

## Submittal Data

# Line RTAR Series

## Commercial & Specialty Reversible Heat Pumps

### Gas Fired Absorption Reversible Heat Pumps With Modular Capability

### Heating & Cooling

Robur's High Efficiency Modular Heat Pump-Links are comprised of multiple combinations of the GAHP-AR Reversible Heat Pumps, which utilize an ammonia/water absorption cycle designed for outdoor installation. By using natural gas as the primary energy source it supplies hot water up to 140 °F or chilled water down to 37.4 °F. The same unit is suitable for heating or cooling by reversing the absorption cycle, using the

outside air for heat rejection in cooling mode and as a heat source in heating mode. The gas efficiency at rated conditions is 126% in heating mode. As a general efficiency feature, in moderate climate areas (about twice the heating load versus cooling load) the gas savings during the heating season can offset the gas consumption normally required during the cooling season. The RTAR series offers a wide variety of

convenient applications, for instance: air conditioning systems for light commercial, industrial and residential use; single unit for both heating and cooling with low

electrical power consumption; gas-based heating and cooling systems in order to achieve electrical peak shaving.



**Use** Heating and Cooling alternatively

**Type** Air to water

**Heat transfer fluid** Water

**Heating capacity**

From 240,800 to 602,000

**Cooling capacity**

From 115,400 to 288,500

**Renewable energy**

**percentage contributing to the total heat output** 34

**Heating efficiency** 126%

**Cooling efficiency** 60%

**Outlet water temperature**

37.4 °F / 140 °F

**Main applications**

High efficiency low temperature hydronic heating and cooling system

**Main advantage** Savings up to 40% in heating operational costs in comparison with the best gas boilers, due to the

energy recovered from a renewable source (air).

**Additional advantages**

- **Single Phase Power.**
- **Remote management** and staging by Direct Digital Controller (DDC - Optional). One DDC can manage up to 16 Heat Pump modules on a common water loop.
- **One Single System** supplies hot or chilled water.
- The prevailing use of gas **reduces the need of electric power by approx. 87%** in comparison with electric compression units (3.75 kW for 602,000 Btu/h heating and 288,500 Btu/h cooling).
- **Minimal Electrical Panel requirements.**
- For application requiring standby power, the **electric**

**generator size and electric output will be lower.**

- **High Reliability** due to few moving parts inside the unit.
- **Easy Maintenance**, similar to gas fired boilers.
- **No Water Consumption.** No need for cooling tower (no problems associated with legionella).
- **No use of Harmful Refrigerants.**
- **Outdoor Installation.**

**Features**

- **Patented reversible absorption cycle.**
- **Air source/cooled heat exchanger** with single row aluminium fin coil.
- **Evaporator/Condenser-Absorber** tube and shell heat exchanger made of stainless steel.

• **Axial fan** with thermally protected motor drive.

• **Pre-mixed gas burner.**

Stainless steel multiple gas type with ignitor and flame sensor device controlled by an electronic ignition box.

• **Microprocessor control.**

Printed resin electronic circuit with LED display. Ensures optimum operation of the absorption cooling process while allowing easy access of unit data for preventative maintenance and diagnostics.

• **Optional Direct Digital Controller (DDC).**

A single device to fully manage and control Robur units.

• **Built-in safety and control devices.**

			RTAR	RTAR	RTAR	RTAR
			120-240	180-360	240-480	300-600
<b>PERFORMANCE RATINGS - HEATING <sup>(1)</sup></b>						
Heating capacity <sup>(2)</sup>	BTU/h		240,800	361,200	481,600	602,000
Gas input	BTU/h		191,000	286,500	382,000	477,500
Ambient operating temperature	maximum	°F	95	95	95	95
	minimum	°F	-20	-20	-20	-20
Hot water temperature	max. outlet (to hydronic system)	°F	140	140	140	140
	maximum inlet (to unit)	°F	122	122	122	122
Hot water flow	nominal	GPM	26.8	40.2	53.6	67.0
Internal pressure drop at nominal hot water flow		psig	4.2	4.2	4.2	4.2

