



ARRAY

CONDENSING BOILER



Project Details	Date:	
	Project Name:	
	Project Location:	
	Installing Contractor:	
	Engineering Firm:	
	Riello Representative:	

Boiler Supply	AR 800 Qty.	
	AR 1000 Qty.	
	AR 1500 Qty.	
	AR 2000 Qty.	
	AR 3000 Qty.	
	AR 4000 Qty.	

Project Notes:

General Boiler Data	BOILER TYPE	CONDENSING HYDRONIC HEATING BOILER
	AHRI CERTIFIED EFFICIENCY	96.1% (AHRI STANDARD 1500)
	MAX. TEMPERATURE	210°F (203± 5.5°F HIGH LIMIT)
	MAX. OPERATING TEMPERATURE	194°F
	VESSEL DESIGN	80 PSIG MAWP (ASME SECTION IV)
	PRESSURE RELIEF VALVES SETTING	75 PSIG (PER HEAT MODULE)
	FUEL TYPE: AS SHIPPED	NATURAL GAS, 1004 BTU/SCF HHV
	FUEL TYPE: ALTERNATE	PROPANE (REQUIRES CONVERSION KIT)
	MIN. GAS SUPPLY PRESSURE	4.0" W.C. Natural Gas / 8.0" W.C. Propane
	MAX. GAS SUPPLY PRESSURE	13.5" W.C.
	FLAME SAFEGUARD CONTROLLER	EBM PAPST 905MN, ASME CSD-1
	FLAME DETECTION	IONIZATION PROBE CURRENT
	APPROVALS	ASME, AHRI, ETL, SCAQMD ^[Where applicable]

Optional Accessories	INLET FLANGED WATER STRAINER(S)	
	MOTORIZED INTAKE AIR DAMPER(S)	
	CONDENSATE NEUTRALIZER KIT(S)	
	FLUE ADAPTER(S), TO STAINLESS	
	FLUE ADAPTER(S), TO CPVC	
	BOILER CLEANING KIT(S)	
	PROPANE CONVERSION KIT(S)	
	GATEWAY TO BACNET RS485 (MODBUS PROVIDED AS STANDARD)	
	LONWORKS GATEWAY RS232	
	DHW TEMP. SENSOR & WELL	
	SYSTEM TEMP. SENSOR & WELL (Std.)	•
	OUTDOOR AIR TEMP. SENSOR (Std.)	•

Factory Integrated Components

- Primary boiler pumps
- Main circuit breaker
- Sequencing controller
- Factory piped and wired;
 - Water-supply manifold
 - Water-return manifold
 - Stainless Exhaust manifold
 - Gas trains
 - Condensate drain manifold (no need for external traps)
 - Relief drain manifold
 - Pumps

Redundancy

- Multiple module design
- Controls for each module
- Isolation valves for each module
- Drain valves for each module

Performance Features

- 316Ti/L Stainless heat exchanger
- High turndown with low excess air
- Air-cooled housing
- Variable speed fans
- Variable water flow (staged pumps)
- Low NOx (30, 20, or 9 ppm)
- Provided with externally mounted gas supply filter**

Operation

- Password protected control levels
- Identified fault circuitry
- Vortex flow meters to each module
- Dynamic operating limits
- 7" color touch screen
- Chart displays
- Adjustable sequencing control and firing rate parameters
- Indirect DHW function and priority
- Hinged front door
- Identical spare parts
- Modbus communication to BMS (other gateways available)

