Waterside Economizer

Waterside Economizer Specification Catalog and Design Guide

SC1650EW 04/15

Table of Contents

Waterside Economizer

According to the U.S. Energy Information Administration, HVAC systems consume 25% to 49% of a typical office building's energy use. Improving the efficiency of the HVAC system makes a major impact on overall energy use and provides significant savings to the building owner. Adding an economizer to an HVAC system makes cooling more energy efficient by using resources such as cool air or water in place of operating a compressor. Depending on design conditions, economizers can provide up to 100% of cooling load requirements.

WaterFurnace waterside economizer option allows the use of a building's interior loop water to provide "free" cooling. It works by passing air through a coil cooled by loop water rather than through a coil cooled by mechanical refrigeration. The economizer contains a water-to-air heat exchanger, a 3-way valve, and controls that manage the flow of water through the heat exchanger. The economizer is mounted in line with the heat pump's return air flow. When cooling is required and the building loop water temperature is below the economizer setpoint, typically 45°F, water is passed through the economizer. Air is drawn through the cool economizer and the heat pump's compressor is turned off. Cooling is then provided by the economizer, reducing energy use.

WaterFurnace Advantage

The greatest benefit of the WaterFurnace waterside economizer is energy savings. A heat pump's compressor consumes the majority of power required to provide cooling. Turning the compressor off provides substantial savings. An added benefit is improved life of the compressor through lower run hours and less cycling. When mandated by code, the waterside economizer can also help buildings comply with ASHRAE Standard 90.1. See "WaterFurnace Code Review" for information on the requirement of economizers on WSHPs.

Waterside economizers have advantages over airside economizers as well. Because they are not directly subject to outdoor air conditions, waterside economizers can provide longer operating hours and better humidity control. They also have fewer mechanical components and are less prone to failure. Airside economizers can fail in the open position, leading to much higher energy costs.

Typical Applications

Candidates for waterside economizers include commercial buildings that have simultaneous heating and cooling loads. For example, during cool weather a building may require heating around the perimeter and at the same time require cooling for the core space. The perimeter heating will cool the loop water which in turn flows through the economizers that are cooling the core space. The heat absorbed from the core space is then put back into the loop, providing higher efficiencies for both heating and cooling. Waterside economizers are also a good fit for buildings where it is difficult to use an airside economizer. An example of this would be a multi-story building using separate air handlers for each floor and no central air delivery system.

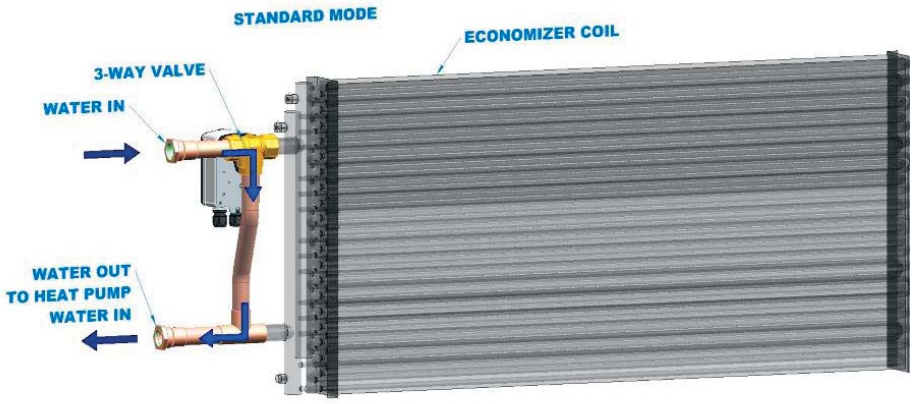
Application Notes

Application Notes

Single compressor units with waterside economizers are only available with ECM fan motors and stainless steel drain pans. Dual compressor units with waterside economizers may require a higher static blower package to compensate for the added pressure drop. In either case, careful consideration of the CFM requirements should be taken into account when using waterside economizers.

