Installation, Operation, and Maintenace Manual

SA Series (3-70 Tons) Startup Forms

Vertical Self-Contained Units and Indoor Air Handling Units

1. APPENDIX A - HEAT EXCHANGER CORROSION RESISTANCE

Corrosion Resistance of Copper and Stainless Steel in Brazed Plate Heat Exchangers - Points to Measure and Check in a Water Analysis

The resistance guide provides the corrosion resistance of stainless steel type AISI 316 and pure Copper (99.9%) in water, to a number of important chemical factors. The actual corrosion is a very complex process influenced by many different factors in combination.

Explanations:

[+] Good resistance under normal conditions
[0] Corrosion problems may occur, especially when more factors are valued 0
[-] Use is not recommended

Table 1: Corrosion Resistance

Water Containing	Concentration (mg/L or ppm)	Time Limits - Analyze Before	AISI 316	SMO 254	Copper Alloy	Nickel Alloy
Alkalinity (HCO_3^-)	< 70	Within 24 Hours	+	+	0	+
	70-300		+	+	+	+
	> 300		+	+	0/+	+
Sulfate ($SO4^{2-}$)	< 70	No Limit	+	+	+	+
	70-300		+	+	0/-	+
	> 300		0	0	-	+
HCO_3^-/ $SO4^{2-}$	> 1.0	No Limit	+	+	+	+
	< 1.0		+	+	0/-	+
Electrical Conductivity	< 10µS/cm	No Limit	+	+	0	+
	10-500 µS/cm		+	+	+	+
	> 500 µS/cm		+	+	0	+
pH	< 6.0	Within 24 Hours	0	0	0	+
	6.0-7.5		0/+	+	0	+
	7.5-9.0		+	+	+	+
	> 9.0		+	+	0	+
Ammonium (NH_4^+)	< 2	Within 24 Hours	+	+	+	+
	2-20		+	+	0	+
	> 20		+	+	-	+
Chlorides (Cl^-)*	< 300	No Limit	+	+	+	+
	> 300		0	+	0/+	+
Free Chlorine (Cl_2)	< 1	Within 5 Hours	+	+	+	+
	1-5		+	+	0	+
	> 5		0/+	+	0/-	+

Note: See Chlorine Content Table

Table 2: Corrosion Resistance Continued

Water Containing	Concentration (mg/L or ppm)	Time Limits - Analyze Before	AISI 316	SMO 254	Copper Alloy	Nickel Alloy
Hydrogen Sulfide (H_2S)	< 0.05	No Limit	+	+	+	+
	> 0.05		+	+	0/-	+
Free (aggressive) Carbon Dioxide (CO_2)	< 5	No Limit	+	+	+	+
	5-20		+	+	0	+
	> 20		+	+	-	+
Total Hardness (°dH)	4.0-8.5	No Limit	+	+	+	+
Nitrate (NO_3)	< 100	No Limit	+	+	+	+
	> 100		+	+	0	+
Iron (Fe)	< 0.2	No Limit	+	+	+	+
	> 0.2		+	+	0	+
Aluminum (Al)	< 0.2	No Limit	+	+	+	+
	> 0.2		+	+	0	+
Manganese (Mn)	< 0.1	No Limit	+	+	+	+
	> 0.1		+	+	0	+

Table 3: Chloride Content

Chloride Content	Maximum Temperature			
	60°C (140°F)	80°C (176°F)	120°C (248°F)	130°C (266°F)
= 10 ppm	SS 304	SS 304	SS 304	SS 316
= 25 ppm	SS 304	SS 304	SS 316	SS 316
= 50 ppm	SS 304	SS 316	SS 316	Ti/SMO 254
= 80 ppm	SS 316	SS 316	SS 316	Ti/SMO 254
= 150 ppm	SS 316	SS 316	Ti/SMO 254	Ti/SMO 254
= 300 ppm	SS 316	Ti/SMO 254	Ti/SMO 254	Ti/SMO 254
> 300 ppm	Ti/SMO 254	Ti/SMO 254	Ti/SMO 254	Ti/SMO 254

2. SA SERIES START-UP FORMS

Job Name:_____ **Date**: _____
Address:_____
Model Number:_____
Serial Number:_____ **Tag**: _____
Startup Contractor:_____
Address:_____
Phone:_____

2.1. Pre-Startup Checklist

1. Is there any visible shipping damage?	☐ Yes
2. Is the unit level?	☐ Yes
3. Are the unit clearances adequate for service and operation?	☐ Yes
4. Do all access doors open freely, and are the handles operational?	☐ Yes
5. Have all shipping braces been removed?	☐ Yes
6. Have all electrical connections been tested for tightness?	☐ Yes
7. Has all gas heat piping been checked for leaks?	☐ Yes
8. Does the electrical service correspond to the unit nameplate?	☐ Yes
9. On 208/230V units, has the transformer tap been checked?	☐ Yes
10. Has overcurrent protection been installed to match the unit nameplate requirement?	☐ Yes
11. Have all set screws on the fans been tightened?	☐ Yes
12. Do all fans rotate freely?	☐ Yes
13. Does the field water piping to the unit appear to be correct per design parameters?	☐ Yes
14. Is all copper tubing isolated so that it does not rub?	☐ Yes
15. Have the damper assemblies been inspected?	☐ Yes
16. Are air filters installed with proper orientation?	☐ Yes
17. Have the condensate drain and p-trap been connected?	☐ Yes
18. Is the actual refrigerant charge of the largest circuit in accordance with the required conditioned floor area according to Table 16?	☐ Yes
19. Are ventilation and exhaust openings unobstructed?	☐ Yes
20. Are markings, decals, and warnings on the unit clearly visible?	☐ Yes
21. Are all damaged or illegible markings and warnings replaced?	☐ Yes