Boiler Data Chart

	UNITS	AR 800	AR 1000	AR 1500	AR 2000	AR 3000	AR 4000
Riello Product Code		20164509	20177312	20177313	20177314	20177315	20177316
I&O Manual Code		20184133	0092303			0092302	
	Redundancy						
Nº of Heating Modules	Qty.	2	2	3	4	6	8
	Combustion						
Maximum Input (<2,000 ft. alt., 30ppm NO_x)	BTU/hr (kW)	798,000 (234)	1,000,000 (293)	1,500,000 (440)	2,000,000 (586)	3,000,000 (879)	4,000,000 (1172)
Minimum Input	BTU/hr (kW)	39,900 (11.7)	100,000 (29)	100,000 (29)	100,000 (29)	100,000 (29)	100,000 (29)
Boiler Turndown	Ratio	20:1	10:1	15:1	20:1	30:1	40:1
Exhaust O ₂ Range (Nat. gas)	%	4.4 – 5.8 (dry basis)					
Exhaust NO _x (Nat. gas)	ppm	<30 ppm standard (<20 ppm & 9 ppm with fuel-air ratio / max. input adjustment)					
Exhaust CO (Nat. gas)	ppm	<150 ppm					
	Hydronic						
Water Volume (Total Boiler)	US Gal. (Liter)	14 53	17 (64)	24 (91)	35 (132)	55 (208)	69 (261)
	Electrical						
Single-Point Electrical Connection	V/ph/Hz	120/1/60	120/1/60	120/1/60	240/1/60 *	208-230/3/60	208-230/3/60
Electrical Supply Terminals		L1, N, GND	L1, N, GND	L1, N, GND	L1, L2, N, GND	L1, L2, L3, N, GND	L1, L2, L3, N, GND
Electrical – FLA	Amps	15.5A	15.5A	23.3A	15.5A	15.5A	23.3A
Electrical – MOCP	Amps	20A	20A	30A	20A	20A	30A
Electrical – MCA	Amps	16A	16A	24A	16A	16A	24A
	Connections						
Gas Inlet [NPT Male]	NPS Inch (DN mm)	1.5 (40)	1.5 (40)	1.5 (40)	1.5 (40)	2.0 (50)	2.0 (50)
External Gas Filter [NPT Female]	NPS Inch (DN mm)	N/A	1.5 (40)	1.5 (40)	1.5 (40)	2.0 (50)	2.0 (50)
Water Return / Supply [ANSI #150 Flange Raised]	NPS Inch (DN mm)	2.5 (65)	3 (80)	3 (80)	4 (100)	4 (100)	4 (100)
Relief Drain Connection [NPT Female]	NPS Inch (DN mm)	2.5 (65)	2.5 (65)	2.5 (65)	2.5 (65)	2.5 (65)	2.5 (65)
Condensate Drain Connection [PVC Female]	NPS Inch (DN mm)	1 (25)	1 (25)	1 (25)	1 (25)	1 (25)	1 (25)
Flue Outlet [Female Centrotherm InnoFlue®]	NPS Inch (DN mm)	6 (160)			8 (200)	8+/10 (200+/250)	
Available Adapters & Suitable Vent Material	CPVC, PP, Stainless Steel, AL29-4C						
Air Inlet [Round Sheet-Metal Opening]	Ø Inch (Ø mm)	5.91” (150)	5.91” (150)		7.87” (200)	9.84” (250)	
System Sensor	NTC Type-4 Sensor: 45mm, 6mmØ (shipped loose)						
System Sensor Thermowell	304 Stainless, ½” NPT x 4” (shipped loose)						
	Misc.						
Ambient Storage Temperature	°F (°C)	5 to 158 (-15 to 70)					
Ambient Functioning Temperature	°F (°C)	32 to 120 (0 to 49)					
Heat Exchanger Surface Area (Per Module)	ft² (m²)	27 (2.5)	43 (4)				

* AR2000: It is possible to power this boiler using two (2) legs of a 208-230V/3PH/60HZ source, provided the system is balanced.

** Models AR1000-4000 include an in-line 20µm gas filter for external mounting. Female NPT connections on filter match boiler gas pipe size. Filter housing is 160mm end-to-end length, and up to 112mm wide. Rated max. 2bar (29 psi).

† Using the 8-inch (200mm) vent connection on the AR3000-AR4000 limits the allowable vent length, see venting section.

