Technical Data Manual

for use by licensed contractor

Vitocal 100-WA
Models AP1T 027020, AP1T 040029, AP1T 052038, AP1T 066049, AP1T 077056
Water Source Heat Pump
Two Stage Packaged Unit

Heating Capacity: 15.6 to 54.8 MBH
4.5 to 16.1 kW
Cooling Capacity: 20.2 to 75.9 MBH
6.5 to 22.2 kW

VITOCAL 100-WA

AHRI CERTIFIED® www.ahridirectory.org
Water Source HP
ANSI/AHRI/ASHRAE/ISO13256

Intertek 5032864

Product may not be exactly as shown

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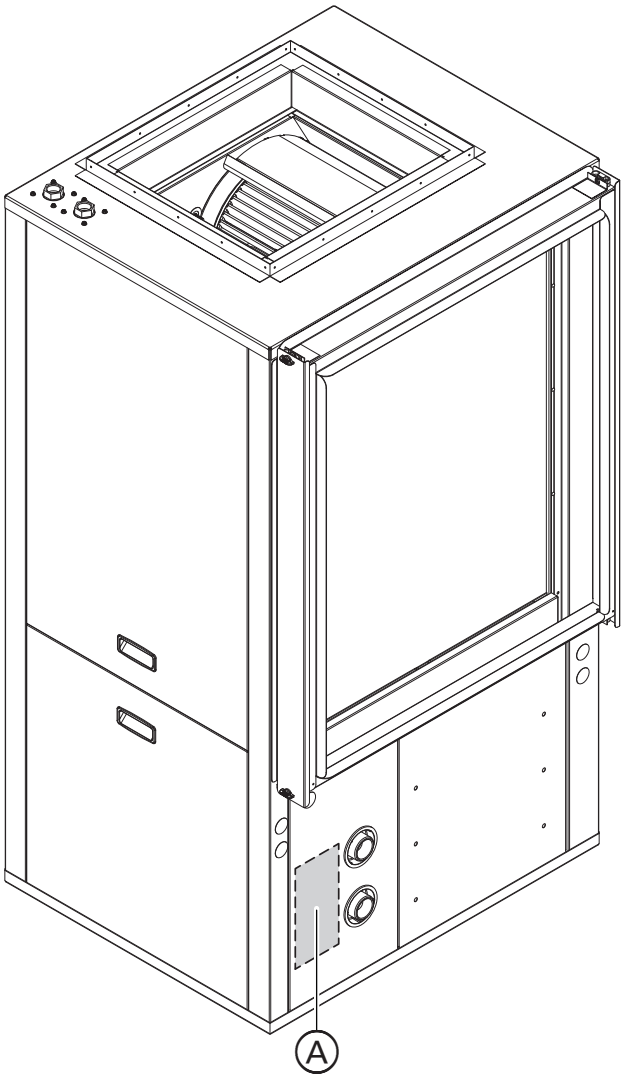
Product Information



Ⓐ Rating plate for registration

The Vitocal 100-WA water source heat pump is designed for heating/cooling of a building and heating domestic hot water. The Vitocal 100-WA has the following integrated components:

- Heating or cooling operation
- 2 stage operation
- Suitable for open or closed loop operation
- Integrated desuperheater for DHW production

Heat pump model must be selected based on an accurate heat loss/gain calculation of the building. Ensure heat pump model is compatible with connected air distribution system.

The rating plate of the heat pump contains extensive product information and is heat pump-specific. Access code with the marking “i” for direct access to product-specific information and product registration on the internet. The access code contains the credentials for the registration and product information portal, as well as the 16-digit serial number.

Prior to installation of this heat pump, consideration should be given for sound and vibration attenuation. Heat pumps, circulation pumps, blowers and fans, as well as other auxiliary equipment used in heating/cooling system generate noise and vibration. There are a number of economical and effective solutions to combat noise and vibration generation and transmission. Flexible couplings, such as flexible ducting and duct connectors may be used to physically separate the equipment from the building, minimizing transmission of sound and vibration to the buildings piping and duct work. Use a shock-absorbing pad to isolate the heat pump and associate equipment from hard surfaces, such as concrete floors, use of a shock-absorbing pad will also help minimize damage caused by moisture which may be generate under the heat pump.

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Applicability

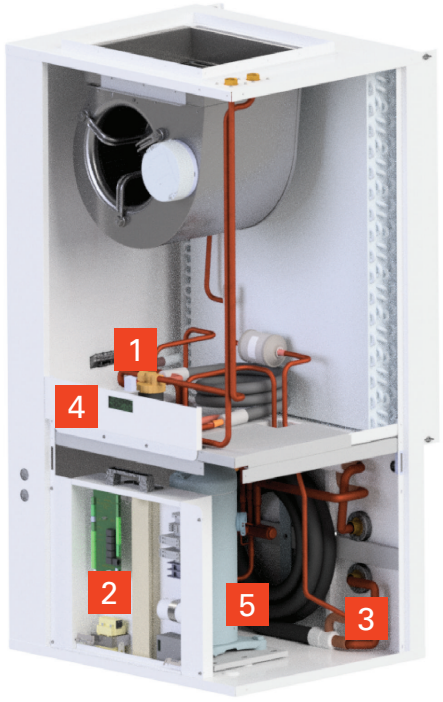
⚠ CAUTION

The serial number must be provided when ordering replacement parts. Some replacement parts are not reverse compatible with previous versions of the Vitocal 100-WA.

IMPORTANT

When ordering replacement parts, provide the 16-digit serial number which is found on the Vitocal rating plate.

Model No.	Serial No.
AP1T 027020	3206461□□□□□□□□□
AP1T 040029	3206462□□□□□□□□□
AP1T 052038	3206463□□□□□□□□□
AP1T 066049	3206464□□□□□□□□□
AP1T 077056	3206465□□□□□□□□□



Product may not be exactly as shown

1 Integrated desuperheater with pump
2 Flexible mounting of the junction box
3 Compatible with closed and open loop systems
4 Information Display Panel
5 2 Stage Compressor

Mechanical Room

During the early stages of designing a new home, we recommend that proper consideration be given to constructing a separate mechanical room dedicated to the heat pump equipment and domestic hot water storage tank(s).

The Vitocal 100-WA must be located in a heated indoor area, near a floor drain. Whenever possible, install the unit near an outside wall so that it is easy to connect the Vitocal 100-WA to the ground loop.

The minimum room temperature of the mechanical room where the Vitocal 100-WA is located must not fall below 60°F (15°C).

Technical Data

Vitocal 100-WA	AP1T	027020	040029	052038	066049	077056
Heating/Cooling Data						
Heating Capacity	MBH (kW)	15.6-19.1 (4.5-5.6)	23.4-28.9 (6.8-8.4)	28.9-37.6 (8.5-11.0)	37.8-48.1 (11.0-14.0)	46.2-54.8 (13.5-16.0)
Cooling Capacity	MBH (kW)	20.2-26.4 (5.9-9.0)	30.3-39.2 (8.9-11.5)	38.1-51.9 (11.2-15.2)	49.9-65.7 (14.6-19.3)	59.8-75.9 (17.5-22.2)
Energy Efficiency Ratio (EER)		22.2-30.8	21.2-29.0	22.1-28.7	20.7-28.0	18.7-24.5
COP		4.2-4.6	4.2-4.5	4.2-4.4	4.3-4.7	4.0-4.4
Electrical Data						
Power Supply	Voltage	208/230 VAC	208/230 VAC	208/230 VAC	208/230 VAC	208/230 VAC
	Phase	1	1	1	1	1
	Hertz	60	60	60	60	60
	Amps	20.9/20.2	27.5/27.0	31.2/30.7	38.1/37.6	43.0/42.7
MCA	Amps	23.4/22.7	31.1/30.6	35.7/35.2	44.4/43.9	50.0/49.7
Max. Overcurrent Protection	Amps	30	40	50	60	70
Short Circuit Current	kA rms 250VAC	5	5	5	5	5
Compressor RLA	Amps	10.3	14.6	18.3	25.2	28.0
Compressor Locked Rotor	Amps	62	90	138	147.3	166
Compressor Locked Rotor (With Soft Starter)	Amps	21.7	32.4	49.7	51.5	58.1
Blower Motor Load Rating	Amps	5.0/4.3	7.3/6.8	7.3/6.8	7.3/6.8	9.4/9.1
Blower Motor	HP	0.50	0.75	0.75	0.75	1.00
Refrigerant						
Refrigerant		R-454B	R-454B	R-454B	R-454B	R-454B
Factory Charge (mc)	oz. (kg)	35.2 (0.998)	56.0 (1.588)	72.0 (2.041)	80.0 (2.268)	96.0 (2.722)
Installed Height (hinst)	Ft (m)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Release Height (ho)	Ft (m)	4 (1.2)	4.2 (1.3)	4.6 (1.4)	(1.5)	4.9 (1.5)
Design Pressure High	PSIG (MPa)	600 (4.1)	600 (4.1)	600 (4.1)	600 (4.1)	600 (4.1)
Design Pressure Low	PSIG (MPa)	40 (0.3)	40 (0.3)	40 (0.3)	40 (0.3)	40 (0.3)
Release Offset (hREL)	Ft (m)	3.83 (1.17)	4.17 (1.27)	4.50 (1.37)	4.83 (1.47)	5.00 (1.52)
Minimum Room Area (Amin)	Ft^2 (m^2)	62.12 (5.77)	90.92 (8.45)	108.23 (10.06)	111.97 (10.40)	129.88 (12.07)
Total Conditioned Room Area (TAmin)	Ft^2 (m^2)	32.99 (3.06)	52.48 (4.88)	67.48 (6.27)	74.98 (6.97)	89.97 (8.36)
Minimum Air Flow (Qmin)	CFM (m^3h)	59 (101)	95 (191)	122 (207)	135 (230)	162 (276)
Domestic Hot Water						
Max. DHW Inlet Temp.	°F(°C)	116 (47)	116 (47)	116 (47)	116 (47)	116 (47)
DHW Flow Rate	GPM (l/m)	0.5-4.4 (1.9-16.7)	0.5-4.4 (1.9-16.7)	0.5-4.4 (1.9-16.7)	0.5-4.4 (1.9-16.7)	0.5-4.4 (1.9-16.7)
Dimensional Data						
Dimensions (HXWXD) Height Width Depth	 in. (mm) in. (mm) in. (mm)	 46 (1168) 27-¼ (694) 26-½ (673)	 50 (1270) 32-¼ (821) 28-½ (724)	 54 (1372) 32-¼ (821) 28-½ (724)	 58 (1473) 32-¼ (821) 28-½ (724)	 60 (1524) 32-¼ (821) 28-½ (724)
Supply Air Connection	in. (mm) X in. (mm)	16 (406) X 14 (356)	20 (508) X 18 (457)	20 (508) X 18 (457)	20 (508) X 18 (457)	20 (508) X 18 (457)
Return Air Connection	in. (mm) X in. (mm)	22-¼ (565) X 22-¾ (578)	26-¼ (667) X 27-¾ (705)	30-¼ (768) X 27-¾ (705)	34-¼ (870) X 27-¾ (705)	34-¼ (870) X 27-¾ (705)
Filter Size	inches	24 X 24 X 2	30 X 28 X 2	30 X 32 X 2	30 X 36 X 2	30 X 36 X 2
Weight	lbs (kg)	265 (120)	334 (152)	371 (168)	388 (176)	440 (220)

