

The World's First Sustainable Solid State HVAC Solution

Rethink HVAC with the TTAP Platform

TTAP [Terminal Treatment of Air with Peltier] from Halton, in partnership with Phononic, is an HVAC terminal unit using Thermo-Electric technology to provide all-electric active cooling and heating. This technology eliminates fossil fuels and the need for hydronic loops common with incumbent terminal units, while enabling:

- Significant reduction in emissions (CO₂e)
- Lower total cost of ownership (TCO)
- Elimination of refrigerants (HFCs)

Building-level Benefits

15%

reduction in embedded CO₂e emissions



16%

reduction in operational CO₂e emissions

18%

lower total cost of ownership



Application Areas

TTAP units have been deployed for active cooling, heating and ventilation of common commercial building spaces such as open-plan offices, meeting rooms, common areas, lobbies, etc. Additional applications are being explored by our partners for retrofits and new construction.

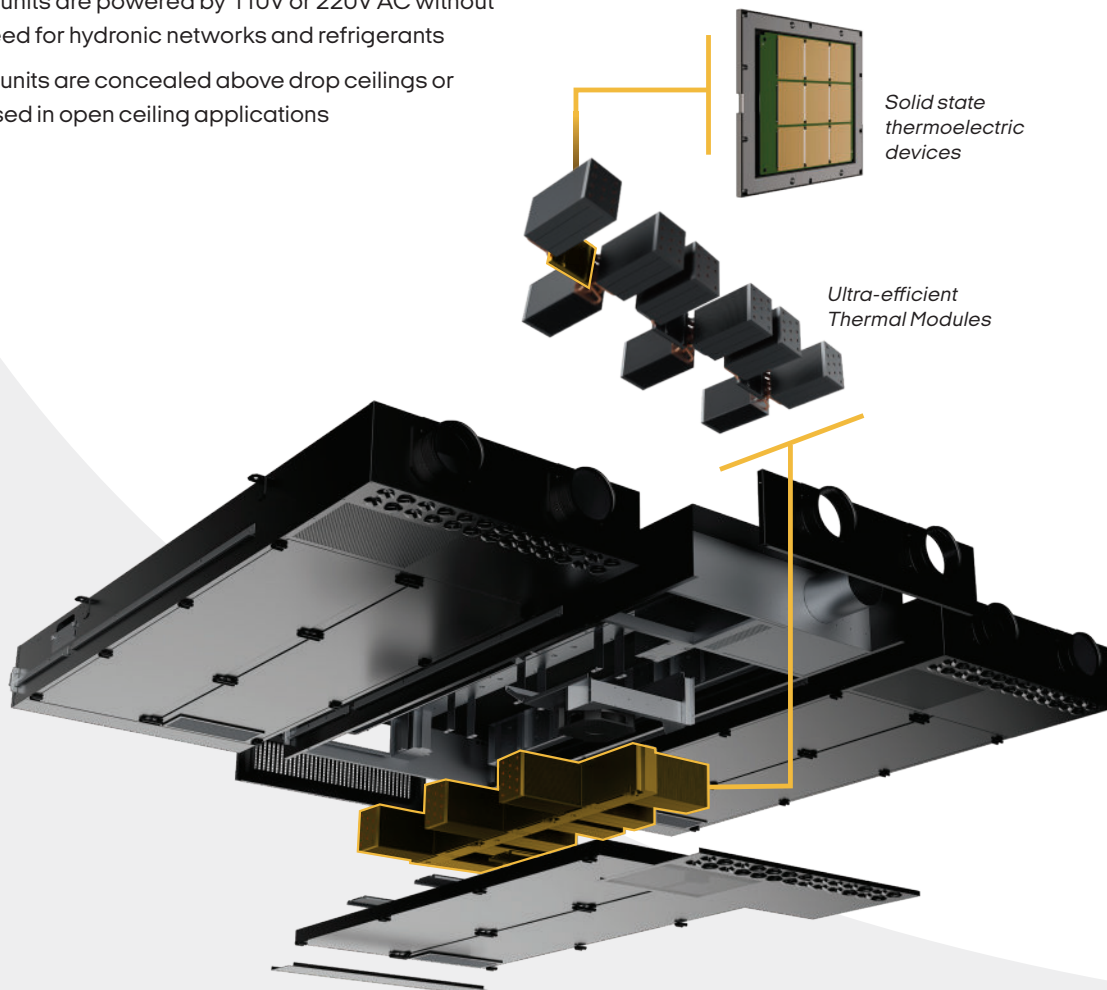


The TTAP unit provides demand-based cooling and heating without the need for refrigerants or a hydronic network.

