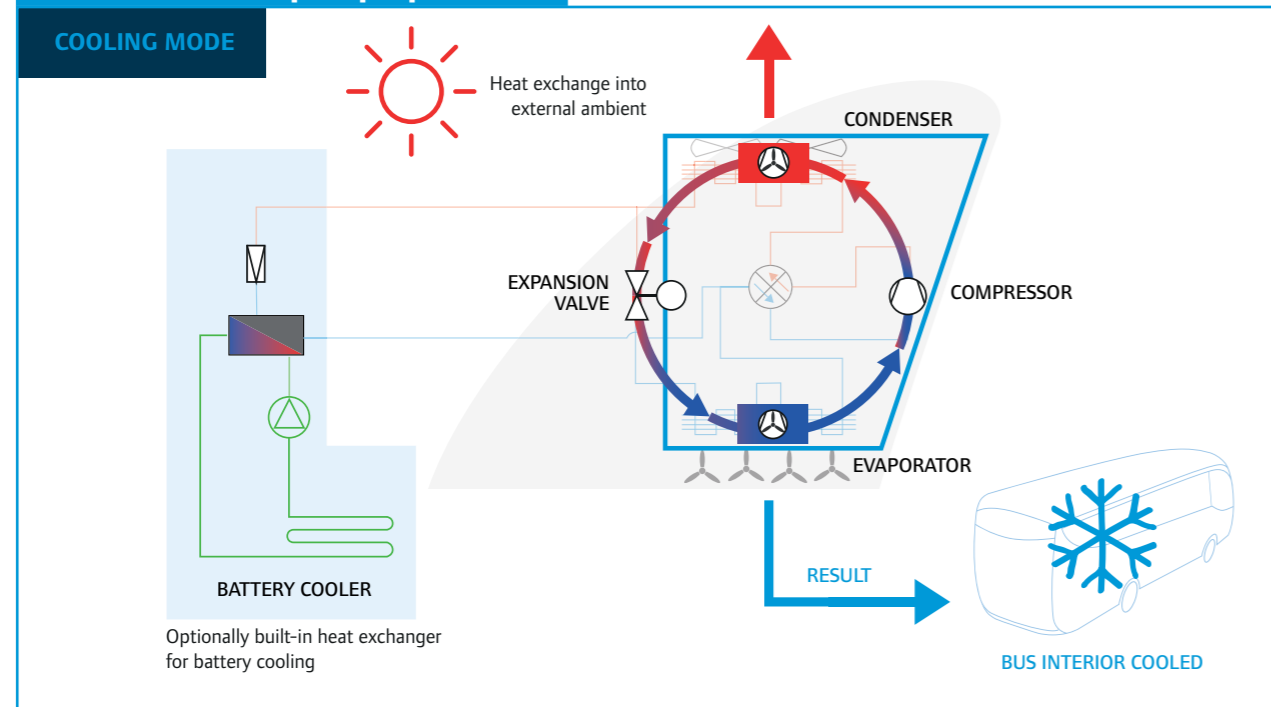
In order to lower total power consumption, Athenia™ MkII Electric and Electric Heat Pump units use an electric variable speed compressor with a cooling/heating capacity modulation range of up to 60 %, even when the bus is at a bus station.

Athenia™ MkII Electric and Electric Heat Pump Series units use the modular expandable control system CANAIRE™ which guarantees efficient operation and low power consumption. Thanks to the CAN-bus communication, the unit is able to communicate bidirectionally with other connected devices in the bus.

The CANAIRE™ control system can be equipped with a built-in CO₂ sensor that monitors air quality. Up to 100 % fresh air can be added to improve the efficiency.