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Technical Data

Vitocal 100-WA	AP1T	027020	040029	052038	066049	077056
Hydronic Data						
Hydronic connection		1-½ NPS (Male Threads)	1-½ NPS (Male Threads)	1-½ NPS (Male Threads)	1-½ NPS (Male Threads)	1-½ NPS (Male Threads)
Min. water/brine entering temperature (cooling)	°F(°C)	30 (-1)	30 (-1)	30 (-1)	30 (-1)	30 (-1)
Normal water/brine entering temperature (cooling)	°F(°C)	50 to 90 (10 to 32)	50 to 90 (10 to 32)	50 to 90 (10 to 32)	50 to 90 (10 to 32)	50 to 90 (10 to 32)
Max. water/brine entering temperature (cooling)	°F(°C)	100 (38)	100 (38)	100 (38)	100 (38)	100 (38)
Min. water/brine entering temperature (heating)	°F(°C)	20 (-7)	20 (-7)	20 (-7)	20 (-7)	20 (-7)
Normal water/brine entering temperature (heating)	°F(°C)	30 to 70 (-1 to 21)	30 to 70 (-1 to 21)	30 to 70 (-1 to 21)	30 to 70 (-1 to 21)	30 to 70 (-1 to 21)
Max. water/brine entering temperature (heating)	°F(°C)	80 (27)	80 (27)	80 (27)	80 (27)	80 (27)
Closed Loop Minimum Inlet Water Pressure	PSI (kPa)	5 (35)	5 (35)	5 (35)	5 (35)	5 (35)
Closed Loop Maximum Inlet Water Pressure	PSI (kPa)	50 (345)	50 (345)	50 (345)	50 (345)	50 (345)
Open Loop Minimum Inlet Water Pressure	PSI (kPa)	20 (138)	20 (138)	20 (138)	20 (138)	20 (138)
Open Loop Maximum Inlet Water Pressure	PSI (kPa)	60 (414)	60 (414)	60 (414)	60 (414)	60 (414)
Air Flow Data						
Air Flow / Static Pressure	CFM/w.c.	800/0.5	1200/0.5	1600/0.5	2000/0.5	2400/0.5
Min. Ambient Air Temperature (cooling)	°F (°C)	45 (7)	45 (7)	45 (7)	45 (7)	45 (7)
Max. Ambient Air Temperature (cooling)	°F (°C)	100 (38)	100 (38)	100 (38)	100 (38)	100 (38)
Min. Entering Air Temperature (cooling)	°F (°C)	50 (10)	50 (10)	50 (10)	50 (10)	50 (10)
Max. Entering Air Temperature (cooling)	°F (°C)	100 (38)	100 (38)	100 (38)	100 (38)	100 (38)
Min. Ambient Air Temperature (heating)	°F (°C)	45 (7)	45 (7)	45 (7)	45 (7)	45 (7)
Max. Ambient Air Temperature (heating)	°F (°C)	85 (29)	85 (29)	85 (29)	85 (29)	85 (29)
Min. Entering Air Temperature (heating)	°F (°C)	40 (4)	40 (4)	40 (4)	40 (4)	40 (4)
Max. Entering Air Temperature (heating)	°F (°C)	80 (27)	80 (27)	80 (27)	80 (27)	80 (27)
Maximum Supply Air Temperature	°F (°C)	140 (60)	140 (60)	140 (60)	140 (60)	140 (60)

Note:
Minimum/maximum limits are only for start-up conditions, and are meant for bringing the space up to occupancy temperature. Units are not designed to operate at the minimum/maximum conditions on a regular basis. The operating limits are dependent upon three primary factors: 1) water temperature, 2) return air temperature, and 3) ambient temperature. When any of the factors are at the minimum or maximum levels, the other two factors must be at the normal level for proper and reliable unit operation.

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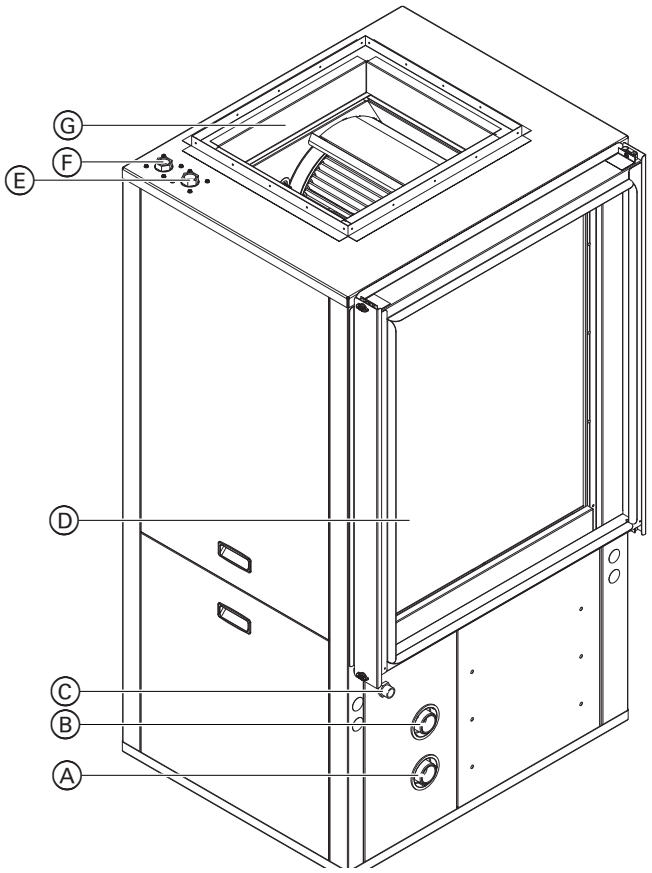
Piping Connections



Legend

Ⓐ Return to Ground Loop
Ⓑ Supply from Ground Loop
Ⓒ Condensate Line Connection
Ⓓ Return Air
Ⓔ DHW Supply to the DHW Tank
Ⓕ DHW Tank return to the DHW Desuperheater
Ⓖ Supply Air

Note: Ground loop connections are supplied with caps installed, which must be removed prior to installation.

⚠ WARNING

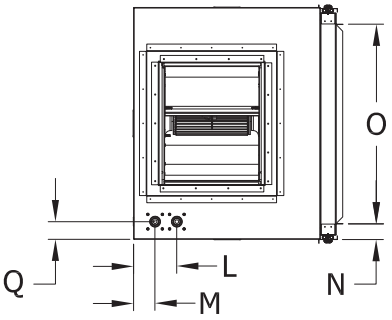
Exposing the heat pump to pressures and temperatures in excess of those listed will result in damages, and will render warranty null and void.

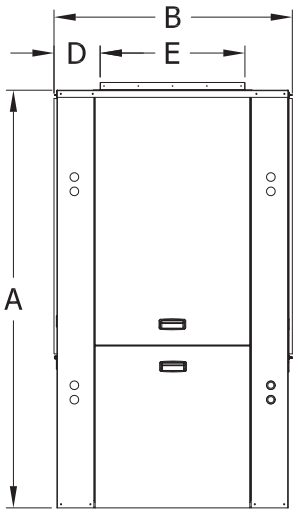
- Use a two-hand wrench method when tightening fittings or piping onto the heat pump connectors. Use one wrench to prevent the heat pump pipes from twisting and the second wrench to tighten the fitting or piping. Failure to support the boiler connection could damage the heat pump and its internal piping.
- All plumbing must meet or exceed all local state and national plumbing codes.

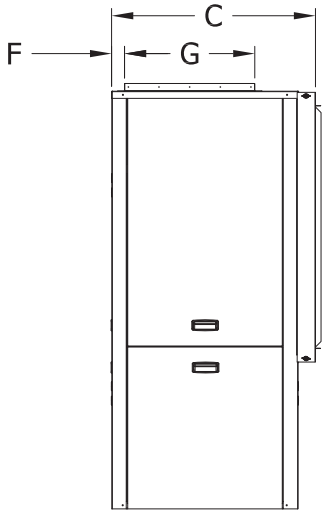
SUPPORT ALL PIPING USING HANGERS. DO NOT support piping by the Vitocal or its components.

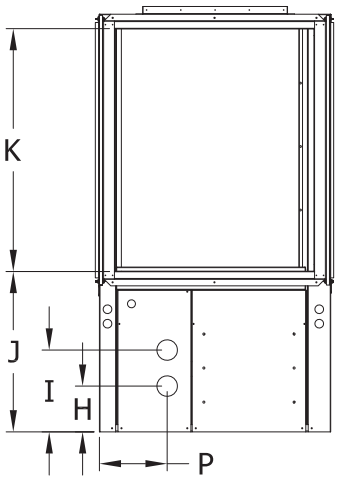
- Use isolation valves to isolate system components.

Dimensions









Dimensions in. (mm)

	AP1T 027020	AP1T 040029	AP1T 052038	AP1T 066049	AP1T 077056
A	46 (1168)	50 (1270)	54 (1372)	58 (1473)	60 (1524)
B	27-¼ (694)	32-¼ (821)	32-¼ (821)	32-¼ (821)	32-¼ (821)
C	26-½ (673)	28-½ (724)	28-½ (724)	28-½ (724)	28-½ (724)
D	5-½ (140)	6 (152)	6 (152)	6 (152)	6 (152)
E	16 (406)	20 (508)	20 (508)	20 (508)	20 (508)
F	2-¾ (70)	1-¾ (44)	1-¾ (44)	1-¾ (44)	4-¼ (108)
G	14 (356)	18 (457)	18 (457)	18 (457)	18 (457)
H	4-¼ (108)	5-¾ (146)	6-½ (165)	6-½ (165)	7-¾ (197)
I	9-¼ (235)	10-¾ (273)	11-½ (292)	11-½ (292)	12-¾ (324)
J	22 (559)	22 (559)	22 (559)	22 (559)	24 (610)
K	22-¼ (565)	26-¼ (667)	30-¼ (768)	34-¼ (870)	34-¼ (870)
L	5-¼ (135)	5-¼ (135)	5-¼ (135)	5-¼ (135)	5-¼ (135)
M	2-¼ (59)	2-¼ (59)	2-¼ (59)	2-¼ (59)	2-¼ (59)
N	2-¼ (59)	2-¼ (59)	2-¼ (59)	2-¼ (59)	2-¼ (59)
O	22-¾ (578)	27-¾ (705)	27-¾ (705)	27-¾ (705)	27-¾ (705)
P	4-½ (114)	9-½ (241)	9-½ (241)	9-½ (241)	9-½ (241)
Q	2-½ (64)	2-½ (64)	2-½ (64)	2-½ (64)	2-½ (64)

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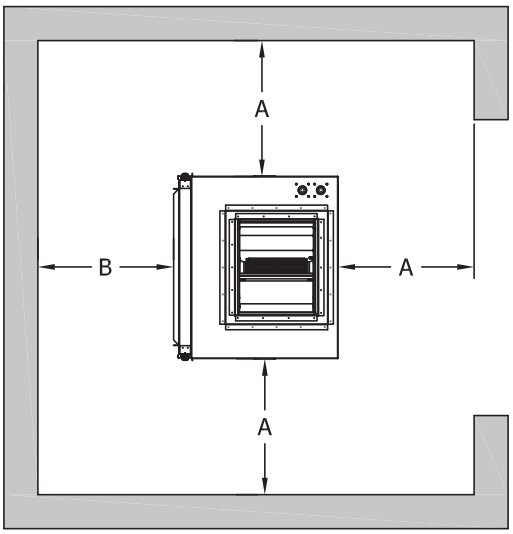
Recommended Minimum Service Clearances



Recommended minimum service clearances

For typical installation, it is recommended to install the Vitocal with the clearances shown in the illustration.