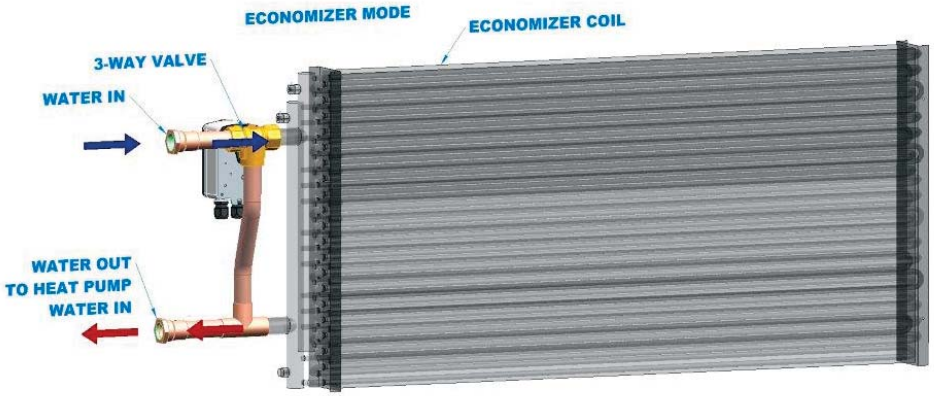
Standard Mode

In standard operating mode, water flows through the inlet to the 3-way valve, bypasses the economizer coil, and flows directly into the inlet of the coaxial heat exchanger inside the heat pump.



Economizer mode

In economizer operating mode, water flows through the inlet to the 3-way valve, continues through the economizer coil, and then into the inlet of the heat pump. The tee port on the 3-way valve is closed off in economizer mode.



Sequence of Operations

Thermostat Mode

An additional thermostat control will be factory provided on water source heat pumps equipped with waterside economizer that will be controlled through standard thermostat signals. A temperature sensor is factory installed on the inlet water connection to the economizer. The economizer thermostat will be set in the factory to enable economizer operation when the incoming water temperature falls below 45°F. If the temperature is above this setpoint, normal mechanical cooling is enabled. Please refer to the schematic provided for more information on thermostat mode.

DDC Control Mode (Aurora with UPC)

Water source heat pumps equipped with waterside economizer option that require communication with the building management system (BMS) will need the UPC option as well. A factory installed sensor will be installed with the UPC controls that will read the incoming water temperature. Based on the setpoint, the UPC will determine whether the unit shall operate in standard cooling mode or in economizer mode. Factory default is 45°F and can be adjusted through the BMS or Aurora Touch Unit (ATU). Please consult UPC Application Guide for specific details of control sequence of operations.

Performance Data

Versatec Base Waterside Performance Data

Model		Waterside			Airside		Cooling Capacity	
		GPM	psig	ft. hd.	CFM	Delta P (in. w.g.)	Total Btu/hr	Sensible Btu/hr
Vertical	024	6	0.8	1.8	800	0.23	24,477	19,478
	030	8	1.3	3.1	1,000	0.33	29,537	23,697
	036	9	1.9	4.4	1,150	0.25	38,181	29,441
	042	11	1.8	4.2	1,400	0.26	44,771	34,789
	048	12	2.1	5.0	1,600	0.32	48,651	38,472
	060	15	3.5	8.1	1,900	0.30	62,414	47,714
	070	18	4.1	9.5	2,100	0.28	71,672	53,971
Horizontal	024	6	1.0	2.3	800	0.18	25,896	20,300
	030	8	1.7	3.9	1,000	0.27	33,317	25,548
	036	9	1.4	3.2	1,150	0.21	38,117	29,445
	042	11	2.1	4.9	1,400	0.24	48,236	36,462
	048	12	2.5	5.8	1,600	0.30	53,222	40,616
	060	15	2.6	6.0	1,900	0.26	65,411	49,783
	070	18	3.2	7.4	2,100	0.25	75,252	56,014