<b>PERFORMANCE RATINGS - COOLING <sup>(1)</sup></b>						
Cooling capacity <sup>(3)</sup>	BTU/h		115,400	173,100	230,800	288,500
Gas input	BTU/h		191,000	286,500	382,000	477,500
Ambient operating temperature	maximum	°F	120	120	120	120
	minimum	°F	32	32	32	32
Chilled water temperature	minimum outlet (to hydronic system)	°F	37.4	37.4	37.4	37.4
	maximum inlet (to unit)	°F	113	113	113	113
Chilled water flow	nominal	GPM	25.6	38.4	51.2	64.0
Internal pressure drop at nominal chilled water flow		psig	4.5	4.5	4.5	4.5

<b>ELECTRICAL RATINGS <sup>(4)</sup></b>						
Required voltage, 60 Hz, single phase <sup>(5)</sup>	V	208 - 230				
Operating consumption <sup>(6)</sup>	kW	1.5	2.25	3	3.75	
MCA (Minimum Circuit Ampacity)	A	16	24	32	40	
MOP (Maximum Overcurrent Protection)	A	21,8	32,7	43,6	54,5	

<b>PHYSICAL DATA <sup>(1)</sup></b>						
Operating weight	pounds	2,086	3,144	4,027	5,242	
Chilled water entering and leaving connections	FPT	1 1/2	1 1/2	2	2	
Gas inlet connections	FPT	1	1	1	1	
Dimensions	width	inches	49 1/2	49 1/2	49 1/2	49 1/2
	length	inches	102.5	154.5	206.0	257.5
	height	inches	53 1/4	53 1/4	53 1/4	53 1/4

<sup>(1)</sup> All illustrations and specifications contained herein are based on the latest information available at the time of publication.

<sup>(2)</sup> Heating capacity at standard conditions of 44.6 °F ambient temperature. Hot water outlet temperature 122 °F, hot water inlet temperature 104 °F.

<sup>(3)</sup> Cooling capacity at standard conditions of 95 °F ambient temperature. Chilled water outlet temperature 44.6 °F, chilled water inlet temperature 53.6 °F.

<sup>(4)</sup> May vary by ± 10% as function of both power supply and electrical motor input tolerance.

<sup>(5)</sup> Modular links are factory-wired for 208-230 volts operation. Breakers Factory Installed.

**Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.**

**Optional DDC**

- One Robur DDC can control up to 16 units working on a common hydronic loop or up to 48 units on a common loop when connected to two additional Robur DDCs.
- Programmable time scheduling.
- Monitoring of inlet and outlet water temperatures.
- Sequence step control of multiple units (Staging).
- Equalizes run time of individual modules.
- Visual and audible alarm for each module.
- Constant display of the system operating parameters.
- Logging and displaying of fault events.
- General fault and burner lockout signal for remote connection.



**HEATING MODE CAPACITY (BTU/h)**

External ambient operating temperature (dry bulb)	Outlet (to plant) hot water temperature			
	86 °F	113 °F	122 °F	140 °F
	$\Delta\Delta T = 18\text{ °F}$		$\Delta\Delta T = 27\text{ °F}$	
-20.0 °F	91,100	82,900	82,900	80,900
-13.0 °F	92,100	83,900	83,900	81,900
-4.0 °F	93,200	85,000	85,000	82,900
5.0 °F	97,200	89,400	88,000	85,600
14.0 °F	105,400	94,500	92,100	90,100
19.4 °F	111,900	100,300	96,900	95,500
35.6 °F	123,900	118,700	109,900	102,400
44.6 °F	129,300	128,000	<b>120,400</b>	112,600
50.0 °F	131,700	131,000	124,200	117,700
59.0 °F	134,100	133,400	128,300	122,200
68.0 °F	134,800	134,400	129,300	123,900
77.0 °F	134,800	134,400	129,700	126,200

Nominal value in bold type.

$\Delta T$  is the difference between outlet and inlet temperature.

**COOLING MODE CAPACITY (BTU/h)**

External ambient operating temperature (dry bulb)	Outlet (to plant) chilled water temperature		
	37.4 °F	44.6 °F	50.0 °F
	$\Delta\Delta T = 9\text{ °F}$		
59.0 °F	64,800	63,800	64,800
68.0 °F	63,500	63,500	64,100
77.0 °F	60,100	62,400	63,300
86.0 °F	54,300	60,700	61,800
95.0 °F	44,000	<b>57,700</b>	59,400
104.0 °F	--	51,200	54,600
113.0 °F	--	--	46,100