Reversible heat pump operation

COOLING MODE



Benefits of new external heat exchanger design

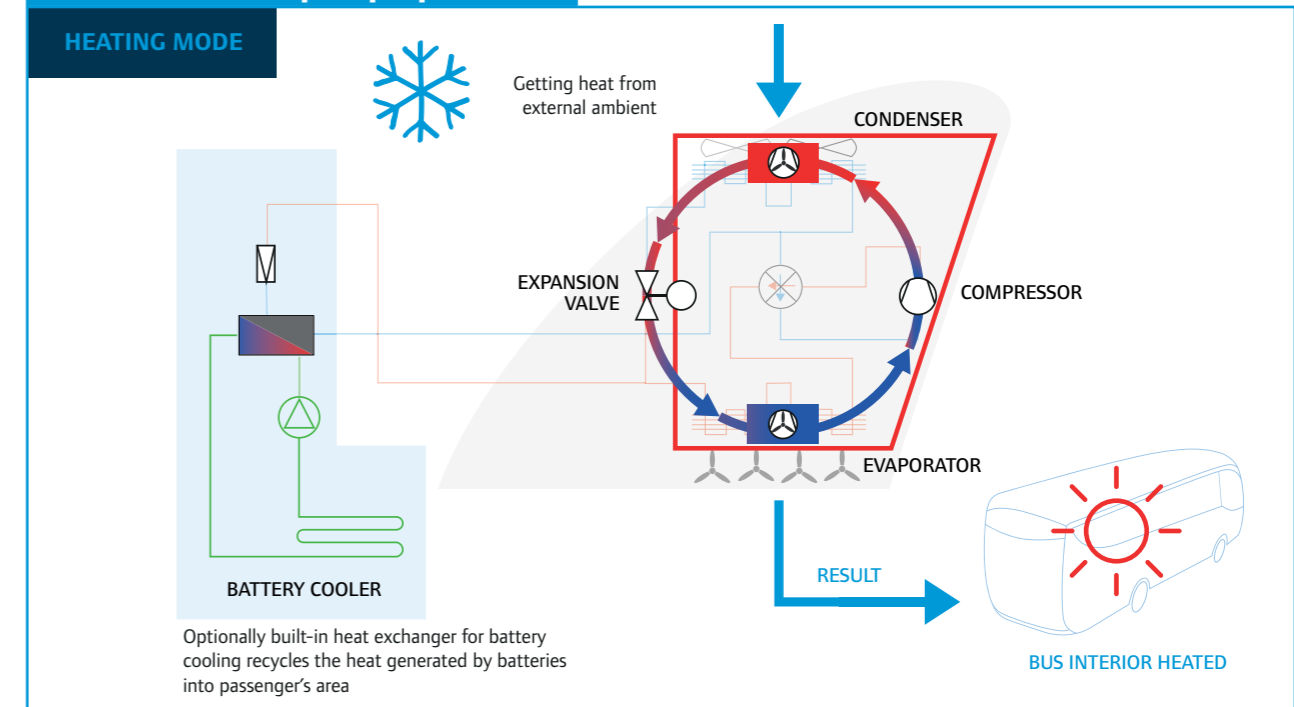
We at Thermo King are continuously improving and evolving our products. The 2nd generation Heat Pump design offers higher efficiency heat exchangers providing further increases in heating and cooling capacity. Operators benefit from this with increased energy transfer, decreasing losses and an industry leading COP.

BENEFITS

AMBIENT TEMPERATURE [°C]	HEATING CAPACITY NEW UNIT [kW]	DIFFERENCE [%]	COP	DIFFERENCE [%]
-7	8.4	18 %	1.6	23 %
0	10.7	26 %	2	33 %
7	12.9	15 %	2.5	14 %
15	18.3	12 %	3.1	11 %

Reversible heat pump operation

HEATING MODE



ATHENIA™ MkII ELECTRIC SERIES		
SPECIFICATIONS ELECTRIC SERIES	E-700	E-960
Unit type	Narrow (N)	
Listed cooling capacity ¹ [kW]	36	38
Rated cooling capacity ² [kW]	13,6 @ 40 Hz 16,1 @ 50 Hz 21,3 @ 75 Hz	13,7 @ 40 Hz 16,7 @ 50 Hz 21,6 @ 75 Hz
Heating capacity ³ [kW]	47	
Evaporator air capacity ⁴ [m ³ /h]	4500 (4920)	6200 (7380)
Fresh air range [%]	0-100	0-100
Current draw ⁵ [A]	81	99
Power supply of integrated compressor ⁶	3PH 280V 38 Hz - 460V 75 Hz AC	
Dimensions roof unit (W x L x H) [mm]	1850 x 2500 x 305	1850 x 2500 x 305
Refrigerant type / average filling volume [kg]	R407C / 3,2	
Weight (cool/cool+heat) [kg]	231 / 238	235 / 242
Control system	CANAIRES™ (EN/DE/CZ/IT/FR/SP)	
Integrated compressor	Variable speed compressor (38-75 Hz)	
Driver unit evaporator extension availability	Yes (EDS-700)	Yes (EDS-960)