3/13/15

Versatec Ultra Waterside Performance Data

Model		Waterside			Airside		Cooling Capacity	
		GPM	psig	ft. hd.	CFM	Delta P (in. w.g.)	Total Btu/hr	Sensible Btu/hr
Vertical	024	6	1.2	2.7	800	0.14	28,403	21,486
	030	8	2.0	4.6	1,000	0.20	36,362	27,050
	036	9	1.5	3.6	1,150	0.19	39,581	29,909
	042	11	2.5	5.7	1,400	0.18	52,063	38,020
	048	12	2.9	6.7	1,600	0.22	57,559	42,459
	060	15	3.6	8.3	1,900	0.23	69,670	50,951
	070	18	3.5	8.2	2,100	0.23	78,293	57,550
Horizontal	024	6	0.6	1.4	800	0.12	26,898	20,831
	030	8	1.1	2.6	1,000	0.17	33,549	25,885
	036	9	1.5	3.4	1,150	0.18	39,840	30,264
	042	11	1.8	4.2	1,400	0.16	50,365	37,359
	048	12	2.1	5.0	1,600	0.20	55,962	41,858
	060	15	2.7	6.4	1,900	0.21	69,193	51,654
	070	18	3.4	7.8	2,100	0.21	78,773	57,755

3/13/15

Performance Data cont.

Envision2 Compact Waterside Performance Data

Model		Waterside			Airside		Cooling Capacity	
		GPM	psig	ft. hd.	CFM	Delta P (in. w.g.)	Total Btu/hr	Sensible Btu/hr
Vertical	024-026	8	1.2	2.87	800	0.11	31,404	22,593
	030	8	1.2	2.87	900	0.13	33,289	24,518
	036-038	9	1.3	2.94	1,200	0.14	41,764	31,793
	042	11	1.6	3.67	1,300	0.13	48,857	35,999
	048-049	12	1.9	4.32	1,500	0.16	54,625	40,782
	060-064	15	2.5	5.79	1,800	0.18	67,153	49,607
	070-072	18	3.5	8.18	2,000	0.21	76,538	55,758
Horizontal	024-026	8	1.2	2.71	800	0.10	31,533	22,751
	030	8	1.2	2.7	900	0.12	33,413	24,766
	036-038	9	1.2	2.86	1,200	0.13	41,862	31,615
	042	11	1.5	3.51	1,300	0.12	49,404	36,229
	048-049	12	1.8	4.13	1,500	0.15	55,437	41,177
	060-064	15	2.9	6.6	1,800	0.16	70,507	51,010
	070-072	18	3.3	7.73	2,000	0.19	76,998	55,954

3/13/15

Envision XL and XXL Waterside Performance Data

Model		Waterside			Airside		Cooling Capacity	
		GPM	psig	ft. hd.	CFM	Delta P (in. w.g.)	Total Btu/hr	Sensible Btu/hr
Horizontal	080	22	1.0	2.3	2,600	0.15	91,509	68,872
	095	24	1.2	2.7	2,800	0.16	100,274	74,831
	120	28	1.6	3.6	3,600	0.24	123,397	93,349
Vertical	080	22	1.9	4.3	2,600	0.16	96,506	71,324
	095	24	2.5	5.8	2,800	0.15	113,644	80,924
	120	28	2.2	5.1	3,600	0.18	129,742	97,238
	160	35	1.8	4.1	5000	0.13	191,896	140,078
	180	45	2.8	6.5	5,600	0.15	226,916	161,648
	240	60	4.6	10.5	7,600	0.25	287,542	208,758
	300	75	6.9	15.9	9,500	0.36	337,654	249,294

3/13/15

Correction Factors

Entering Fluid Temperature Deg °F	Total Btu/hr	Sensible Btu/hr
45	1.000	1.000
50	0.819	0.899
55	0.641	0.799
60	0.478	0.657
65	0.360	0.494
70	0.241	0.330

3/13/15

Water Pressure

Waterside economizer coils are designed to handle a maximum fluid side working pressure of 500 psig. Pressure drop values published in the waterside economizer performance tables only account for the economizer coil. The heat pump pressure drop published in the specification catalogs shall be added to this pressure drop. Pressure drop is calculated with rated flow as stated in the table at 45˚F entering fluid temperature.