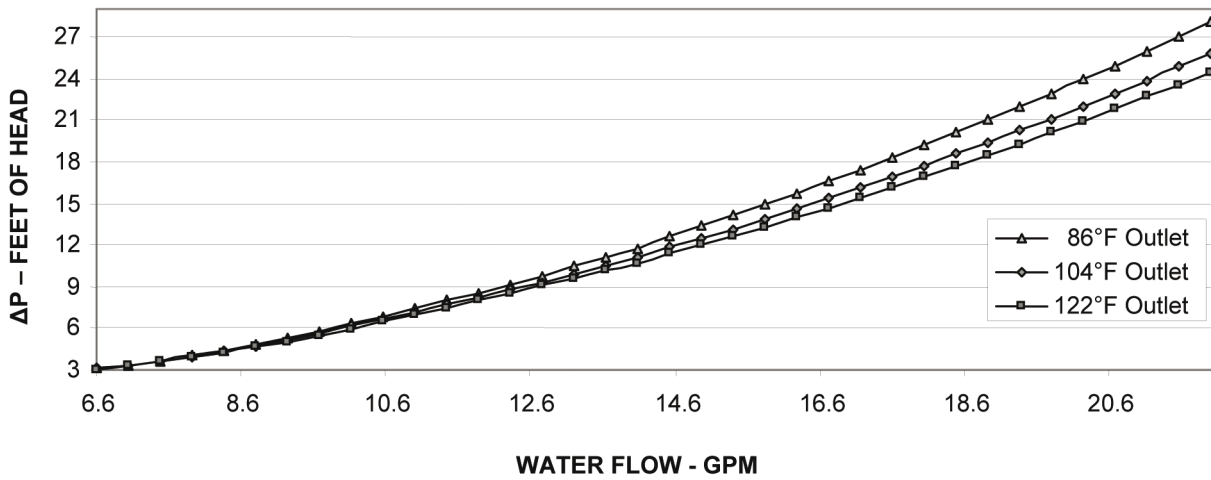
Nominal value in bold type.

$\Delta T$  is the difference between outlet and inlet temperature.

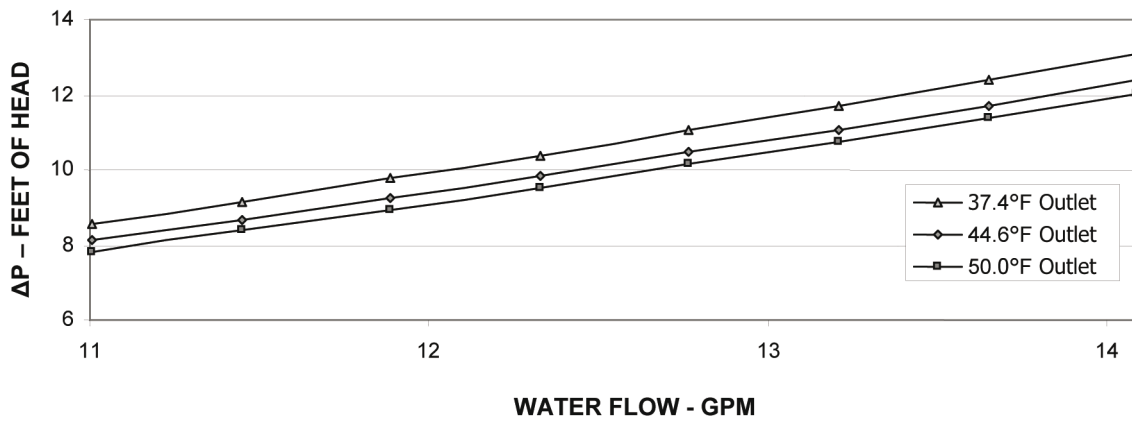
**PRESSURE DROP - Cooling mode ( $\Delta P$  evaporator)**

Chilled water flow	Outlet water temperature		
	37.4 °F	44.6 °F	50.0 °F
GPM	$\Delta\Delta P$ (Feet of Head)		
11.01	8.55	8.11	7.84
11.45	9.15	8.67	8.39
11.89	9.77	9.25	8.96
12.33	10.40	9.85	9.54
12.77	11.05	10.46	10.15
13.21	11.71	11.08	10.76
13.65	12.38	11.72	11.40
14.09	13.07	12.38	12.04

**PRESSURE DROP – HEATING MODE**



**PRESSURE DROP – CHILLING MODE**



**Glycol percentage information**

(All numbers are approximate - see glycol manufacturer specs for more accurate information)

It is essential, regardless of the glycol in question, to verify that it is adequately inhibited and that the necessary checks are routinely performed during its entire period of use.