A - 24 in. (600 mm)
B - Clearance for Ductwork

These dimensions reflect the recommended service clearance for the Vitocal only, ensure adequate clearance is left for the installation of piping, ductwork and electrical connections.

Minimum Clearances to Combustibles

Top	Front	Rear	Left	Right
8	8 AL, CL	8	8	8

AL = Alcove
CL = Closet

Altitude Adjustment Factor

The maximum altitude of use shall be 10000 ft (3048 m).

Altitude ft (m)	Adjustment Factor (AF)
0 (0)	1.00
656 (200)	1.00
1312 (400)	1.00
1968 (600)	1.00
2624 (800)	1.02
3280 (1000)	1.05
3937 (1200)	1.07
4593 (1400)	1.10
5249 (1600)	1.12
5905 (1800)	1.15
6561 (2000)	1.18
7217 (2200)	1.21
7874 (2400)	1.25
8530 (2600)	1.28
9186 (2800)	1.32
9842 (3000)	1.36
10499 (3200)	Not Recommended

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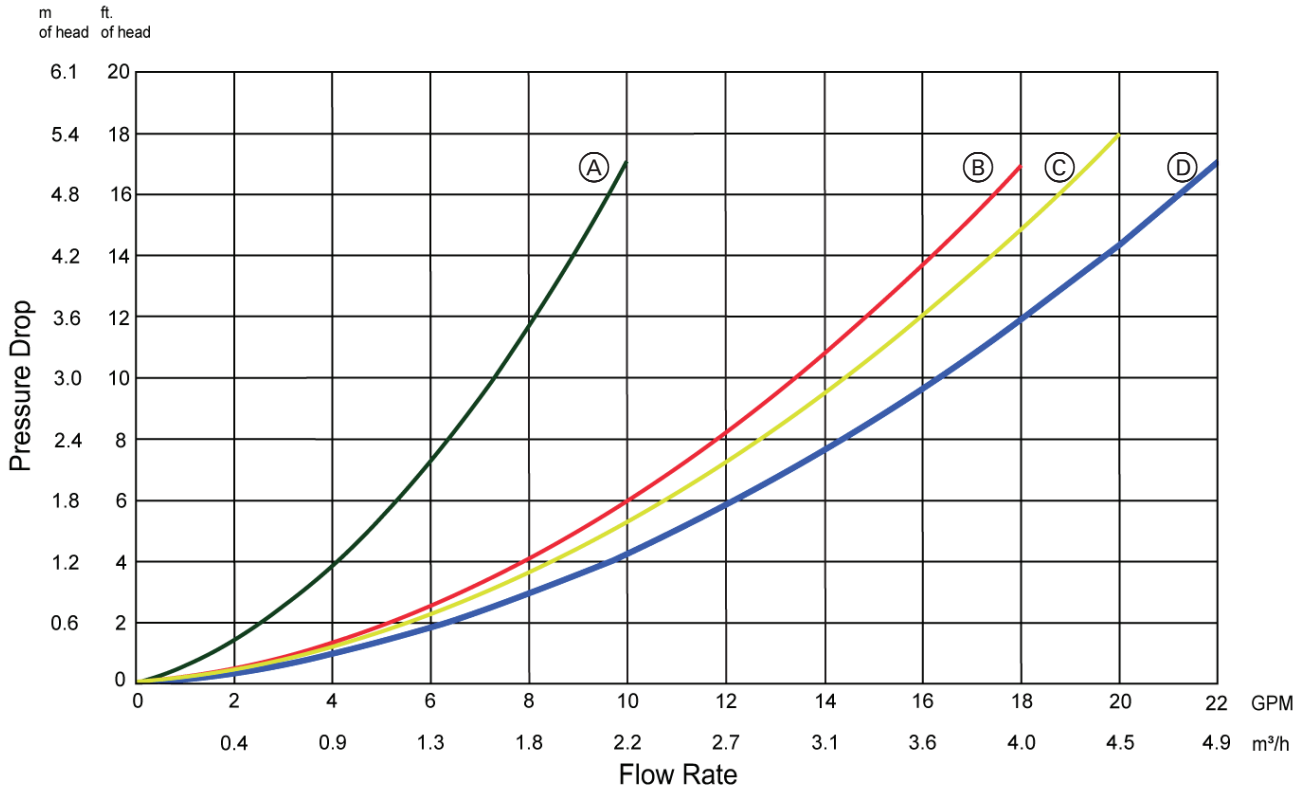
Flow Rate and Pressure Drop

Recommended Flow Rates

Vitocal 100-WA	AP1T 027020	AP1T 040029	AP1T 052038	AP1T 066049	AP1T 077056
Close Loop	4.5-6.0 GPM 1.0-1.4 m³/h	6.75-9.0 GPM 1.5-2.0 m³/h	9.0-12.0 GPM 2.0-2.7 m³/h	11.25-15.0 GPM 2.6-3.4 m³/h	13.5-18.0 GPM 3.0-4.1 m³/h
Open Loop	3.0-4.0 GPM 0.7-0.9 m³/h	4.5-6.0 GPM 1.0-1.4 m³/h	6.0-8.0 GPM 1.4-1.8 m³/h	7.5-10.0 GPM 1.7-2.3 m³/h	9.0-12.0 GPM 2.0-2.7 m³/h

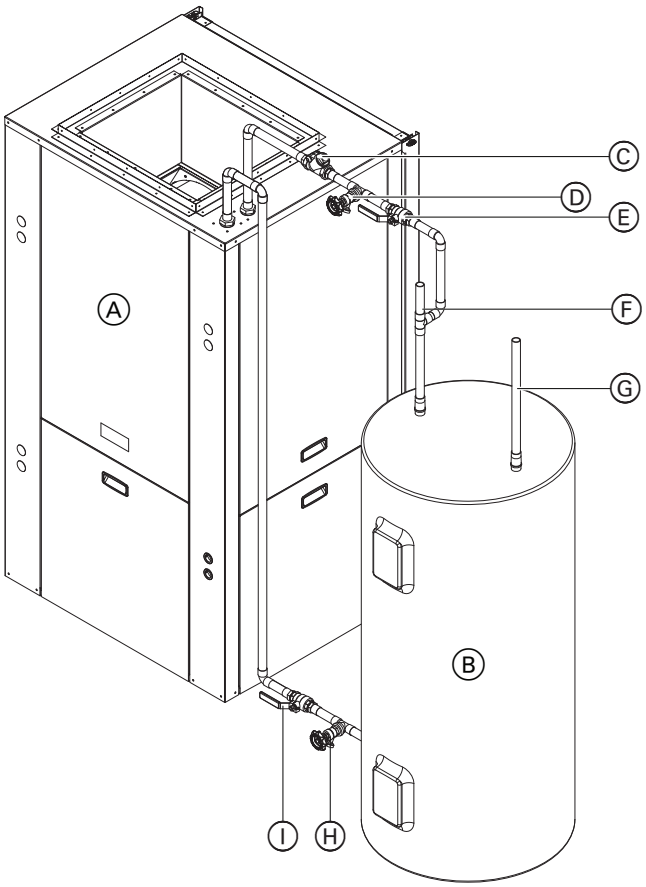
Pressure Drop



Legend

Ⓐ AP1T 027020
Ⓑ AP1T 040029
Ⓒ AP1T 052038 and AP1T 066049
Ⓓ AP1T 077056

Domestic Hot Water



Legend

Ⓐ Vitocal 100-WA
Ⓑ DHW Tank
Ⓒ Check Valve (Horizontal Swing)
Ⓓ Drain Valve (Purging)
Ⓔ Ball Valve
Ⓕ Domestic Cold Water
Ⓖ Domestic Hot Water
Ⓗ Drain Valve (DHW Tank)
Ⓘ Ball Valve

Note:
All copper piping must be the same size as the fittings on the Vitocal. Undersizing the piping will reduce the flow rate and can damage the unit and void the warranty. If 1 inch (25 mm) copper is used, it must be reduced as close to the tank as possible. On long pipe runs the piping may need to be upsized to lower the pressure drop.

Note:
All piping fittings within 12 inches (300 mm) of the desuperheater tee in must be metal (ie. brass, copper, or stainless steel).

Installation with DHW Tank

1. Turn off the power supply or the fuel supply to the DHW tank.
2. Close the cold water supply valve to the DHW tank.
3. Attach water hose to the tank drain connection and empty the tank to a drain or outside.
4. Open the pressure relief valve or faucet nearby to break the vacuum inside the water system to speed up the draining process.
5. After the tank has been drained disconnect the hose and remove the DHW tank drain fitting.