Operating Principles

- Distributed TTAP units provide active cooling and heating throughout the building
- Each TTAP unit is controlled independently by the BMS, ensuring both occupants' comfort as well as overall system energy efficiency
- Air Handling Units (AHUs) supply pre-conditioned fresh air to TTAP units
- Hot air [in cooling mode] or cold air [in heating mode] is returned from the TTAP units to the AHU via the return air duct
- TTAP units are powered by 110V or 220V AC without the need for hydronic networks and refrigerants
- TTAP units are concealed above drop ceilings or exposed in open ceiling applications

- Small form factor allows for architectural flexibility and preservation of building character
- Maintenance is minimal due to the elimination of compressors and refrigerants
- Minimum supply and return airflow of 64 CFM per TTAP aligns with ASHRAE 62.1 and 241, and CDC recommendations for healthy indoor air quality (IAQ)
- TTAP units can be coupled with on-site renewable energy production [e.g. solar panels] to enable even higher energy efficiency



TTAP

SOLID STATE HVAC INNOVATION

Functionality

Cooling & heating of ambient air

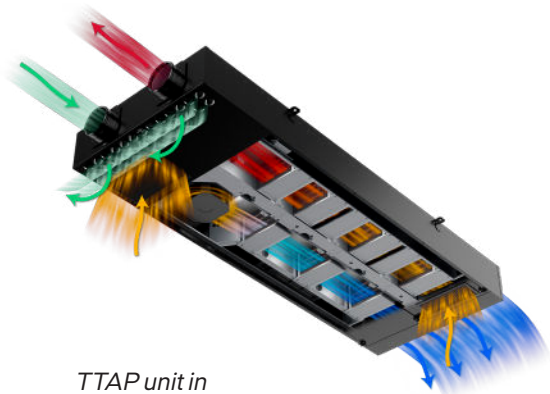
- Ambient air is recirculated through the TTAP unit by an integrated fan
- Air is conditioned (cooled or heated) by Thermal Modules inside TTAP
- Conditioned air is diffused into the room through the grille at the end of the unit (side or front configuration)
- Cooling and heating capacity is variable in 10 stages via control of Thermal Modules

Air supply & diffusion

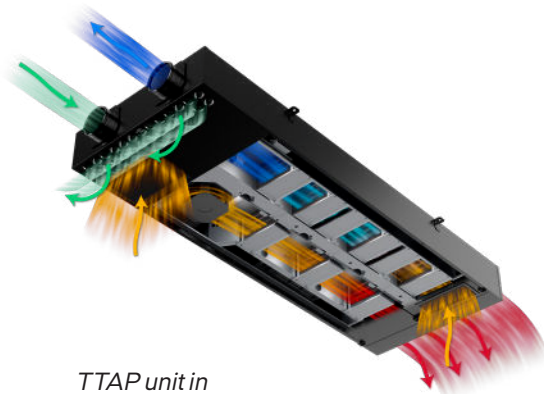
- Preconditioned fresh air is distributed into the room via a diffuser at one end of the TTAP unit
- Air flow rates can vary between 64 and 127 CFM, with an optional VAV function

Air extraction & return

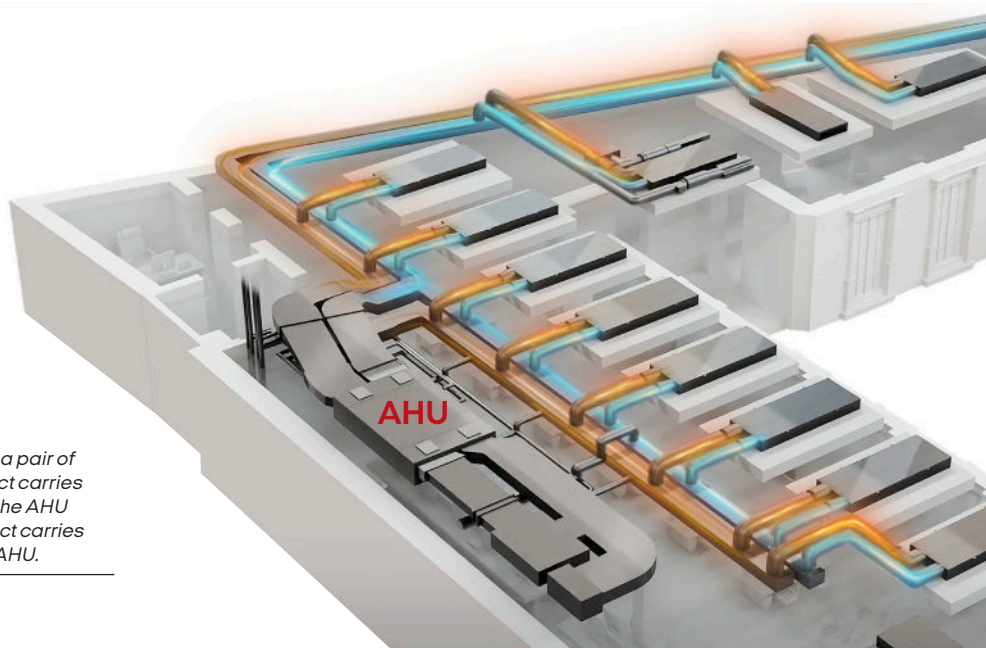
- The TTAP unit has a return air intake which is used to evacuate stale air from the room
- Return air is routed through the Thermal Modules inside the TTAP unit to absorb heat (when in cooling mode) or cold (when in heating mode) before entering the return air duct
- Evacuated air is balanced with an equal volume of fresh air from the AHU