Air Pressure

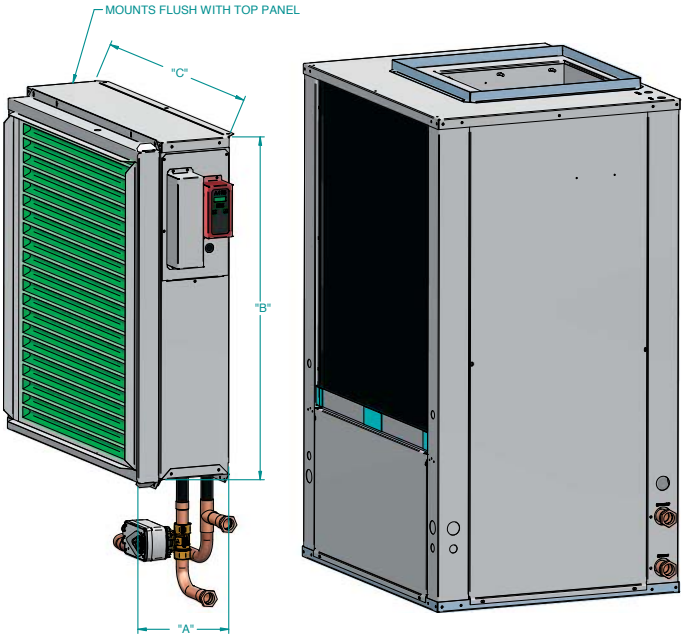
Published air side pressure drop only accounts for the economizer coil and shall be added to the heat pump pressure drop. Pressure drop is calculated with a wet coil at 80˚F/67˚F (db/wb) return air temperature. Please verify the required CFM can be delivered to the space with the extra resistance of the economizer coil along with the design external static pressure.

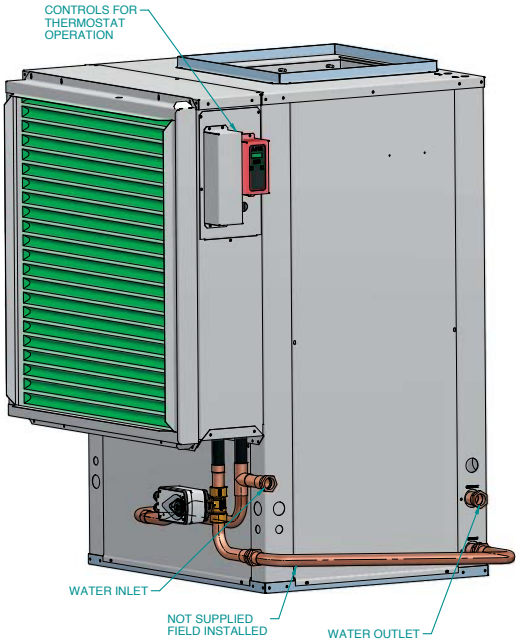
Condensate

All horizontal heat pumps must be externally trapped and vented according to mechanical code requirements. The condensate drains should be tied together as illustrated below. Most vertical units are internally trapped on the heat pump and will need externally trapped at the waterside economizer drain.