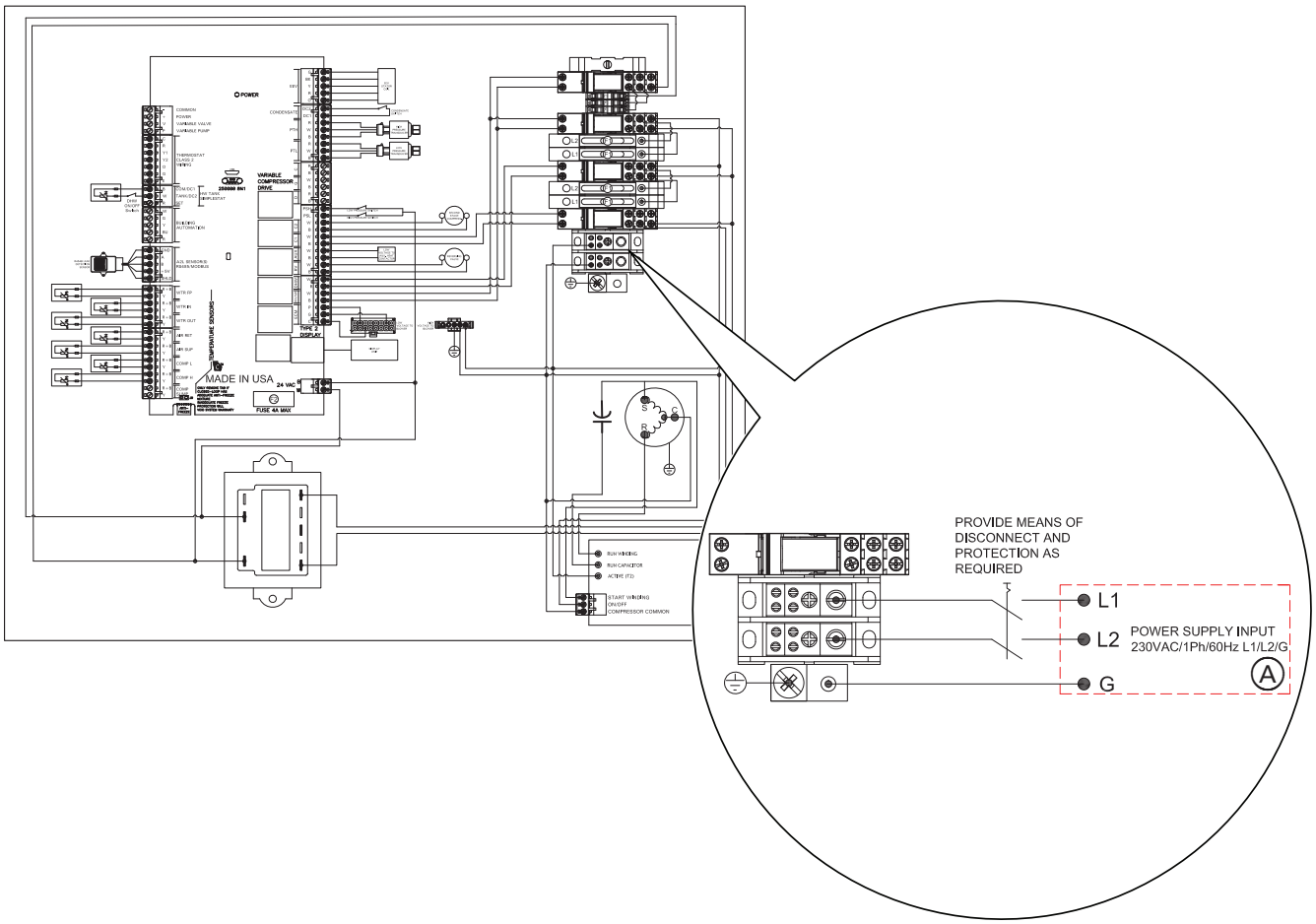
Connect the desuperheater circuit similar as shown. Include isolation valves and two boiler drain valves for tank draining and DHW system purging. Valves allow for pump service without draining the DHW tank. A horizontal swing check valve must be used to prevent over heating of the tank.

When connecting the DHW system to a Marathon hot water tank, all fittings must be mechanical fittings at the tank; due to the tank being plastic you cannot solder or braze close to the tank. The direction of flow in and out of the tank and plumbing is the same as with a steel tank. Never use plastic fittings when connecting between the tank and the Vitocal 100-WA.

⚠ IMPORTANT

Follow the Installation Instructions supplied with the DHW storage tank.

Power Supply



⚠ WARNING

Incorrectly executed electrical installations can lead to injuries from electrical current and result in appliance damage.

⚠ WARNING

The control must be grounded.
Ensure that 'L1', 'L2', and 'G' are not interchanged.

⚠ IMPORTANT

Electrical installations must comply with the latest edition of:

- **In the U.S.A., the National Electrical Code (NEC), ANSI/NFPA 70 and any other state, local codes and/or regulations.**
- **In Canada, the Canadian Electrical Code (CEC), CSA C22.1 Part 1 and any other province, territory, local codes and/or regulations.**

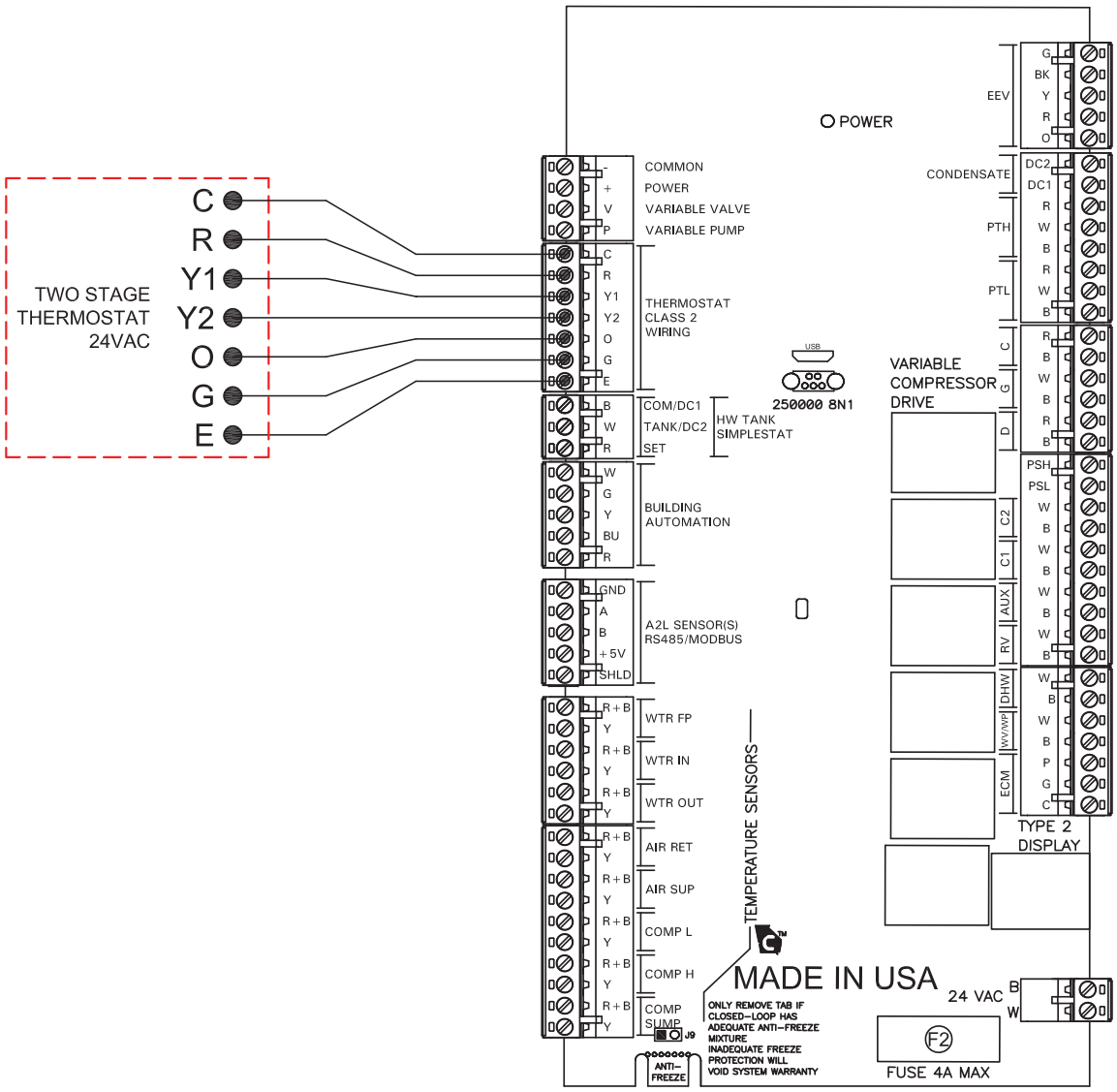
Legend

Ⓐ 208/230V/1Ph/60Hz L1/L2/G Power Supply Connection

AP1T 027020 - 20.9FLA@208V/20.2 FLA@230V
AP1T 040029 - 27.5FLA@208V/27.0 FLA@230V
AP1T 052038 - 31.2FLA@208V/30.7 FLA@230V
AP1T 066049 - 38.1FLA@208V/37.6 FLA@230V
AP1T 077056 - 43.0FLA@208V/42.7 FLA@230V

Size all wire in accordance to local electrical code. All circuits must have its own power disconnect near the system. The electrical installation must be performed by a licensed electrician, except for the low voltage wiring (Class 2) (i.e. thermostat) which can be done by the certified contractor. Always use caution when working with or around electrical wiring or connections!

Thermostat Installation



Mount the thermostat on a piece of foam tape, to seal around the wire penetration. Sometimes silicone may be used to help seal this hole. This prevents drafts from affecting the thermistor, and thus helps prevent short cycling of the equipment from errant air movement. Thermostat operating instructions and wiring options are enclosed with the thermostat and should be kept for future operation and set up needs.

Third party thermostats may also be used, provided they meet the following specifications:

Two heat plus aux. heat and two cool, 7 day programmable thermostat. Some thermostats must be programmed as a heat pump thermostat to work. Only Heat pump thermostats or thermostats that can be programmed for heat pump mode will work on the terminal strip driven system.

Follow the instruction provided with the thermostat for programming and configuration of the thermostat with a heat pump.

Wire the thermostat as shown on this page for any terminal strip unit (single speed, dual compressor or single compressor with two speeds). The Y2 terminal on the system terminal strip is used for the optional stage 2 heating or cooling. If your system is a single speed system nothing is wired to the B terminal. The E terminal on the system terminal strip is used for the optional strip heater. If you system doesn't have strip heat (or Auxiliary Heat) this terminal will have nothing wired to it.

Ductwork

All duct designs must be designed to conform with ACCA Manual "D" or local codes and requirements.

Install ductwork within the conditioned space of the building to minimize duct heat loss or gain.

⚠ IMPORTANT

Ductwork installed in an attic area needs to be a low profile design and laid directly on the ceiling joist (code permitting). After being installed and wrapped in insulation, it is recommended the ductwork be covered with 6-8 inches (150-200 mm) of insulating material. If the attic ductwork is not covered with the specified amount of insulating material it can lose a significant amount of its heating and cooling capacity into the attic area. Ductwork that is inadequately insulated will cause poor system performance.

To minimize air velocity noise transferring to the air supply grills, flex duct should be installed from the supply grill back six feet. It is recommended that the first six feet of supply and return air duct be lined with acoustic insulation.

Ductwork should be designed to handle the CFM delivery for the unit while running in High Speed. Supply duct should be based on .08 inches of pressure drop per 100 feet. Return duct should be based on .05 inches of pressure drop per 100 feet. Always check register CFM requirements against register manufacturer's data for register performance.

⚠ IMPORTANT

Ensure not to undersize return air duct system. Undersized return air can cause poor system performance and blower pulsation. Provide adequate sized supply air plenums and ductwork. Make all turns as smooth as possible avoiding any restrictions.

For residential design the static pressure should not be greater than 0.3".

⚠ WARNING

When attaching the ductwork to the Vitocal 100-WA ensure that drilling and screws do not penetrate and damage the air coil.

To maintain good indoor air quality in a tight building, the air distribution system should have a high-efficiency air filter. To ensure proper unit operation, be sure to inform the building owner of the importance of proper maintenance and the maintenance schedule for checking/changing the filter installed. Most air filters require monthly attention.

⚠ IMPORTANT

The Vitocal 100-WA should never be run during any kind of construction or remodeling that would allow drywall, wood, or any kind of dust to be pulled in the system. Even with extra filtering, dust particles can still accumulate in the duct system. It may also lead to clogging of the air coil and condensate drain, blower dust accumulation and lead to operational problems to the system. Running the system during construction/remodeling will VOID the system warranty.