Antifreeze liquids for cars, which do not contain inhibiting components (other than mono-ethylene glycol), are not recommended for cooling and heating systems. The manufacturer does not accept any contractual or extra-contractual liability for damage caused by the incorrect use or disposal of glycol antifreeze. It is important to note that the use of glycol modifies

the characteristics of the water in the plant, and in particular its density, viscosity and specific average heat. The table below gives the approximate freezing temperature of water containing monoethylene glycol and the consequent increased pressure drop of the system, according to the percentage of glycol. This table should be taken into account when sizing of

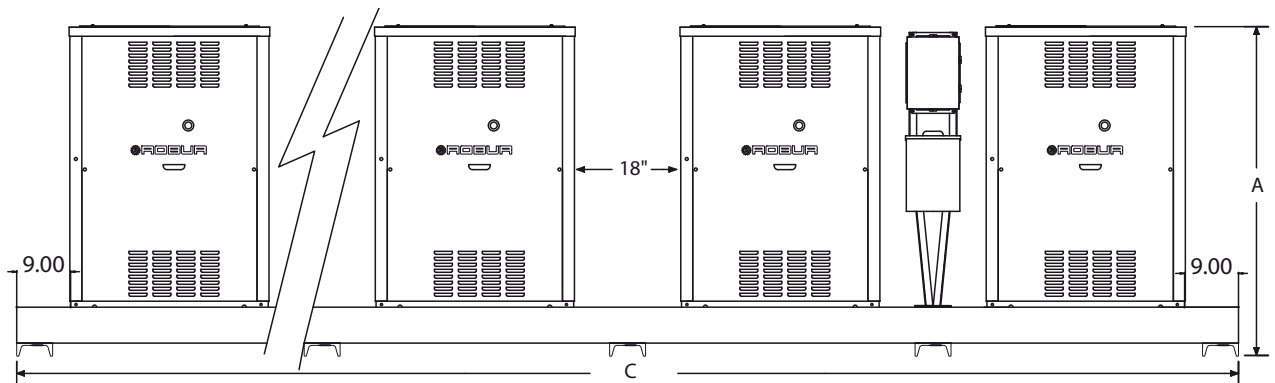
the pipes and the circulation pump for the system. It is advisable to consult the technical specifications of the glycol used to verify pressure drop and capacity loss. If automatic fill systems are used, a seasonal check of the quantity of glycol present in the plant is also necessary.

**APPROXIMATE WATER FREEZING POINT TEMPERATURE**

Percentage of monoethylene glycol	10	15	20	25	30	35	40
Water freezing point temperature (°F)	26.6	23.0	17.6	10.4	5.0	-4.0	-13.0
Percentage of increase in pressure drop	--	6	8	10	12	14	16
Loss of efficiency of unit	--	0.5	1	2	2.5	3	4

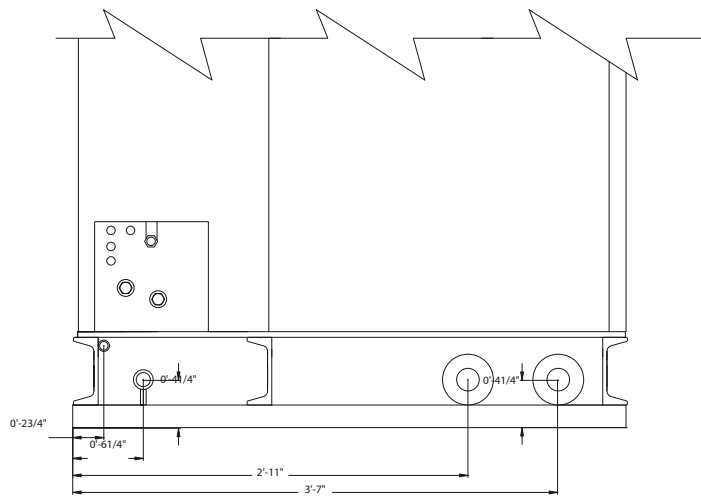
The numbers provided in this table are approximate and you must refer to the glycol manufacturer's specifications for additional instructions and amount of glycol required based on expected ambient conditions.