Dimensional Data

Single Compressor Vertical



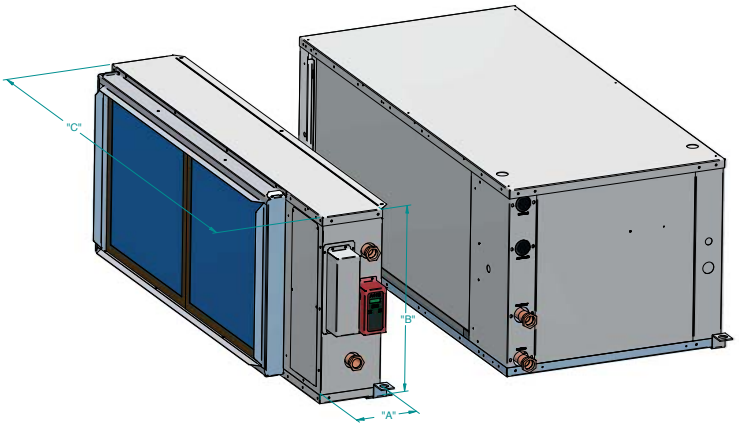


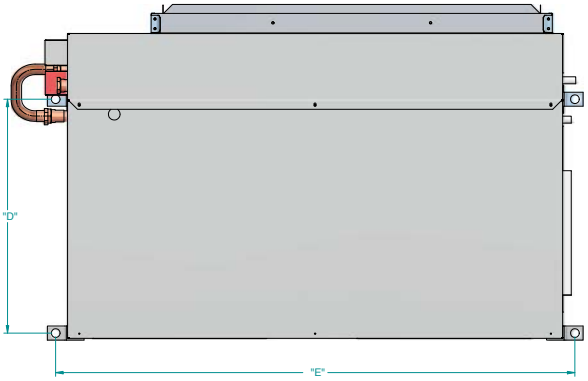
MODEL SERIES	MODEL SERIES	MODEL SERIES	"A"	"B"	"C"	FILTER RACK WIDTH
UBV024-030			7.2	22	22.2	2.2
UBV036	USV024-030		7.2	26	26.2	2.2
UBV042-048	USV036-041	NBV024-030	7.2	30	26.2	2.2
UBV060	USV042-048	NBV036-038	7.2	30	31.2	2.2
UBV070	USV060	NBV042-049	7.2	34	31.2	2.2
	USV070	NBV060-072	7.2	38	31.2	2.2

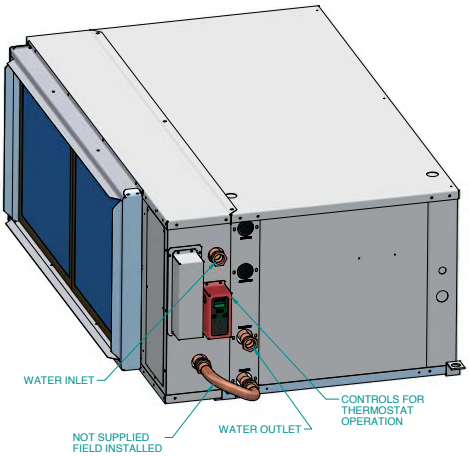
All dimensions in inches.