All Models, SCCR = 5kA

Major Components Distribution

	Common to Boiler	On Each Independent Heat Module
Electrical Compartment	7" Color touch screen (non-controlling) - LCD service display and touchpad - Electrical feed landing terminals - Main boiler circuit breaker - System input/output terminals	- Burner, sequencing, and flame safeguard controller - Module on/off rocker switch - Overload fuse
Water-Side	- Internally Piped Manifolds: - Supply water - Return water - Relief drain - Condensate drain - Low water-pressure switch - Low water-level cut-off - Boiler drain valve - Boiler supply temperature sensor - System supply temperature sensor and thermowell - Outdoor air temperature sensor	- Safety relief valve: ASME rated 75 psig (517 kPa) setting. - Hydronic Pump - Temperature and pressure gauge (supply side) - Supply manual isolation valve - Return manual isolation valve - Check valve - Drain valve - Module return temperature sensor - Module supply temperature sensor - Module high temperature limit control - Module low water cut-off - Automatic air vent - Water flow meter
Gas-Side	- Single connection to gas supply line - Low gas pressure switch (manual reset) - High gas pressure switch (manual reset) - Blocked cabin air inlet switch	- Gas burner with variable speed blower - Self-compensating zero governing gas valve with dual safety shut off function - Manual gas shutoff valve (upstream of automatic valve) - Manual gas shutoff valve before the burner - Combination flame supervision & ignition electrode - Flue gas temperature sensor - Flue gas / condensate pressure switch - Module exhaust backflow check valve (clapper)

Piping & Available Head Pressure

Important! The Array boiler includes internal boiler loop pumps. The boiler(s) must be piped primary-secondary, "hydraulically separated" from the system and other pumps. Boiler(s) must connect the distribution via closely spaced Tees or hydraulic separator. See IO&M Boiler Room Layout example.

Boiler loop piping must be sized to accommodate the required boiler maximum flow with pressure drop at or below the available head pressure. Below: Available head pressure for the boiler loop.

		Available Waterside Head Pressure					
		AR 800	AR 1000	AR 1500	AR 2000	AR 3000	AR 4000
ΔT 36°F Across Boiler	Water Flowrate (USgpm) <i>(Est., No Glycol, Full Firing)</i>	42	53	80	107	160	213
	Available Head (ft-head) Water Only	16.0	7.5	7.0	8.0	4.5	4.0
	Available Head (ft-head) 50% Glycol	14.4	7.0	6.0	7.0	4.0	3.0
ΔT 45°F Across Boiler	Water Flowrate (USgpm) <i>(Est., No Glycol, Full Firing)</i>	34	43	64	85	128	171
	Available Head (ft-head) Water Only	20.0	16.5	16.0	16.5	14.5	14.0
	Available Head (ft-head) 50% Glycol	18.0	16.0	15.5	15.5	14.0	13.5

Venting I – Specified in Total Equivalent Length

! See boiler installation manual for full venting requirements.

Maximum Equivalent Venting Length (Combined Exhaust + Combustion Air)			
Nominal Size	6"	8"	10"
Units	ft (m)	ft (m)	ft (m)
AR 800	100 (30)	-	-
AR 1000	100 (30)	-	-
AR 1500	100 (30)	-	-
AR 2000	-	100 (30)	-
AR 3000	-	70 (21)	100 (30)
AR 4000	-	40 (12)	100 (30)

45° Elbow Typical Equivalent Length			
Nominal Size	6"	8"	10"
Units	ft (m)	ft (m)	ft (m)
AR 800	5 (1.5)	-	-
AR 1000	5 (1.5)	-	-
AR 1500	5 (1.5)	-	-
AR 2000	-	7 (2.1)	-
AR 3000	-	7 (2.1)	5 (1.5)
AR 4000	-	7 (2.1)	5 (1.5)

90° Elbow Typical Equivalent Length			
Nominal Size	6"	8"	10"
Units	ft (m)	ft (m)	ft (m)
AR 800	6 (1.8)	-	-
AR 1000	6 (1.8)	-	-
AR 1500	6 (1.8)	-	-
AR 2000	-	9 (2.8)	-
AR 3000	-	9 (2.8)	6 (1.8)
AR 4000	-	9 (2.8)	6 (1.8)

Venting II – Specified as Total Allowable Pressure Drop

This section can be used for designing a multiple boiler common vent or for custom engineering single boiler venting.