2.2. A2l Refrigerant Detection System (RDS) Pre-Start Checklist

1. Does each port (sensor 1-3) have a male connector plugged into both the Cabinet and Airstream connection on the mitigation board?	☐ Yes
2. Do the compressor and gas heat operation shut off when the cabinet board sensor trips?	☐ Yes
3. Normal unit operation commences except for the compressor and gas heater after the cabinet board sensor trips?	☐ Yes
4. Does the compressor shut off and the fan stay on when the Airstream board sensor trips?	☐ Yes
5. Non-compressor or gas heating/cooling stay on when both boards trip? (electric heater stays on)	☐ Yes
6. When the A2L airstream alarm is activated, do supply fans start, VAV boxes open, and compressors stop?	☐ Yes

2.3. Ambient Temperature

Ambient Temperature	
Ambient Dry Bulb Temperature _____°C/°F	Ambient Wet Bulb Temperature _____°C/°F

2.4. Supply Fan Assembly

Alignment ☐		Check Rotation ☐		Nameplate Amps _____
Number	**Hp**	**L1 Volts/Amps**	**L2 Volts/Amps**	**L3 Volts/Amps**
1				
2				
3				
4				
Band Size_____		VAV Controls _____		
VFD Frequency _____				

2.5. Compressors/DX Cooling

Number	L1 Volts/Amps	L2 Volts/Amps	L3 Volts/Amps	Head Pressure PSIG	Suction Pressure PSIG
1					
2					
3					
4					

2.6. Refrigeration Systems Cooling Mode

Refrigeration System 1 - Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 2 - Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 3 - Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 4 - Cooling Mode					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

2.7. Refrigeration Systems Heating Mode

Refrigeration System 1 - Heating Mode (Heat Pump Only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 2 - Heating Mode (Heat Pump Only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 3 - Heating Mode (Heat Pump Only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

Refrigeration System 4 - Heating Mode (Heat Pump Only)					
	Pressure	Saturated Temperature	Line Temperature	Sub-cooling	Superheat
Discharge				N/A	N/A
Suction				N/A	
Liquid					N/A

2.8. Unit Configuration

Water- Cooled Condenser ☐	Air Cooled Condenser ☐
No Water Leaks ☐	
Condenser Safety Check ☐	
Water Flow _____GPM	
Water Inlet Temperature _____°F	
Water Outlet Temperature _____°F	

2.9. Water/Glycol System

1. Has the entire system been flushed and pressure checked?	☐ Yes
2. Has the entire system been filled with fluid?	☐ Yes
3. Has air been bled from the heat exchangers and piping?	☐ Yes
4. If glycol is used, is it the proper type and concentration (N/A if water)?	☐ Yes
5. Is there a minimum load of 50% of the design load?	☐ Yes
6. Has the water piping been insulated?	☐ Yes
7. What is the freezing point of the glycol (N/A if water)? _____	☐ Yes

2.10. Air-Cooled Condenser Fans

Alignment ☐	Check Rotation ☐	Nameplate Amps _____		
Number	**Hp**	**L1 Volts/Amps**	**L2 Volts/Amps**	**L3 Volts/Amps**
1				
2				
3				
4				
5				
6				

2.11. Additional Findings

2.12. Signature

By signing this form, you verify that all of the information contained is correct and filled out to the best of your ability.

Name:		
Title:		
Rep/Contractor:		
Signature:_____		**Date/Time**:_____

3. APPENDIX B - MAINTENANCE LOGS

This log must be kept with the unit. It is the responsibility of the owner and/or maintenance/service contractor to document any service, repair, or adjustments. AAON Service and Warranty Departments are available to advise and provide phone help for proper operation and replacement parts. The responsibility for proper start-up, maintenance, and servicing of the equipment falls to the owner and a qualified licensed technician.

Entry Date	Action Taken	Name/Tel.

3.1. Maintenance Log (E-Coated Coil)

AAON E-COATED COIL MAINTENANCE RECORD

Installation Site _____ Installation Date _____
Unit Model # _____ Unit Location _____
Unit Serial # _____ Customer _____

Year 20____	Ambient Temp (°F)	Surface Debris Removed	Coil Cleaned	Approved Cleaner Used	Potable Water Backwash Rinse	Potable Water Frontwash Rinse	Chlorides Removed	Comments
Jan								
Feb								
Mar								
Apr								
May								
Jun								
Jul								
Aug								
Sep								
Oct								
Nov								
Dec								

The following cleaning agents have been approved for use on AAON E-Coated Coils to remove mold, mildew, dust, soot, greasy residue, lint and similar particulate without harming the coated surfaces.

CLEANING AGENT	RESELLER	PART NUMBER
GulfClean ™ Coil Cleaner or Enviro-Coil Cleaner	Rectorseal 2601 Spenwick Drive, Houston, Texas 77055 (P): 713-263-8001	G074480 / 80406 or V82540
GulfClean Salt Reducer™	" "	G074490 / 80408

RECOMMENDED CHLORIDE REMOVER
Rectorseal 2601 Spenwick Drive, Houston, Texas 77055 (P): 713-263-8001

AAON
2425 South Yukon Ave.
Tulsa, OK 74107-2728
Phone: 918-583-2266
Fax: 918-583-6094
www.AAON.com

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