

	Make, Model, Reliability		Cost	Features			Performance Metrics		
	Manufacturer		Indoor+ Outdoor	Single phase?		Notes and Features	Nameplate Capacity		
Air-to-Water Heat Pumps Installed as part of the Demonstration Project	Manufacturer	Sanden	Purchased in April 2018 for: \$3,990	Single phase?	Yes	Heating use only allowed if installed as combination DHW and heating system ^[ii] Heating capacity is only ~8,000 Btuh ^[iii]	Nameplate Capacity	15,400 Btuh	
	Unit ID (Model)	SanCO2		Refrigerant Type	uses CO2 as refrigerant ^[i]		Capacity at 0F	Maintains full capacity down to -15F, at -20F drops to ~12,000 Btuh	
	Number of Past Installations	A couple hundred		Max Supply Temp. (F)	Up to 149F in heating ^[iv]		Efficiency	Avg. 4.5 COP COP at -20F ~1.7-1.8, Max COP 5.2	
	Warranty?	Yes, 3yr labor, 10yr parts, 15yr tank		Min. Oper. Temp. (F)				-15F (DHW) >27F for heating	
	Source: https://www.sandenwaterheater.com/for-professionals/								
	Manufacturer	Solstice (spacePac)	The Solstice Extreme retails for \$7,100.	Single phase?	Yes	Has a spot for immersion heater for backup heating	Nameplate Capacity	48,000 Btuh	
	Unit ID (Model)	Solstice Extreme (LAHP48 series)		Refrigerant Type	R-410a		Capacity at 0F	Just under 40,000 Btuh at 5F OAT, 120F supply water	
	Number of Past Installations	In the 1,200 range		Max Supply Temp. (F)	Up to 140F		Efficiency	up to 4 COP	
	Warranty?	Yes, 1 yr parts , 2 yr compressor		Min. Oper. Temp. (F)				as low as 0F (with 120F supply temp)	
	Source: http://spacepak.com/products/solstice-heat-pumps.asp								

[i] Up to 25' separation allowed between indoor and outdoor unit.

[ii] Required to be used as combination DHW and heating system with at least 25 gallons of DHW use per day. Manufacturer also requires that a specific heat exchanger (Taco X-Block) be used to maintain warranty

[iii] Full capacity not available for prolonged use due to defrost requirements

[iv] System only able to operate with return water temperatures at or below 130F. Outlet temperatures can be raised to 170F in latest models

Make, Model, Reliability		Cost Indoor+ Outdoor	Features			Performance Metrics		
Evaluated Air-to-Water Heat Pumps	Manufacturer	Electro Industries (NorAire)	~\$10,000 for fully installed system	Single phase?	Yes	Notes and Features Includes external gas boiler interface. Bluetooth control (per website) May not require buffer tank *Max is supply temperature is ~100F without electric backup.	Nameplate Capacity	3,4,5 ton
	Unit ID (Model)	NorAire		Refrigerant Type	R-410a		Capacity at 0F	50-60,000 Btuh (with electric supplemental heat)
	Number of Past Installations	Not a lot		Max Supply Temp. (F)	~100F*		Efficiency	Rating for -12F design day is 1.73 COP
	Warranty?	Yes					Min. Oper. Temp. (F)	-20F
Source: http://www.electromn.com/gen/noraire.htm								
Evaluated Air-to-Water Heat Pumps	Manufacturer	Aermec		Single phase?	Yes	Notes and Features Optional electric heat, antifreeze Reduced starting current (soft start), silent operation Capacity varies – per manual: at -20C (-4F) capacity of largest is ~18,900 Btuh (at 50C supply) Efficiency varies: per chart in the manual 1.25 to 3.7 COP at 55-60C output temp	Nameplate Capacity	2.5-4 tons
	Unit ID (Model)	ANK		Refrigerant Type	R-410a		Capacity at 0F	~18,900 Btuh (at 50C supply temp)
	Number of Past Installations	In the hundreds		Max Supply Temp. (F)	Up to 140F* *largest unit can go only up to 130F		Efficiency	1.25 to 3.7+ COP at 55-60C output temp
	Warranty?	Yes 1 year parts					Min. Oper. Temp. (F)	-4F
Source: http://www.aermec.us/products-home/2015-06-11-14-07-23/ank								
Evaluated Air-to-Water Heat Pumps	Manufacturer	Nordic	ATW 75 is \$6,868	Single phase?	Yes	Notes and Features Advanced controls with backnet interface Typical supply water temperature range is 100-115F	Nameplate Capacity	2-6 tons
	Unit ID (Model)	ACE/ ATW		Refrigerant Type	R-410a		Capacity at 0F	under 30,000 Btuh, loop temp slightly over 100F
	Number of Past Installations	Roughly 100		Max Supply Temp. (F)	up to 120F		Efficiency	3.7 COP @ 45F, 1.3 COP @ -20F
	Warranty?	Yes 5 years					Min. Oper. Temp. (F)	-20F
Source: http://www.nordicghp.com/product/nordic-products/air-source-heat-pump/air-to-water/								