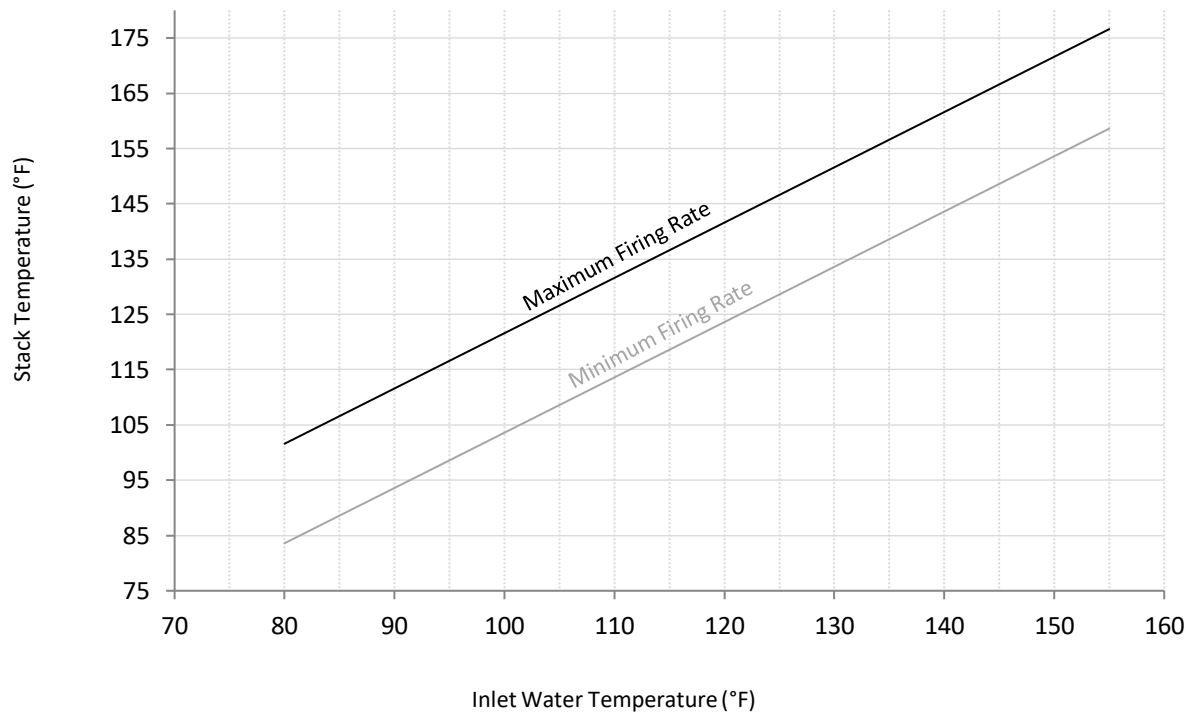
Installation must comply with local requirements and with the National Fuel Gas Code ANSI Z223.1. **Array** boilers vent and air piping can be installed through the roof or through a sidewall. Suitable, UL approved, positive pressure, watertight vent materials **MUST** be used for safety and UL certification. (CPVC, PP, Stainless Steel, AL29-4C)

Model	Allowable Vent Pressures			
	Exhaust Mass Flow Rate	Max. Allowable Negative Draft at Boiler Exit	Max. Positive Vent Pressure at Boiler Exit ⁽¹⁾	
			176°F supply / 140°F return	104°F supply / 86°F return
AR 800	0.21 lbs/s	-62 Pa (-0.25" WC)	180 Pa (0.72" WC)	180 Pa (0.72" WC)
AR 1000	0.26 lbs/s	-62 Pa (-0.25")	202 Pa (0.81")	224 Pa (0.90")
AR 1500	0.40 lbs/s	-62 Pa (-0.25")	174 Pa (0.70")	197 Pa (0.79")
AR 2000	0.52 lbs/s	-62 Pa (-0.25")	187 Pa (0.75")	209 Pa (0.84")
AR 3000	0.78 lbs/s	-62 Pa (-0.25")	162 Pa (0.65")	179 Pa (0.72")
AR 4000	1.04 lb/s	-62 Pa (-0.25")	149 Pa (0.60")	167 Pa (0.67")

(1) Pressure drop from ducted combustion air must be subtracted from the allowable exhaust vent pressure.