Dimensional Data

Single Compressor Horizontal



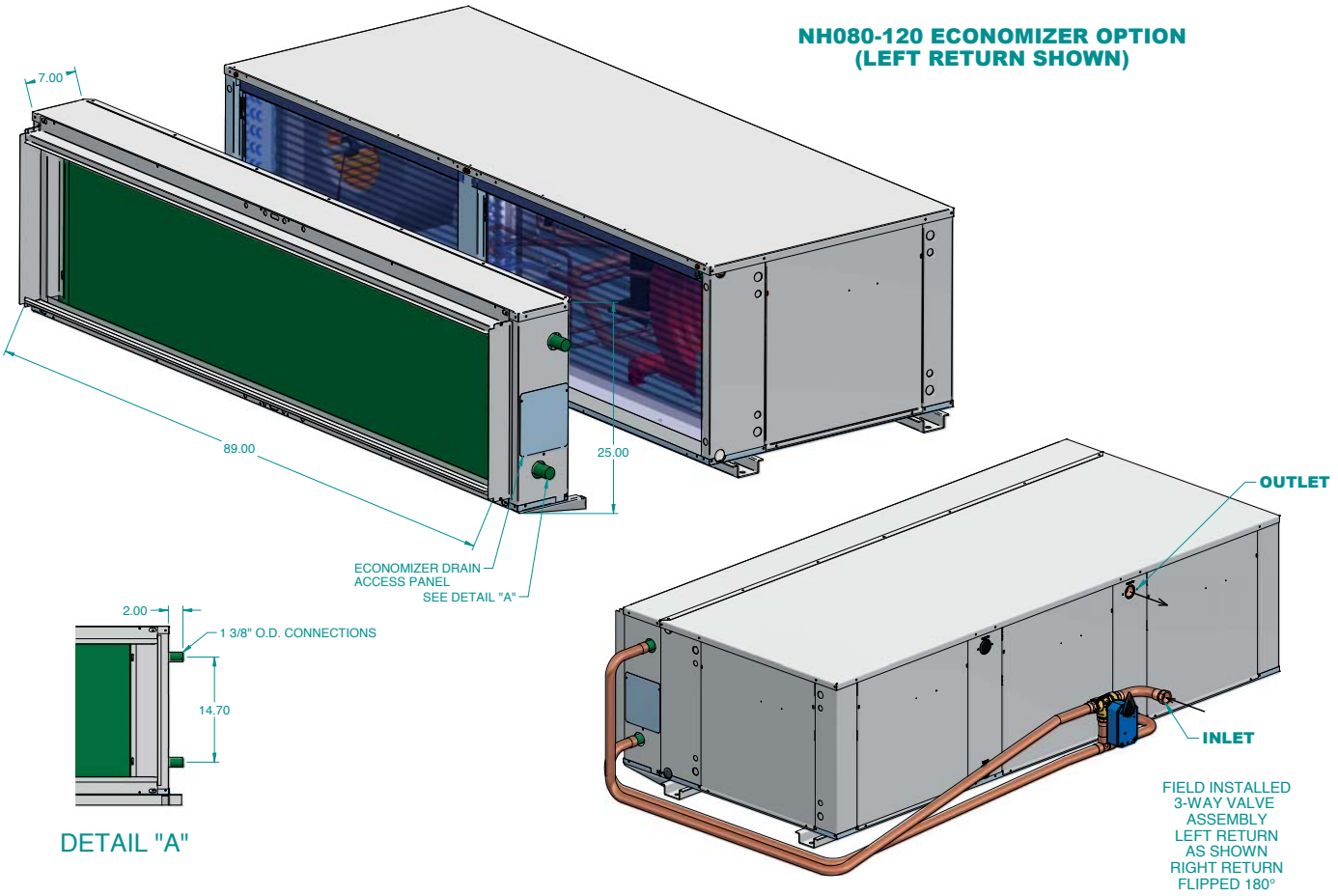




MODEL SERIES	MODEL SERIES	MODEL SERIES	"A"	"B"	"C"	"D"	"E"	FILTER RACK WIDTH
UBH024-030			7.2	17.2	42	22.7	44.6	2.2
UBH036	USH024-030		7.2	19.2	42	22.7	44.6	2.2
UBH042-048	USH036	NBH024-030	7.2	19.2	45	22.7	47.6	2.2
UBH060	USH042-048	NBH036-038	7.2	21.2	48	25	50.6	2.2
UBH070	USH060	NBH042-049	7.2	21.2	53	25	55.6	2.2
	USH070	NBH060-064	7.2	21.2	61	25	63.6	2.2
		NBH070-072	7.2	21.2	68	25	70.6	2.2