Make, Model, Reliability		Cost Indoor+ Outdoor	Features			Performance Metrics	
Manufacturer	Chiltrix	Pricing for CX-30 \$3,400	Single phase?	Yes	Notes and Features Cooling mode is reported better than competitors. *The heating capacity is given at 95F outlet water temperatures and drops from 30.5 kBtuh at 43F OAT down to 20 kBtuh at 17F OAT.	Nameplate Capacity	At 95F supply water temp. 30.5 kBtuh*
Unit ID (Model)	Cx30		Refrigerant Type	R-410a		Capacity at 0F	Capacity at 113F supply water drops to 12.15 kBtuh at -4F OAT.
Number of Past Installations	In US ~200 installations		Max Supply Temp. (F)	Up to 131F		Efficiency	1.66 COP @ -4F, 2.5-4.1 COP @ 50F (86F-131F LWT)
Warranty?	Yes - 2yr compressor 5yr all other components		Min. Oper. Temp. (F)				-4F
Source: http://www.chiltrix.com/documents/							
Manufacturer	EcoLogix		Single phase?	Yes	Notes and Features COP in the high 4's at standard operating temperature and pressure COP 3 @ 17F, COP 1.8 @ -13F	Nameplate Capacity	58-68 kBtuh
Unit ID (Model)	A2W540-D-LI A2W600-2-LI		Refrigerant Type			Capacity at 0F	22-36 kBtuh at -13F OAT
Number of Past Installations			Max Supply Temp. (F)	104F		Efficiency	Varies, COP in the high 4's at STP
Warranty?	Yes 2 years+		Min. Oper. Temp. (F)				-13F
Source: http://ecologix.ca/products/cold-climate-heat-pumps/							
Manufacturer	Artic Heat Pumps	outdoor unit: \$3,248 \$4,560 \$5,360 Storage tanks with electric backup ~\$2,000	Single phase?		Notes and Features currently out of stock	Nameplate Capacity	
Unit ID (Model)	Three models: 29,000 48,000 & 60,000		Refrigerant Type			Capacity at 0F	
Number of Past Installations	Unknown		Max Supply Temp. (F)			Efficiency	
Warranty?			Min. Oper. Temp. (F)				
Source: https://www.arcticheatpumps.com/buy-cold-climate-heat-pump/heat-pumps.html https://www.arcticheatpumps.com/buy-cold-climate-heat-pump/storage-tanks.html							

Evaluated Air-to-Water Heat Pumps

Make, Model, Reliability		Cost Indoor+ Outdoor	Features			Performance Metrics		
Evaluated Air-to-Water Heat Pumps	Manufacturer	Fujitsu	Single phase?	Yes	Notes and Features No US models available. Unit has option of supplemental heater (electric) Can provide up to two zones with different temperature water	Nameplate Capacity	Up to 14kW in single phase	
	Unit ID (Model)	Waterstage		Refrigerant Type			Capacity at 0F	
	Number of Past Installations			Max Supply Temp. (F)		Up to 140F	Efficiency	Slightly over 4 COP at 7C OAT
	Warranty?						Min. Oper. Temp. (F)	-4F
	Source:		http://www.fujitsu-general.com/global/support/downloads/erp/lot-1/index.html					
Evaluated Air-to-Water Heat Pumps	Manufacturer	Panasonic	Single phase?	Yes	Notes and Features Does not appear to be available in the US	Nameplate Capacity	Up to 12 kW in single phase	
	Unit ID (Model)	Aquarea SXC		Refrigerant Type			Capacity at 0F	Unclear – larger unit (16kW) maintains capacity to -15C
	Number of Past Installations			Max Supply Temp. (F)		Up to 131F	Efficiency	Up to 5 COP
	Warranty?	Yes 5 years					Min. Oper. Temp. (F)	-4F
	Source:		http://www.aircon.panasonic.eu/GB_en/ranges/aquarea/					
Evaluated Air-to-Water Heat Pumps	Manufacturer	LG	Single phase?		Notes and Features Has an indoor unit, but no single phase outdoor unit yet	Nameplate Capacity		
	Unit ID (Model)	ThermaV Hydrokit		Refrigerant Type			Capacity at 0F	
	Number of Past Installations			Max Supply Temp. (F)			Efficiency	
	Warranty?						Min. Oper. Temp. (F)	
	Source:		http://www.lgethermav.com/overview/EN/LGThermaV_sub01.html					

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Evaluated Air-to-Water Heat Pumps	Manufacturer	Daikin	Single phase?		Notes and Features	Removed from the North American market	Nameplate Capacity		
	Unit ID (Model)	Altherma					Refrigerant Type		
	Number of Past Installations						Max Supply Temp. (F)	Up to 176F	Capacity at 0F
	Warranty?							Efficiency	
	Source: https://www.daikin.com/products/ac/lineup/heat_pump/index.html						Min. Oper. Temp. (F)		
Manufacturer	Emerson		Single phase?		Notes and Features	Emerson provides components for systems (not plug and play), but is reportedly known for large commercial installation. Reportedly has high supply temperatures	Nameplate Capacity		
Unit ID (Model)			Refrigerant Type						
Number of Past Installations			Max Supply Temp. (F)						
Warranty?				Capacity at 0F					
Source: http://www.emersonclimate.com/europe/en-eu/Market_Solutions/Residential/Heating/Pages/Refrigerant_Considerations.aspx						Efficiency			
Manufacturer	Aqua Products Company		Single phase?		Notes and Features	In design/redesign	Nameplate Capacity		
Unit ID (Model)	RCC (Reverse Cycle Chiller) TM		Refrigerant Type						
Number of Past Installations			Max Supply Temp. (F)						
Warranty?				Capacity at 0F					
Source: http://www.aquaproducts.us/reverse-cycle-chiller.html						Efficiency			
Manufacturer	Mitsubishi		Single phase?		Notes and Features	Units not available in US, and no predicted timeline for their availability	Nameplate Capacity		
Unit ID (Model)			Refrigerant Type						
Number of Past Installations			Max Supply Temp. (F)						
Warranty?				Capacity at 0F					
Source: https://www.mhi-global.com/products/detail/heat_pump_web_catalog.html						Efficiency			
						Min. Oper. Temp. (F)			