Linearized Exhaust Temperatures (Approx.)

Operating at 36°F Across Boiler



General Dimensions & Weight

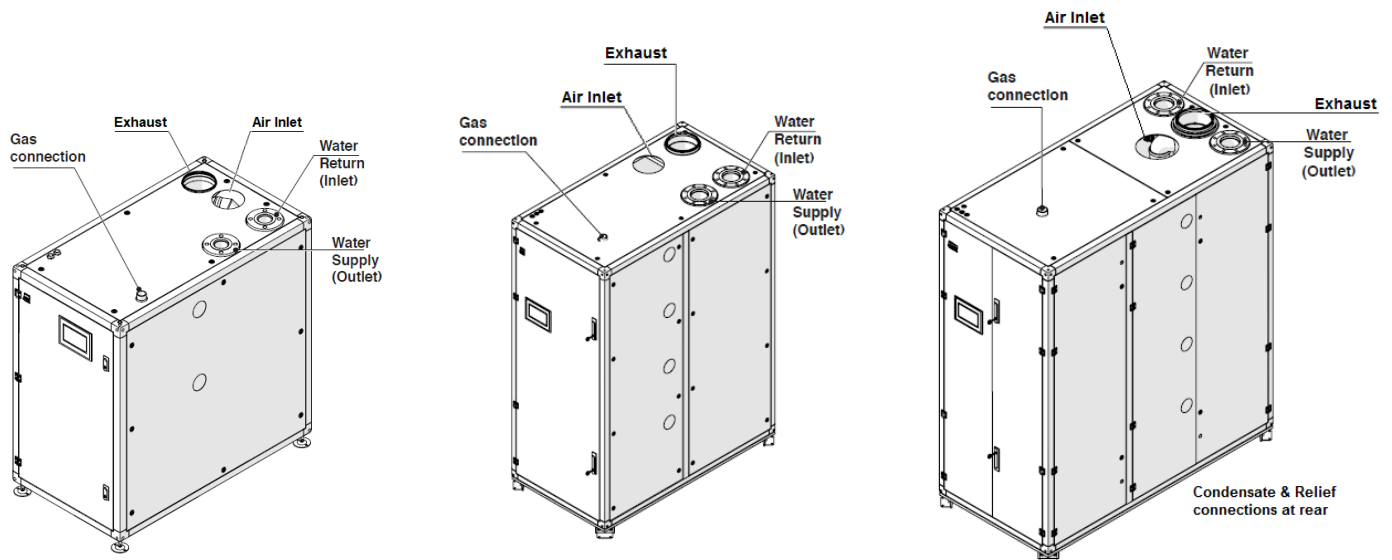
		AR 800	AR 1000	AR 1500	AR 2000	AR 3000	AR 4000
Width	Inches (mm)	29.4 (747)	33.3 (846)	33.3 (846)	33.3 (846)	35.4 (900)	35.4 (900)
Height*	Inches (mm)	54.2 (1,378)	67.2 (1,707)	67.2 (1,707)	83.0 (2,108)	83.0 (2,108)	83.0 (2,108)
Depth	Inches (mm)	52.4 (1,330)	60.8 (1,544)	60.8 (1,544)	60.8 (1,544)	72.8 (1,850)	72.8 (1,850)
Dry Weight	lbs. (kg)	926 (430)	1,058 (480)	1,323 (600)	1,676 (760)	2,315 (1,050)	2,998 (1,310)
Operating Weight	lbs. (kg)	1,008 (467)	1,200 (544)	1,523 (691)	1,968 (892)	2,774 (1,258)	3,574 (1,621)

*Overall height can be reduced a further two (2) inches during installation as boiler feet can be temporarily removed.

Recommended Clearance for Maintenance

Sides, Rear, Top	24"
Front	32"

Installation to provide at least the minimum distances to obstructions for proper service access. These clearances apply to all ARRAY boiler sizes from AR 800 to AR 4000.



AR 800

AR 1000 | AR 1500 | AR 2000

AR 3000 | AR 4000

Not to scale

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