Closed Loop System

⚠ IMPORTANT

Do NOT use PVC or CPVC plastic piping on any of the ground loop connections. PVC or CPVC plastic piping may only be used as condensate lines.

Closed loop systems will require a minimum flow rate of 3 GPM/ton (11.5 LPM/3.5kW) based on a ground loop that is designed to maintain a loop temperature between 32 to 90°F (0 to 32°C). If design temperatures are outside of the temperature range specified, higher flow rates will be required. The loop pump requirement will depend upon the project specific loop design.

On residential systems typically a pump is required for each unit. The loop pump requirement will depend upon the loop design for a given application. The ground loop piping system must provide suitable access for purging the outside loop and requires isolation valves for purging the inside plumbing including the system. To properly purge a closed loop system, a minimum velocity of 2 feet per second in every branch of the ground loop must be achieved. The purge ports will also be used for anti-freeze charging.

⚠ IMPORTANT

GROUND LOOPS MUST MAINTAIN A MINIMUM OF 25% PROPYLENE GLYCOL AS ANTIFREEZE SOLUTION IN THE UNIT AND GROUND LOOP AT ALL TIMES. FAILURE TO DO SO WILL FREEZE THE SYSTEM AND CAUSE SEVERE DAMAGE TO THE UNIT. DAMAGE TO THE UNIT CAUSED BY THE FAILURE TO MAINTAIN PROPER ANTIFREEZE LEVELS IS NOT COVERED UNDER THE WARRANTY.

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Water Quality Requirements for Closed Loop Systems

Water quality

Treatment for Vitocal 100-WA feed water should be considered in areas of known problems, such as where a high mineral content and hardness exist.

⚠ IMPORTANT

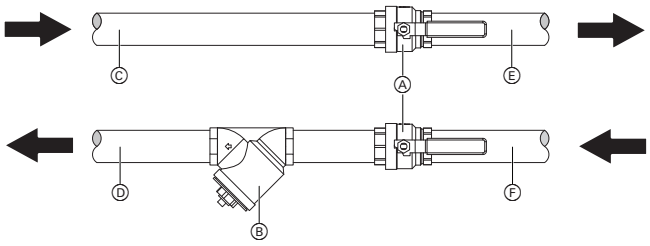
GROUND LOOPS MUST MAINTAIN A MINIMUM OF 25% PROPYLENE GLYCOL AS ANTIFREEZE SOLUTION IN THE UNIT AND GROUND LOOP AT ALL TIMES. FAILURE TO DO SO WILL FREEZE THE SYSTEM AND CAUSE SEVERE DAMAGE TO THE UNIT. DAMAGE TO THE UNIT CAUSED BY THE FAILURE TO MAINTAIN PROPER ANTIFREEZE LEVELS IS NOT COVERED UNDER THE WARRANTY.

Do not use automotive silicate based antifreeze. Please observe that an antifreeze/water mixture may require a backflow preventer within the automatic water feed and influence components such as diaphragm expansion tanks, radiation, etc. Recommended maximum antifreeze content is 35%, antifreeze content above 35% will result in performance degradation and should be avoided or accounted for in equipment selection.

Do not use sulphur-containing feed water. Check pH-level after some operating time. It should be in the range from 7 to 9. If it is not, please take appropriate measures. Total permissible hardness of the fill and top-up water - less than 350 ppm.

Do not use antifreeze other than specifically made for water source heat pumps. System also may contain components which might be negatively affected by antifreeze. Check total system frequently when filled with antifreeze. Advise system operator/ultimate owner that system is filled with a glycol mix. The licensed contractor must provide a SDS (Safety Data Sheet) for the antifreeze used to the system operator/ultimate owner.

Open Loop System



Legend
Ⓐ Ball Valve
Ⓑ Strainer
Ⓒ Return from Vitocal
Ⓓ Supply to Vitocal
Ⓔ Return to Well
Ⓕ Supply from Vitocal

⚠ IMPORTANT
Do NOT use PVC or CPVC plastic piping on any of the ground loop connections. PVC or CPVC plastic piping may only be used as condensate lines.

⚠ IMPORTANT
To prevent unreliable operation and component damage, do not pump pond or lake water directly through the units.

⚠ IMPORTANT
On installations where the groundwater temperature is expected to fall below 50°F (10°C) during any part of the heating season, perform a calculation to anticipate higher flow rate requirements. A higher water flow rate results in a lower temperature drop through the liquid to refrigerant heat exchanger. This prevents freeze protection/low limit from activating unnecessarily.

A well of sufficient capacity and good water quality are the only acceptable water sources for Open loop Systems.

Assemble well water piping in the image to the left. A 18-20 mesh strainer is recommended. Use a water strainer to keep debris out of water regulating valves and heat exchanger. Ensure strainer is situated to provide easy access and maintenance. Provide isolation valves and instruct system user on how to isolate the system and clean strainer. Some wells have excess debris which can restrict the unit's strainer in a short period of time. If this is the case replace the existing strainer with a larger capacity 18-20 mesh strainer. A strainer with more surface area will have to be cleaned less often.

Ensure the water flows through the unit and out the discharge with no leaks. Discharge water should run outside with no restrictions, to a discharge well, creek, pond or where ever water is needed. Never connect the discharge water line directly to a sprinkler as this will restrict the water flow and lower the unit's efficiency, and possibly cause damage to the unit. Check local codes for requirements for discharge water. Discharge tubing must be prepared in a manner that will not freeze. Ensure proper flow, a 2-3 GPM/ton (7.5-11.5LPM/3.5kW) is recommended in open loop applications. Water flow is regulated with Modulating Water Valve (Proportional Control Actuator).

The Freeze stat helps protect the liquid to refrigerant heat exchanger from freezing internally. Freeze protection is accomplished by measuring the refrigerant temperature exiting the water coil in the heating mode. If this temperature drops below the freeze set point the system will activate the freeze protection and then lock out until manually reset.

The Vitocal WA is designed for use with ON/OFF actuator (Open/Close two position water valve) OR Proportional Control Actuators (Modulating Water Valve using 2-10 VDC signal for proportional control).

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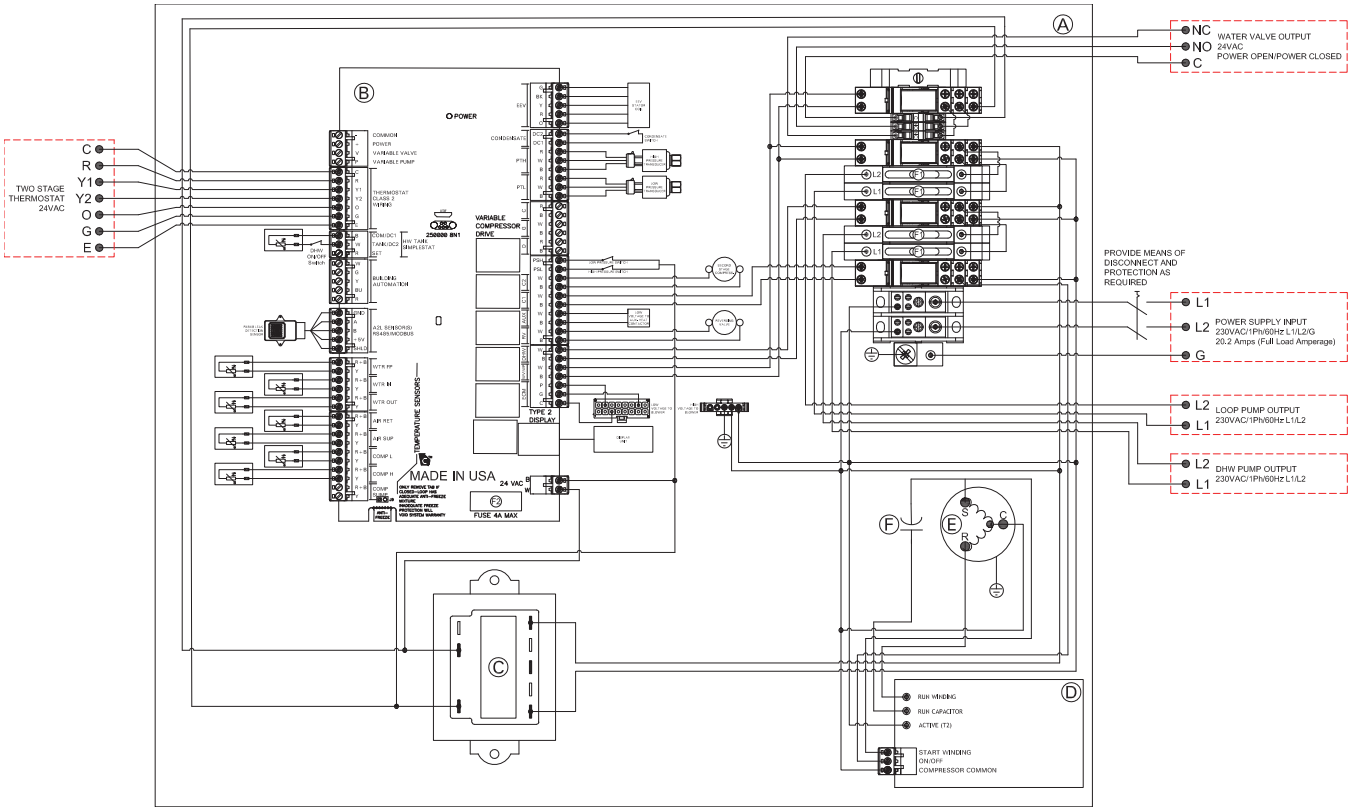
Water Quality Requirements for Open Loop Systems

Characteristic	Acceptable Range
Ryznar Stability Index	6.0 to 7.5
Langelier Saturation Index	-0.5 to 0.5
pH	7 to 9
Iron	<0.2 ppm
Iron Oxide	<1 ppm
Suspended Solids	<10 ppm
Ammonia	<2 ppm
Ammonia Chloride	<0.5 ppm
Ammonia Hydroxide	<0.5 ppm
Ammonia Sulfate	<0.5 ppm
Dissolved Solids	<0.5 ppm
Carbon Dioxide	<1500 ppm
Chlorides	<50 ppm
Chlorine	<0.5 ppm
Hydrogen Sulfide	10 to 50 ppm
Sulfates	<125 ppm

The Vitocal 100-WA uses a cupro nickel heat exchanger which has an increased resistance to ground water chemicals which can cause build up and corrosion. It is recommended that the water source is tested and treated if characteristics fall outside the “acceptable range”. Failure to treat water or meet acceptable range of source water quality will void the warranty of the unit.

Always maintain water pressure in the heat exchanger by placing the water control valve at the outlet of the unit to prevent deposit buildup.