¹ Simulated at conditions 40°C / 40°C / 95 % @ 75 Hz

² Measured at conditions 35°C / 27°C / 19°C

³ Measured at conditions -20°C / +80°C / 16,7 l / min

⁴ Free blow capacity for brush (brushless) blowers

⁵ Current consumption for unit at 27 VDC

⁶ Measured at conditions 35°C / 27°C / 19°C



ATHENIA™ MkII ELECTRIC SERIES		
SPECIFICATIONS ELECTRIC SERIES WITH HEAT PUMP	E-700H	E-960H
Unit type	Narrow (N)	
Listed cooling capacity ¹ [kW]	36	38
Rated cooling capacity ² [kW] / COP	14,4 / 2,2 @ 50 Hz 18,1 / 1,8 @ 75 Hz	16,0 @ 50 Hz 19,9 @ 75 Hz
Heating capacity [kW] / COP @ compressor 50 Hz ⁵	18,3 / 3,1 @ (15 °C / 22 °C) 12,9 / 2,5 (7 °C / 19 °C) 10,7 / 2,0 (0 °C / 19 °C) 8,4 / 1,6 (- 7 °C / 17 °C)	19,2 / 3,1 @ (15 °C / 22 °C) ⁶ 13,5 / 2,5 (7 °C / 19 °C) ⁶ 11,3 / 2,0 (0 °C / 19 °C) ⁶ 8,8 / 1,6 (- 7 °C / 17 °C) ⁶
Heating capacity - water coil ³ [kW]	47	
Evaporator air capacity ⁴ [m ³ /h]	4500 (4920)	6200 (7380)
Fresh air range [%]	0-100	0-100
Maximum operating temperature	49 °C	
Current draw ⁵ [A]	81	99
Battery cooling (small / high) [kW]	6 / 12,4	
Battery heating [kW]	12,6	
Power supply of integrated compressor ⁵	3 PH 360 V 45 Hz - 460 V 75 Hz AC	
Dimensions roof unit (W x L x H) [mm]	1850 x 2925 x 305	1850 x 2925 x 305
Refrigerant type / average filling volume [kg]	R407C / 7	
Weight (cool+heat) [kg]	280	285
Control system	CANAIRES™ (EN/DE/CZ/IT/FR/SP)	
Integrated compressor	Variable speed compressor (45-75 Hz)	

¹ Simulated at conditions 40°C / 40°C / 95 % @ 75 Hz

² Measured at conditions 35°C / 27°C / 19°C

³ Measured at conditions -20°C / +80°C / 16,7 l / min

⁴ Free blow capacity for brushless blowers

⁵ Measured at conditions 35°C / 27°C / 19°C

(Outside temperature / interior set point)

⁶ Calculated



Reliability

We only use the most reliable and internally validated components in our A/C systems. That is why Thermo King products are continuously tested and our designs are developed to meet the high demands of bus temperature control applications.

We carry out a range of rigorous functional and performance tests to validate all our transport refrigeration equipment in a controlled environment such as special 3D multi-axial vibration and twist profile tests. Thermo King units regularly exceed the standard bus homologation requirements (ECE R10.05).

Our Thermo King manufacturing plant is ISO 9001: 2008, ISO 14001: 2004 and BS OHSAS 18001: 2007 accredited which demonstrates our dedication to quality and reliability.

