AQUAS POOL PACKAGE INSTALLATION INSTRUCTIONS
FOR MODELS: APX400 - 1000

AQUAS Pool Package

The AQUAS pool package system is a high efficiency commercial condensing boiler, pre-piped package system from the factory to an indirect heat exchanger. This pool heater is a low temperature operating system designed to take advantage of the stainless steel heat exchanger and condensing operating temperatures to ensure the highest efficiency possible. The AQUAS is designed around a predetermined flow set by the manufacturer between the boiler and the indirect heat exchanger. The AQUAS operates off the pool system pump itself which will continually supply water to the indirect heat exchanger. This means there is no need to purchase a dedicated circulator to deliver water to this package system.

Installation Instructions

To achieve the optimum operating efficiency of your AQUAS it is recommended that you keep the pool water flow of each appliance within plus or minus five gallons per minute of the recommended flow as stated in Table A. Low flow through the indirect heat exchanger will result in elevated temperatures supplied to the pool.

TABLE A

MODEL	RECOMMENDED SYSTEM WATER FLOW	CONNECTION SIZE
400	52 GPM	3"
500	65 GPM	3"
650	84 GPM	3"
800	103 GPM	3"
1000	129 GPM	3"

RECOMMENDED CLEARANCES:
BOILER - SEE KBX I & O MANUAL
INDIRECT HEX - ALLOW 18" FOR SERVICE ON ALL SIDES

Piping

Pool / spa connections to the indirect heat exchanger are SCH 80 CPVC glue fittings. The connections from the field loop to the heat exchanger may be done in CPVC or PVC pipe as follows:

- Use a cement that is rated for PVC/CPVC piping.
- To make the connection, apply glue to both the CPVC flange and the section of pipe.
- Insert the pipe into the flange until it reaches the bottom of the flange.
- Turn the pipe a half turn in the socket to ensure that a proper seal is made.

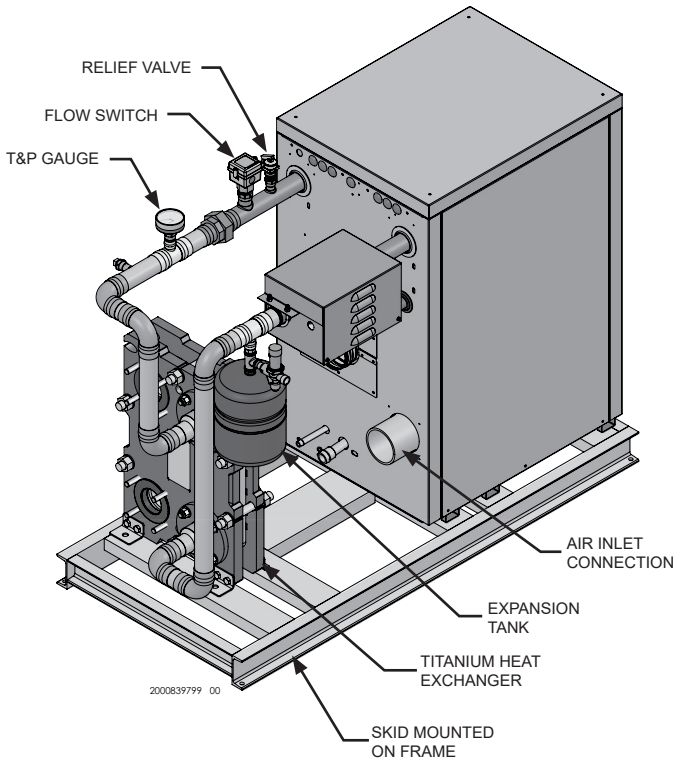
Pool water is designed to flow from bottom to top standing in front of the boiler. The field installed sensor is to be on the inlet of the heat exchanger.

The supply and return water piping to the indirect heat exchanger shall be no smaller than 2" for all models.

Throttling Valve

A ΔT of 15°F - 20°F across the indirect heat exchanger is recommended. Throttling valves are used to set the flow through the indirect heat exchanger (standard gate valves are acceptable).

Figure 1 *Component Location*



The system can be installed in either a Full Flow or Diverted Flow orientation:

Full Flow *(reference FIG. 8)*

If the total system flow of the swimming pool or spa system is within five gallons per minute of the recommended system water flow as shown in Table A on page 1, this type of system is recommended.

Diverted Flow *(reference FIG.'s 9 & 10)*

Criteria for installing a diverted flow system is as follows:

- If the total system flow is greater than the amount required by the indirect heat exchanger.
- Installations with temperatures in excess of 95°F. This is necessary so the pool high limit will not trip. No water should enter the pool / spa in excess of 115°F. If the heat exchanger pool outlet is in excess of 115°F the water must be tempered down.
- Multiple unit installation.

Example: Total system flow is 500 gallons per minute (GPM). If two AQUAS Pool Packages (850,000 Btu/hr) were installed, each of the pool packages would require 90 GPM for a total of 180 GPM of the pool water being diverted through the indirect heat exchangers while the other 320 GPM would be diverted back to the pool.

Safety High Limit Requirements

Ensure that the 115°F safety high limit control is installed in the filter system piping. Install the high limit a minimum of three feet downstream from the point where the heated water from the indirect heat exchanger is added to the filtration system (see FIG.'s 8 - 10). If the water leaving the heat exchanger is in excess of 115°F a bypass must be installed to temper the water below 115°F before re-entering the pool/spa.