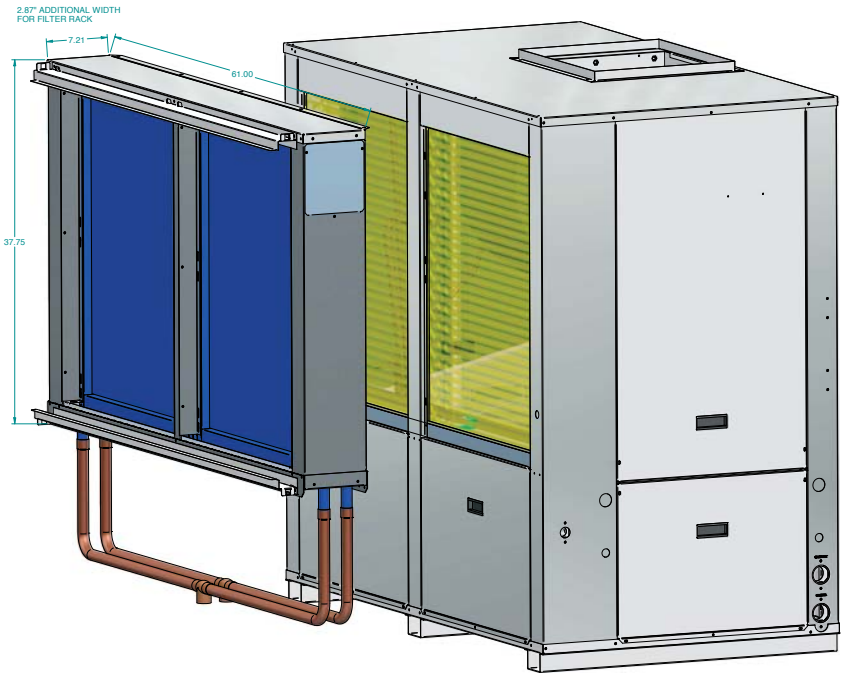
All dimensions in inches.

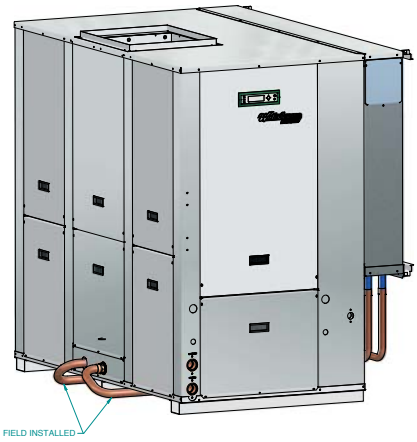
Dimensional Data

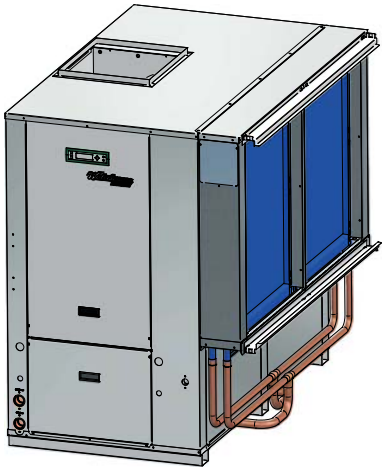


Dimensional Data

NV080-120 ECONOMIZER OPTION
(RIGHT RETURN SHOWN)