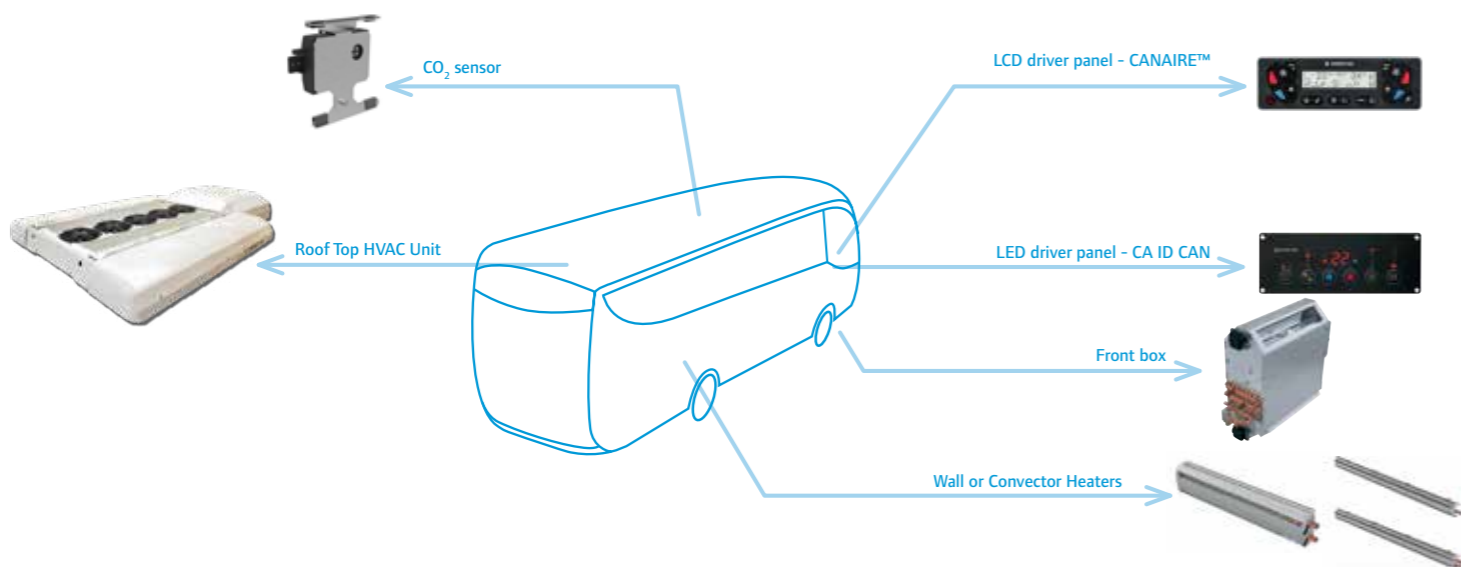
Thermo King is also proud to announce that since September 2019 our production facility in Ovcary, Czech Republic has implemented the IATF 16949 automotive standards.

Ease-of-use and service

Athenia™ MkII Electric and Electric Heat Pump units are compatible with bus roofs with a radius ranging from 7,5 m to flat. To increase flexibility the units are suitable for screw or glue installation. All units are delivered prefilled with refrigerant for immediate use.

To drive down installation costs and facilitate installation, the electrical compressor has been integrated in the roof unit. In the Athenia™ MkII Electric Heat Pump version an optionally built-in heat exchanger for battery cooling helps to maintain ideal battery operating temperature for hybrid and electric buses extending battery life and guaranteeing maximum power capacity. The HVAC unit can be optionally equipped with a front box connection.

The CANAIRE™ control system features an ergonomically-designed LCD driver panel which allows for the control of the A/C roof unit in parallel with a front box unit placed in the driver's area. The control system features can be changed via a service and diagnostic software tools to adapt to the operating conditions and customer needs.



Low Global Warming Potential (GWP)

The electrical heat pump technology increases the power efficiency ratio of the unit while reducing the impact of CO₂ emissions.

The Athenia™ MkII Electric unit provides improved environmental performance with a low global warming potential (GWP) thanks to its innovative micro-channel coils with a reduced refrigerant charge of 50% compared to conventional coils.

To improve environmental-friendliness, the Athenia™ MkII Electric and Athenia™ MkII Electric Heat Pump units are pre-filled with refrigerant and feature a hermetic refrigerant circuit which reduces the of leakage to a minimum. For additional safety, the units run on non-flammable refrigerants with an A1 classification.

Thermo King Dealer Network for low cost of ownership

The Thermo King electric range offers a more sustainable and efficient operation compared to regular diesel climate control systems, providing greater benefits for your business and your service. As a Thermo King Athenia™ MkII Electric owner you will have access to our worldwide dealer and service network to minimize cost of ownership and maximize uptime. The Thermo King Dealer Network has over 75 years experience servicing our extensive range of climate control equipment.



Our Dealer Service Network:

- Over 500 authorized service points in 75 countries
- Open and available 24/7/365
- Always in your area: most locations are within a two-hour drive
- Direct telephone contact
- Immediate assistance in your language
- Optimised fleet maintenance

**FIND THE DEALER CLOSEST TO YOU WITH OUR ONLINE DEALER LOCATOR:
DEALERS.THERMOKING.COM**





THERMO KING

Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938.

For further information, please contact:

europe.thermoking.com

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