Wiring Diagram AP1T 027020 - 230VAC

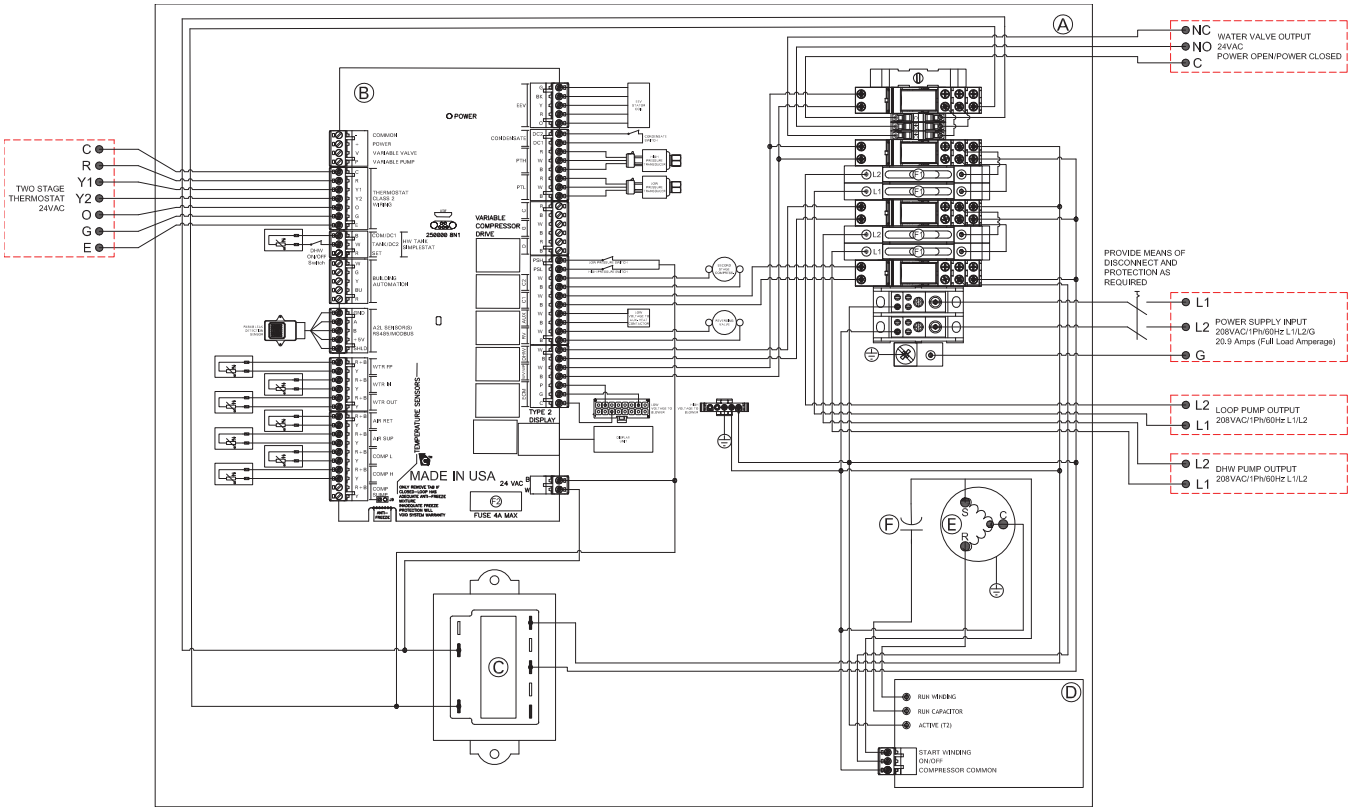


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 08-16 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 30μF-440V/370

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 027020 - 208VAC

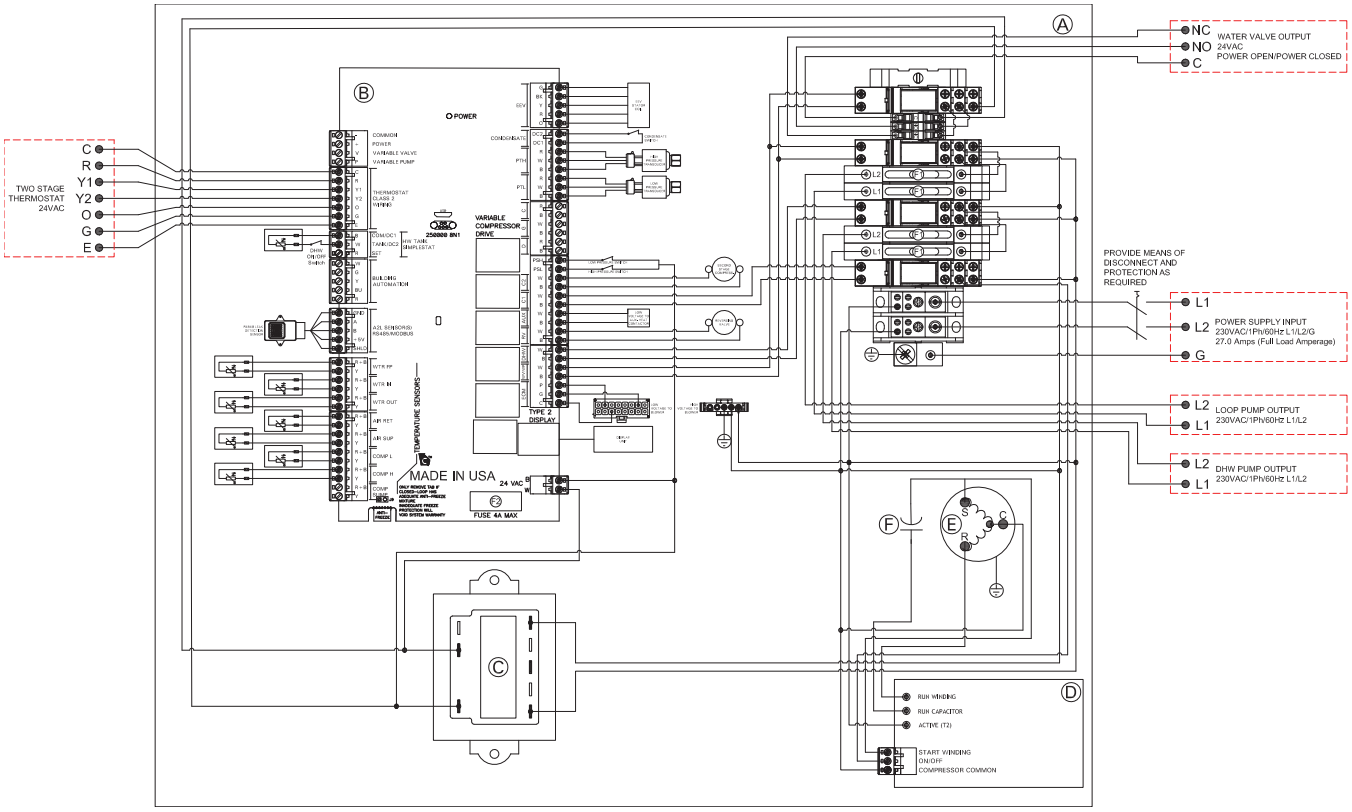


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 08-16 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 30μF-440V/370