**RTAR DIMENSIONS**



MODEL	A	B depth (not shown)	C	Approximate Weight (lb)	
				shipping	operating
RTAR120	53.25	49.0	102.5	2,042	2,086
RTAR180	53.25	49.0	154.5	3,084	3,144
RTAR240	55.25	49.0	206.0	3,765	4,027
RTAR300	55.25	49.0	257.5	5,120	5,242

**RTAR PIPING CONNECTIONS**



**Clearances**

- Area required for service and condenser air: minimum clearance of 18" on sides; 36" front and 24" rear.
- Vertical condenser discharge air must not be obstructed by over-hanging objects.
- Keep unit clear of building roof drip line or gutters.
- Other clearance limitations may apply in specialty applications.
- For outdoor installation only. Note: protect water circuit to the lowest expected ambient temperature (a minimum concentration of 20% inhibited permanent antifreeze is required).

**Location**

The RTAR Series package must be installed outdoors in an area of free natural air circulation. Installation inside a room is not allowed. There must be a minimum clearance of 4 feet horizontally from electric meters, gas meters, regulators, and relief equipment. In no case should the equipment be located above or below these items unless a 4 feet horizontal distance is maintained. The units can be installed at ground level, on a platform or on the roof (if the structure is capable of supporting its weight). The noise generated by the fan during operation is not excessive. However, avoid locating the unit in an area

close to sleeping quarters or neighbouring buildings. Installation in building corners, where air turbulence can take place and the equipment noise can be amplified (reverberation), is to be avoided. Around the unit a free and natural air space is to be provided to allow proper intake of the air needed for unit cooling and for servicing. The minimum clearance from walls, obstructions and other units must be as follows:

- right/left sides: 18 inches;
- rear side: 24 inches;
- front side & control box 36 inches.

There MUST NOT be any obstructions or structural overhangs (roof edges, balconies) over the top of the unit. The re-circulation

of the air discharged from the fans must be avoided. Otherwise, poor unit performance will result. When the unit is installed near buildings, keep the unit away from the roof edge drip line. In no case should the unit be placed near any external air intakes of the building. For installation on balconies or roofs, the unit must not be located in close proximity of chimney flues, outlets and other such vents. It is important that the unit not be installed in such a manner that hot or contaminated air will be drawn into the air intakes of the unit. Check local codes for required minimum installation distances.

**Ground installation**

Ground level units must be supported on a level concrete pad thick enough to prevent shifting. Thickness shall be determined by local soil conditions. Pad should be slightly larger than the unit's rail structure (6 inches on each side is recommended). Do not allow the concrete pad to touch the building foundation or structure. Unit operational noise and vibration can be transmitted inside if pad is allowed to come in contact with building.

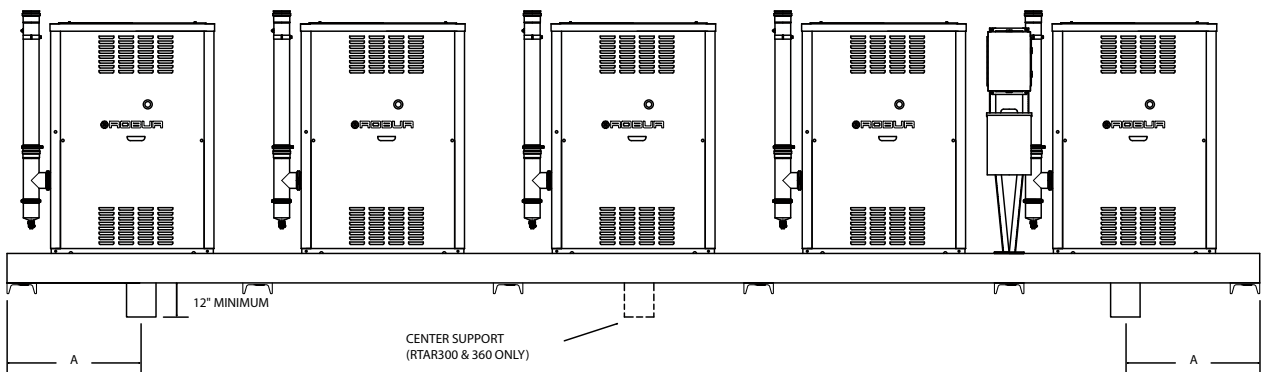
**Roof / Terrace installation**

The building structure/roof joists must be capable of supporting both the unit and any structural base weight. Check operating weight for your particular model in "RTAR Dimensions" section of this document. Provide for a gangway all around the unit for maintenance purposes. Clearances must be respected for roof installations as well. Installation on roofs directly above sleeping quarters should be avoided if possible. If not possible, special consideration must be given to the transmission characteristics of the building structure, the use of vibration isolators under the equipment (acoustically insulated bases) and approved flexible connections (vibration-dampening pipe fittings) between the unit and the system piping is recommended. **Observe all local and State codes.**