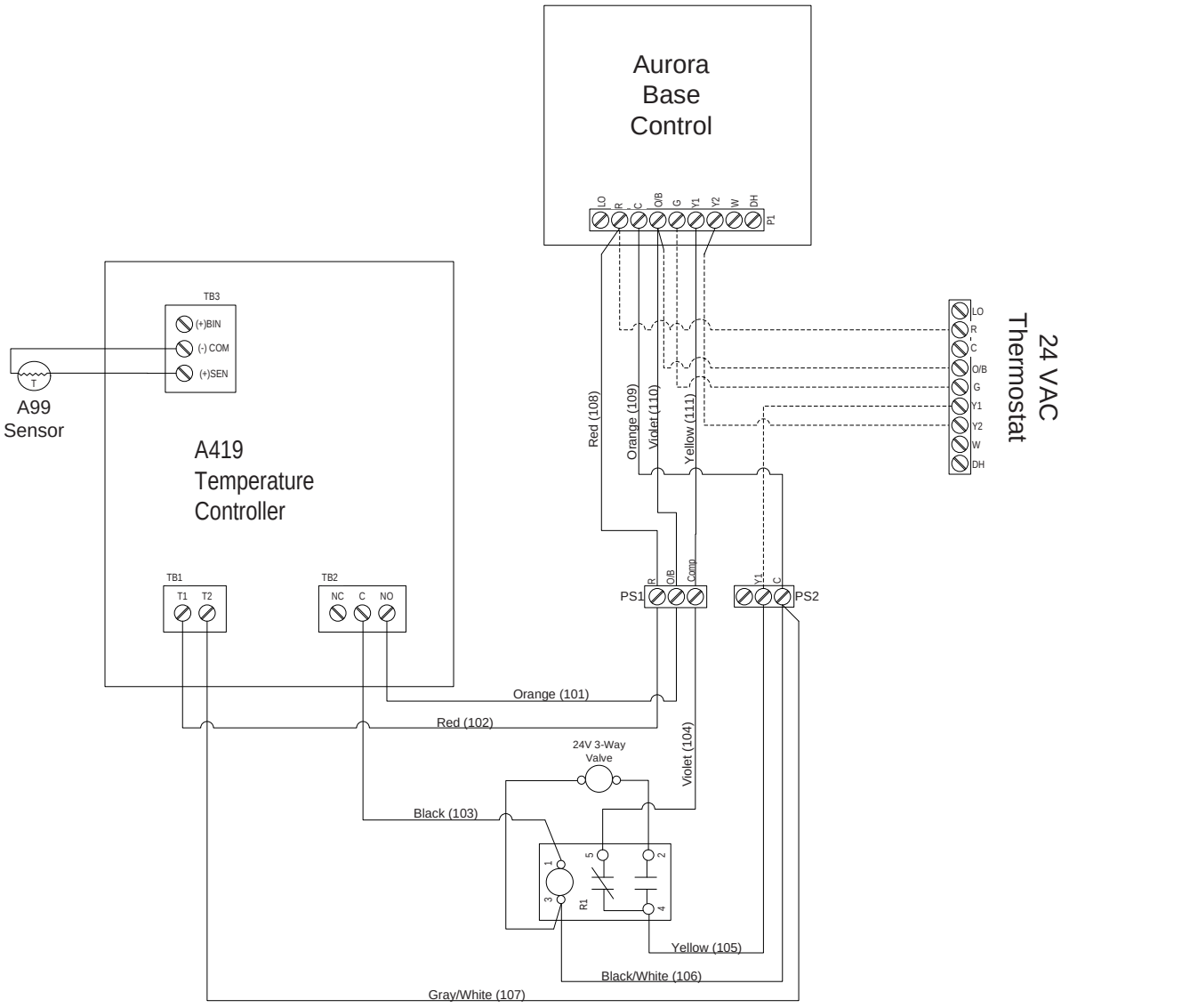


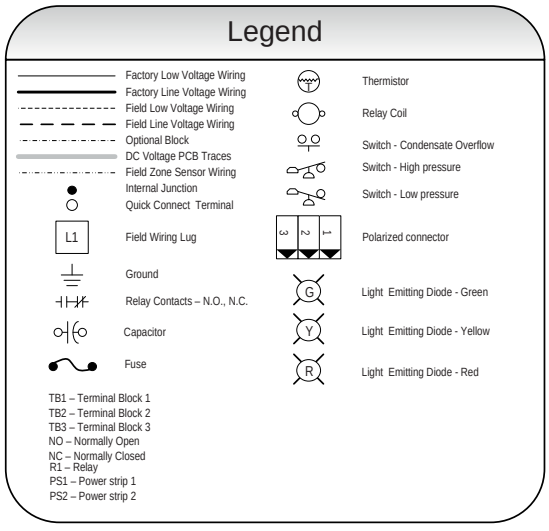




Dimensional Data

24 VAC Thermostat Mode





Notes

Revision Guide

Pages:	Description:	Date:	By:
All	First Published	April 2015	MA

Product: **Waterside Economizer**
Document: Specification Catalog and Design Guide

SC1650EW 04/15

SC1650EW 04/15