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 040029 - 230VAC

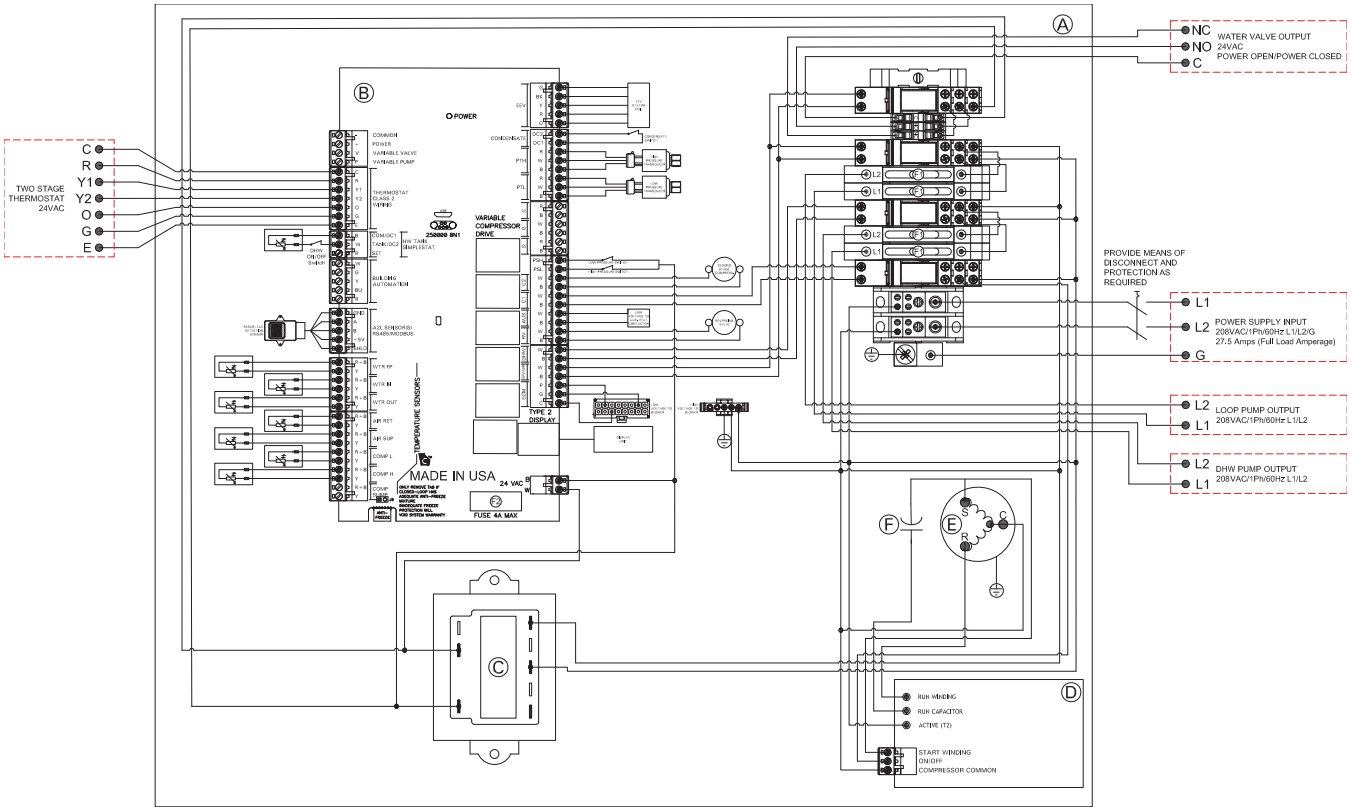


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 45μF-440V/370

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 040029 - 208VAC

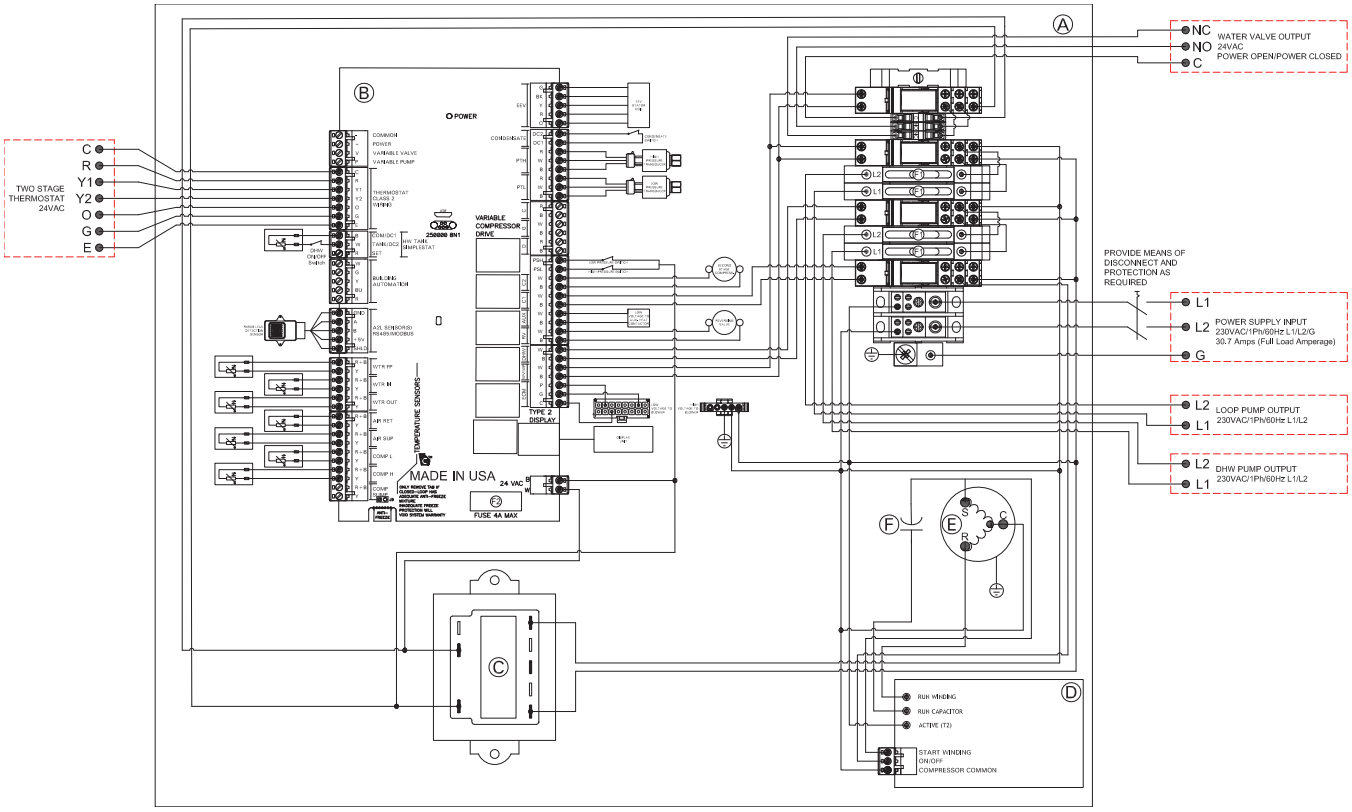


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 45μF-440V/370

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 052038 - 230VAC

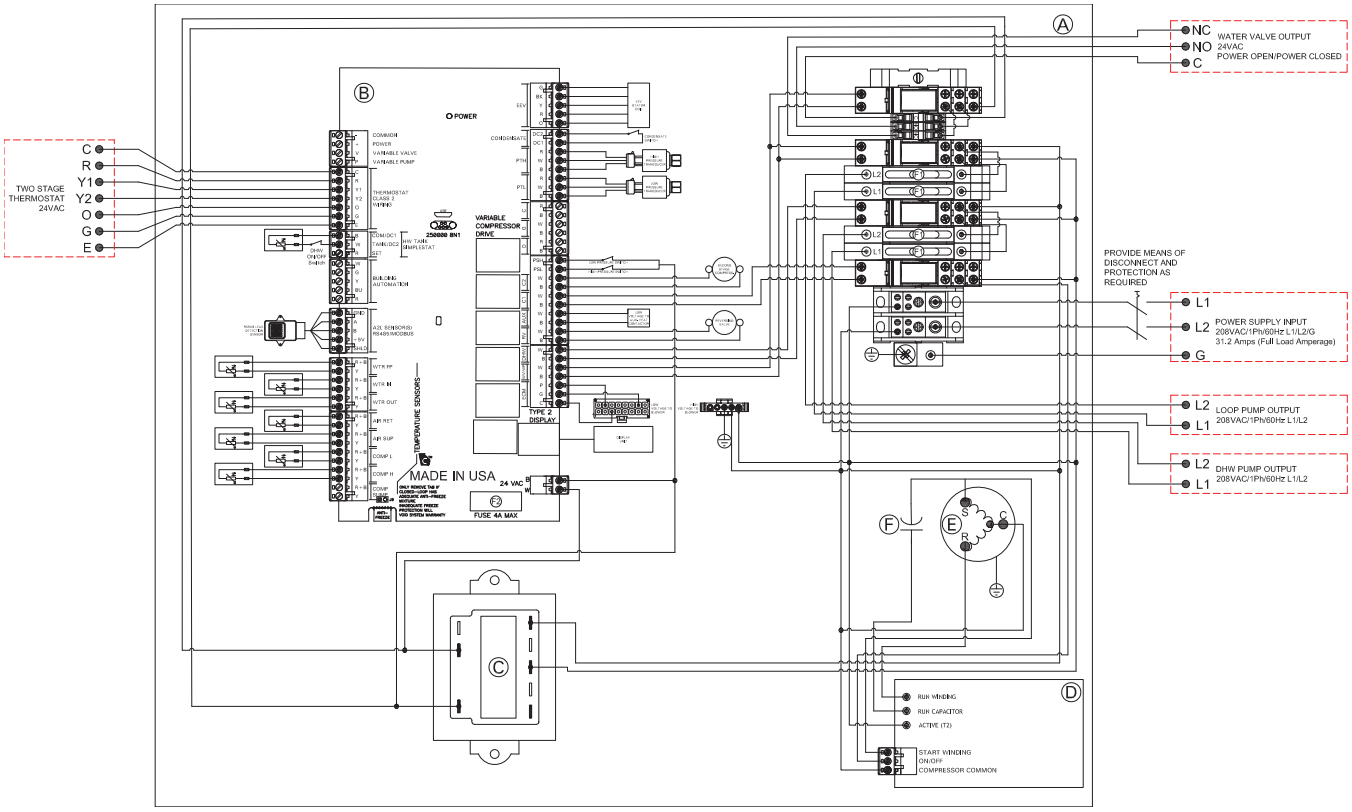


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 40μF-440V

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 052038 - 208VAC

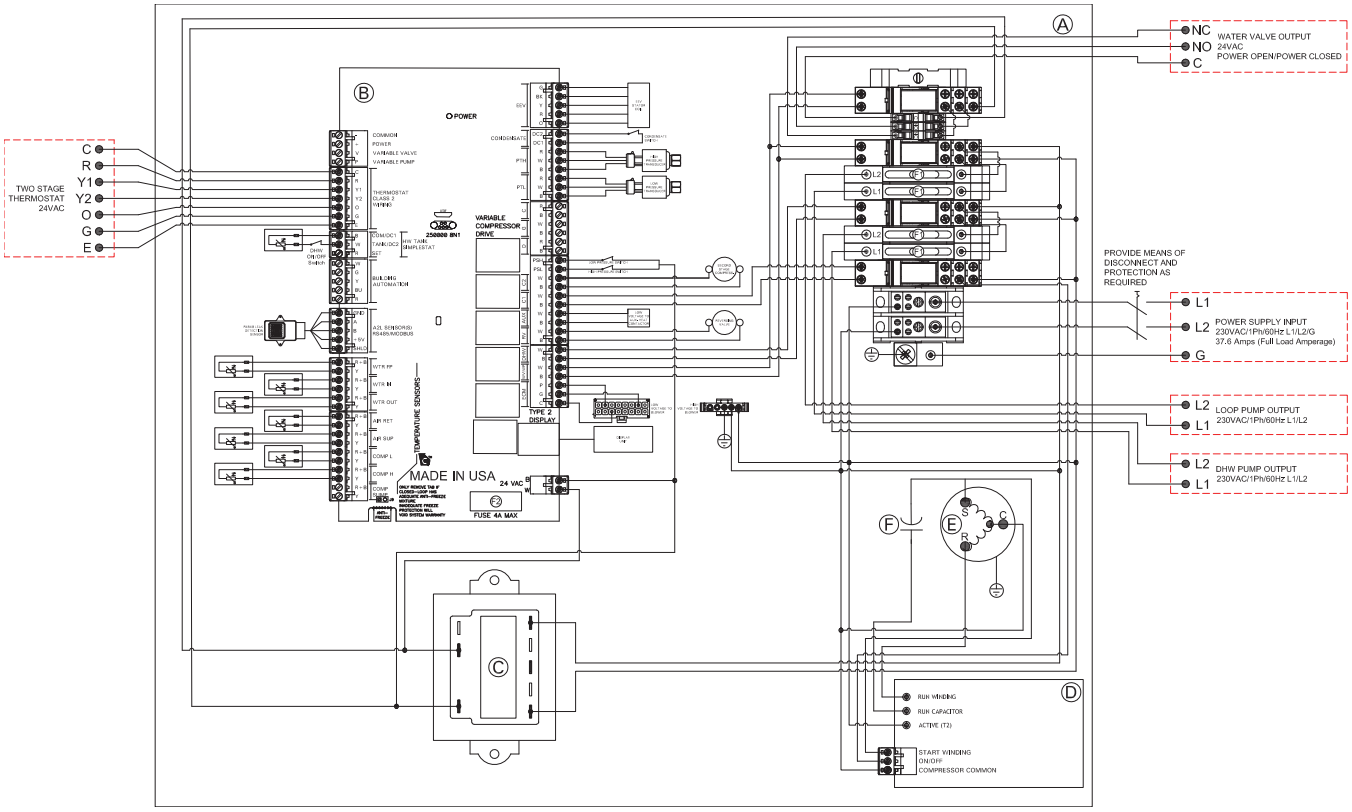


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 40μF-440V

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 066049 - 230VAC

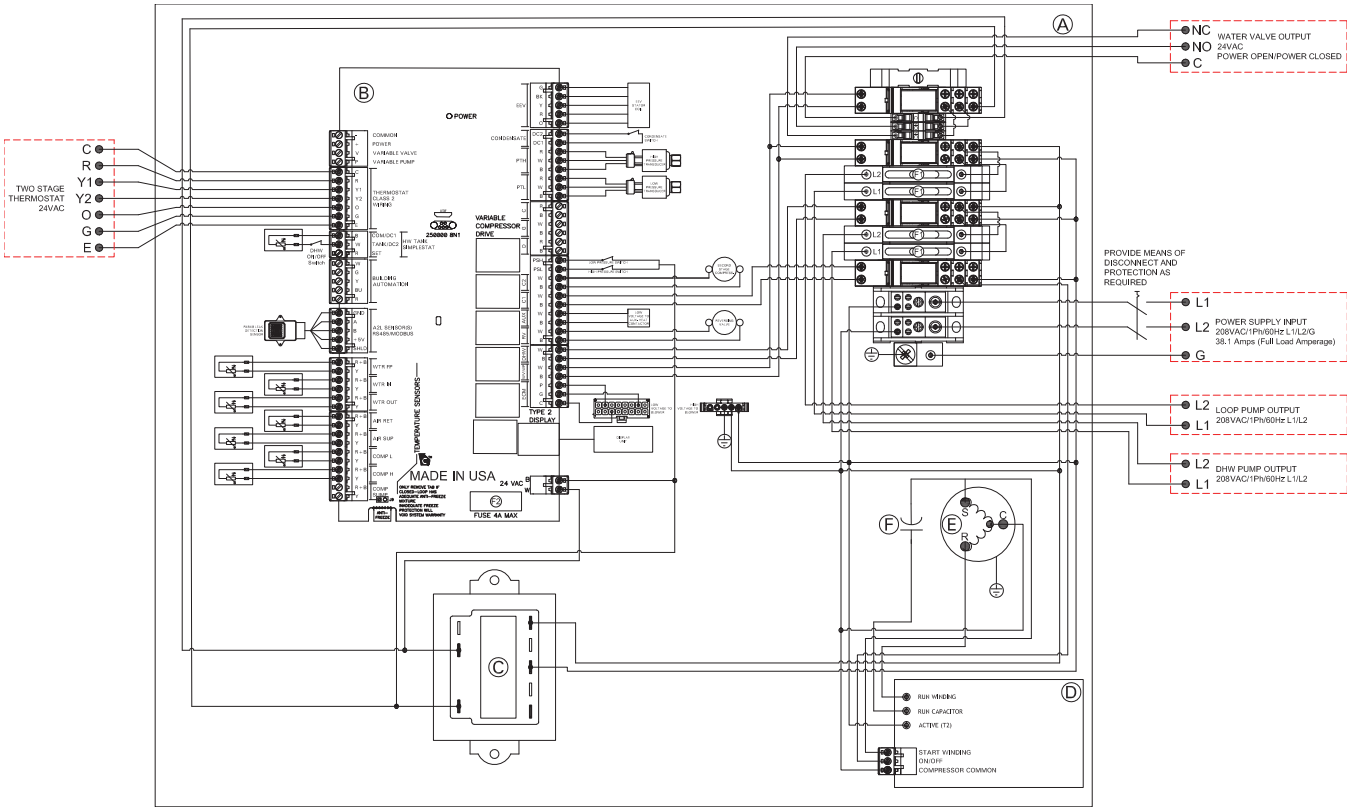