**Handling and rigging**

Care must be used in rigging the unit for hoisting. Keep in mind that the units weight between 2,000 and 5,000 pounds and that rough handling or dropping might cause damage to the unit or result in injury to personnel handling the unit. The cables or chains for hoisting should be chosen to support the weight. Attach hoist lines to channel bases and use spreader bars to prevent hoist lines from damaging unit panels, condenser coils and fins. The center of gravity from horizontal standpoint will be toward the center and front of the unit. When final positioning of unit, push or pry against base rails only. Complete Handling and Rigging instructions are provided with the unit upon shipping.

**RTAR SUPPORT DIAGRAM**



LOCATION OF SUPPORTS				
	RTAR120	RTAR180	RTAR240	RTAR300
A	0" - 12"	18" - 30"	18" - 30"	12" - 24"

**Additional product & application information**

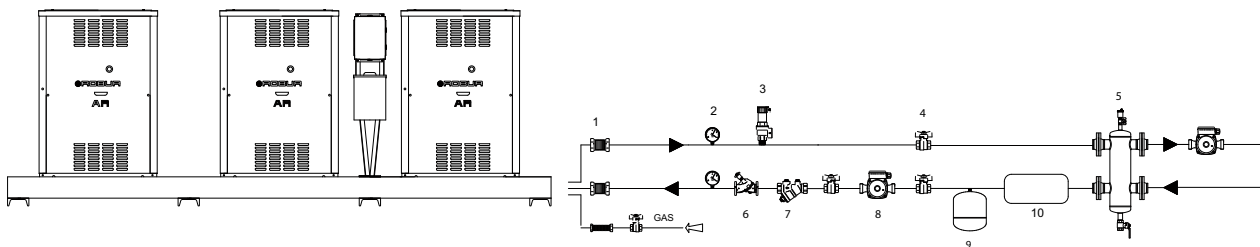
The RTAR Series includes closed water heat exchangers in each module. The water loop will be pressurized and require an expansion tank and an air bleed installed at the highest point in the water loop. A concentration of permanent inhibited antifreeze/glycol must be added to the water loop to prevent freezing in your particular region. A minimum 20% concentration is required in all regions. Operating the unit with no antifreeze will result in

possible freezing of the water in the units' evaporator during mild weather or light cooling load conditions. This freezing condition will result in improper water flow through the unit and may ultimately damage the units' evaporators. RTAR links do not include a water-circulating pump. A pump must be sized and obtained locally for your particular application. Remember, when sizing the pump, each module has a nominal flow rate of approx. 13 GPM with an internal pressure drop of 4.5 psig of

head both in heating and cooling mode. This flow rate must be provided to each module in the multiple unit configuration. Also account for the additional pressure drop of the water piping, fittings, antifreeze concentration and coil(s) in the water loop when sizing the pump. The installer must ensure that the water pump and the RTAR unit start at the same time. Also, the pump must continue to run during the units cycle down period (600 seconds after the opening of the control switch). Contacts

in the link's control box may be used for this purpose if the pump's amp draw does not exceed 4 amps. See RTAR Specification and Installation Manual for additional information. As indicated above, the water loop must contain a properly sized expansion tank and an air bleed must be installed at the highest point of the loop. In addition, water piping must include necessary fittings to properly fill the loop with a water/antifreeze mixture.

**RTAR HYDRONIC SYSTEM: Typical Installation Arrangement (External Components not included with Robur Unit)**



- 1 Antivibration joints
- 2 Pressure gauge
- 3 Safety relief valve
- 4 Isolation valve
- 5 Buffer tank/separator
- 6 Flow control valve
- 7 Water strainer/filter
- 8 Water pump
- 9 Expansion tank
- 10 Buffer tank
- 11 Air bleeds at highest points in system - not shown