TTAP unit in cooling mode



TTAP unit in heating mode



Each TTAP unit is connected to a pair of overhead ducts. The supply duct carries pre-conditioned fresh air from the AHU to each TTAP unit. The return duct carries TTAP-extracted air back to the AHU.

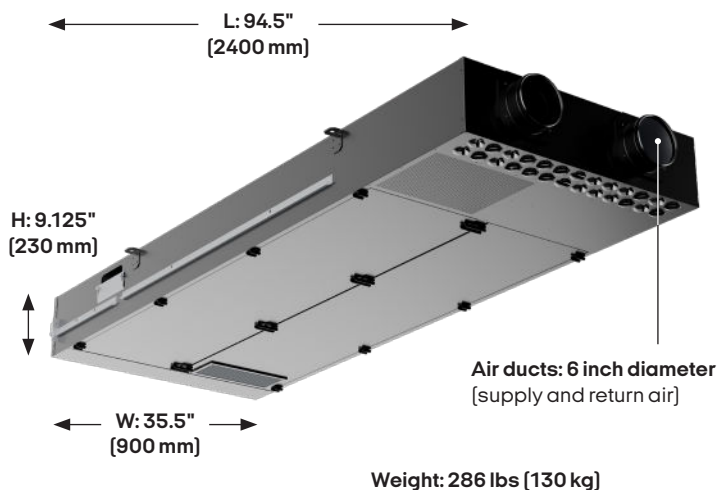
TTAP Specifications

SI				
Electrical	Cooling		Heating	
Voltage [VAC]	110	240	110	240
Current [A]	1.1 - 5	0.5 - 2.3	1.2 - 5.2	0.6 - 2.4
Max current [A]	5.5	2.5	5.5	2.5
Air Flow				
Min/Max AHU supply/return [m³/hr]	108 - 216		108 - 216	
Max recirculation [m³/hr]	238		238	
Min Reject Pressure drop [Pa]	100		100	
Supply/return duct dia [mm]	160		160	
Supply Temp [°C]	12 - 14		19 - 21	
Ambient Air Temp [°C]	21 - 26		19 - 21	
Ambient Air Humidity [%rh]	20 - 55%			
PMV [Predicted Mean Vote]	-0.5 to +0.5			
Performance				
Total Capacity [W]	844 - 1284		940	
Thermo Electric Capacity [W]	400		940	
Typical coverage [m²]	15 - 25			
Dimensions				
Length [mm]	2400			
Width [mm]	900			
Height [mm]	230			

Imperial				
Electrical	Cooling		Heating	
Voltage [VAC]	110	240	110	240
Current [A]	1.1 - 5.0	0.5 - 2.3	1.2 - 5.2	0.6 - 2.4
Max current [A]	5.5	2.5	5.5	2.5
Air Flow				
Min/Max AHU supply/return [cfm]	64 - 127		64 - 127	
Max recirculation [cfm]	140		140	
Min Reject Pressure drop [Pa]	100		100	
Supply/return duct dia [in]	6		6	
Supply Temp [°F]	54 - 57		66 - 70	
Ambient Air Temp [°F]	70 - 79		66 - 70	
Ambient Air Humidity [%rh]	20 - 55%			
PMV [Predicted Mean Vote]	-0.5 to +0.5			
Performance				
Capacity up to [BTU/hr]	2880 - 4381		3207	
Thermo Electric Capacity [BTU/hr]	1365		3207	
Typical coverage [sq ft]	160 - 270			
Dimensions				
Length [in]	94.5			
Width [in]	35.5			
Height [in]	9.125			

Installation and Physical Dimensions

TTAP units can be attached directly to the ceiling surface or suspended via threaded rods using two mounting brackets on each side of the unit.



Electrical & Controls

- TTAP units can be powered by either 110V or 230V AC circuits. Maximum power of 600W per TTAP
- Complies with EN-60335 safety and EN-55014 & EN-61000 EMC. UL certification is planned.
- Each TTAP unit comes with an onboard controller that can interface with common BMS systems

Maintenance

Maintenance of TTAP units is easy and should be performed annually by simply opening the two front doors giving access to the supply plenum. The maintenance protocol consists of visual inspection and cleaning of the internals, and a quick airflow performance check.