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 40μF-440V

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 066049 - 208VAC

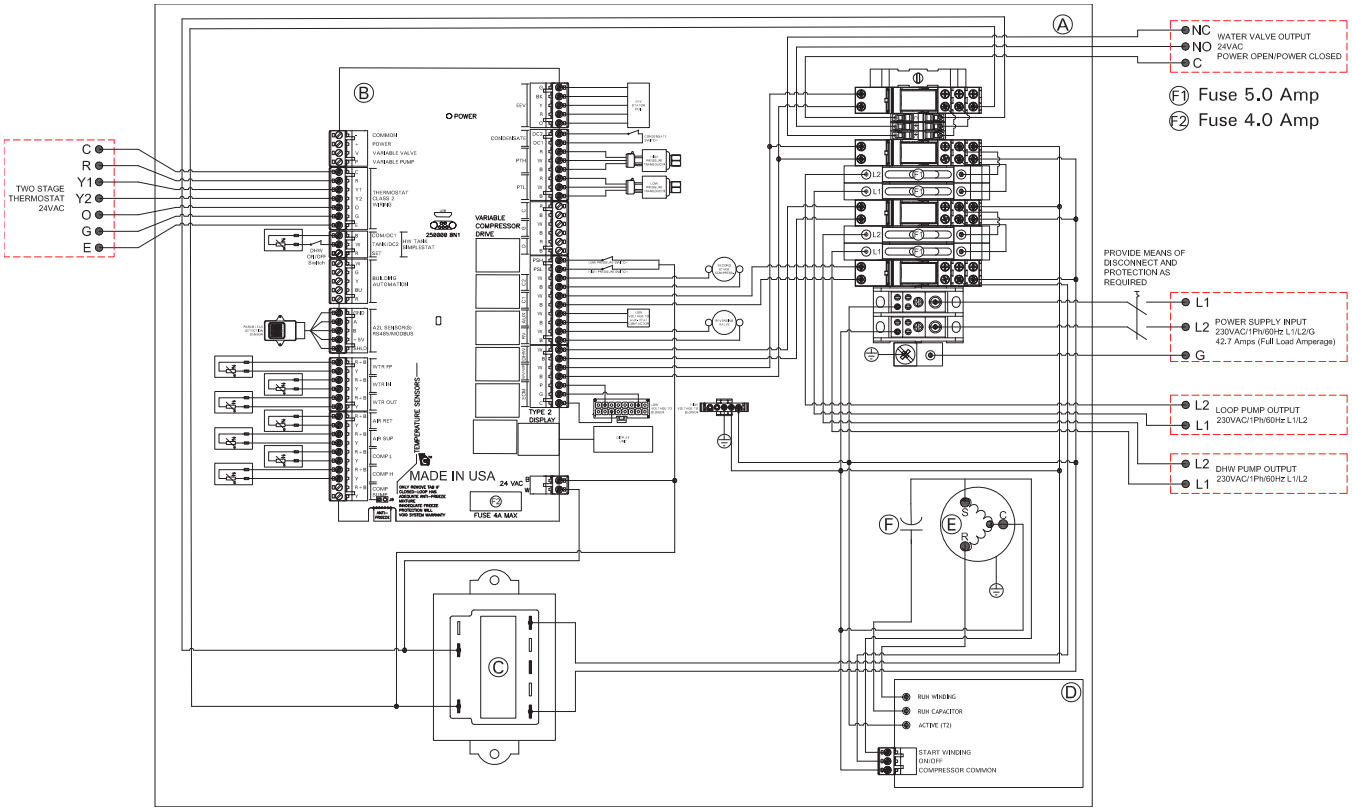


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 40μF-440V

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

Wiring Diagram AP1T 077056 - 230VAC

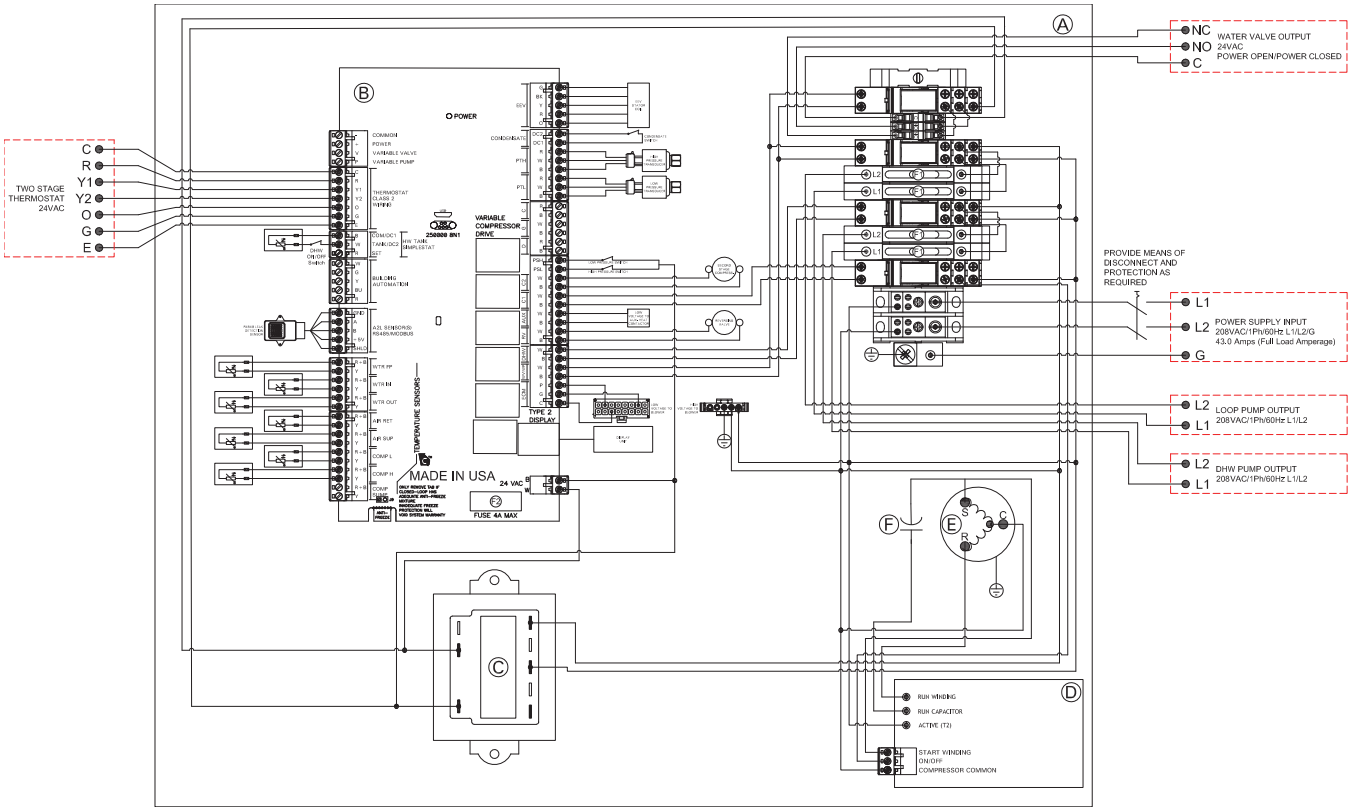


Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 55μF-440V

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp

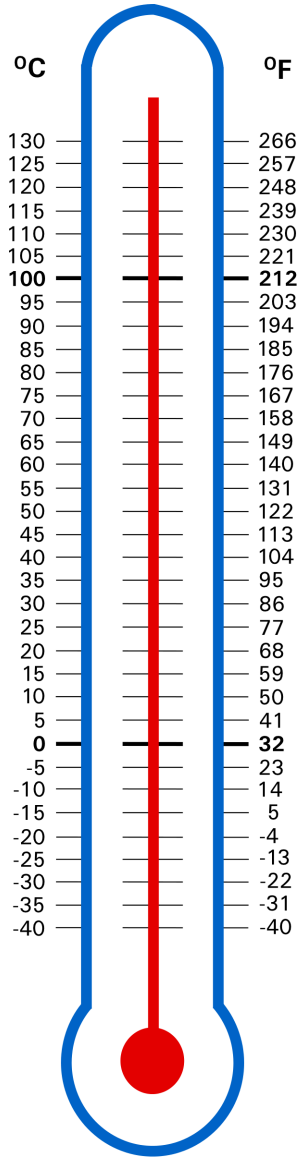
Wiring Diagram AP1T 077056 - 208VAC



Legend

Ⓐ Junction Box
Ⓑ Control Board
Ⓒ 208/230VAC/1PH/60Hz to 24VAC Transformer
Ⓓ Motor Soft Starter 16-32 FLA
Ⓔ Compressor
Ⓕ Run Capacitor 55μF-440V

Fuse F1 5.0 Amp
Fuse F2 4.0 Amp



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