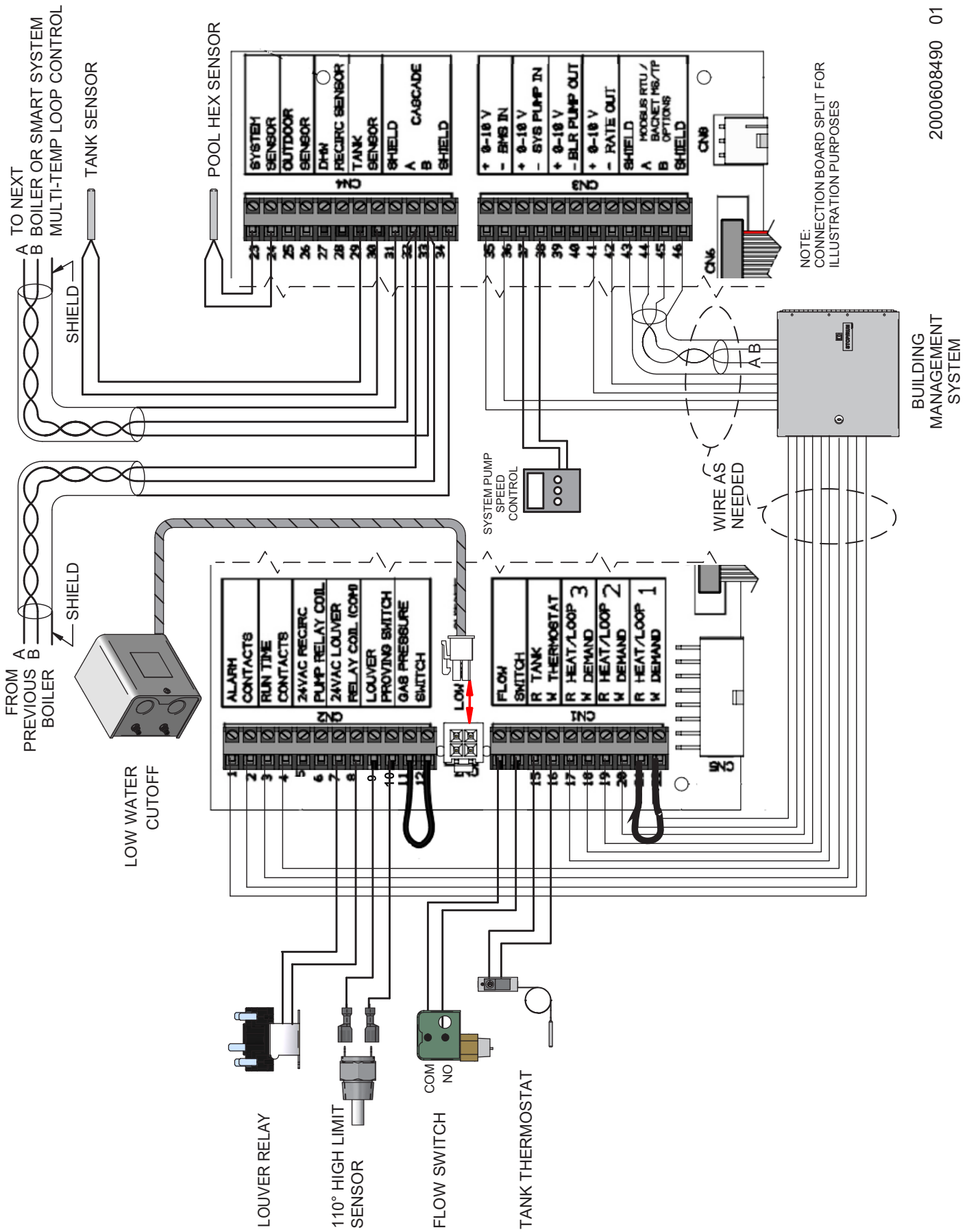
The high limit will be mounted in a 3/8" NPT tapped fitting installed in the filtration system piping or it may be installed directly into a tapped opening in the PVC filter system piping. Turn off the filter system pump when installing the high limit in the filtration system piping. Tapped openings can be added to the PVC pipe by first drilling 9/16" pilot holes in the PVC pipe at least three feet downstream of the point where the heated water from the indirect heat exchanger is added to the filter piping. The drilled pilot holes can now be carefully threaded with a 3/8" NPT tap. After the pipe threads have been cut into the PVC pipe wall the high limit can be inserted into the tapped openings.

Apply a small amount of a high quality RTV silicone sealant to the threads to prevent leaks and install the limit into the threaded opening in the pipe. Install the limit control and tighten to seal. Do not over tighten into the threaded opening in the PVC pipe. Over tightening can damage the parts and/or strip the threads cut into the plastic pipe. Wire the 115°F limit into the pool heater control circuit as shown in FIG. 2 on page 3. If additional wire length is needed, use 18 gauge wire for distances up to 30 feet. For longer distances, size the wire per Table B.

TABLE B
Remote Wire Connection

WIRE GAUGE	MAXIMUM ALLOWABLE LENGTH
12 GA	100 ft.
14 GA	75 ft.
16 GA	50 ft.
18 GA	30 ft.

Figure 2 *Low Voltage Connections*



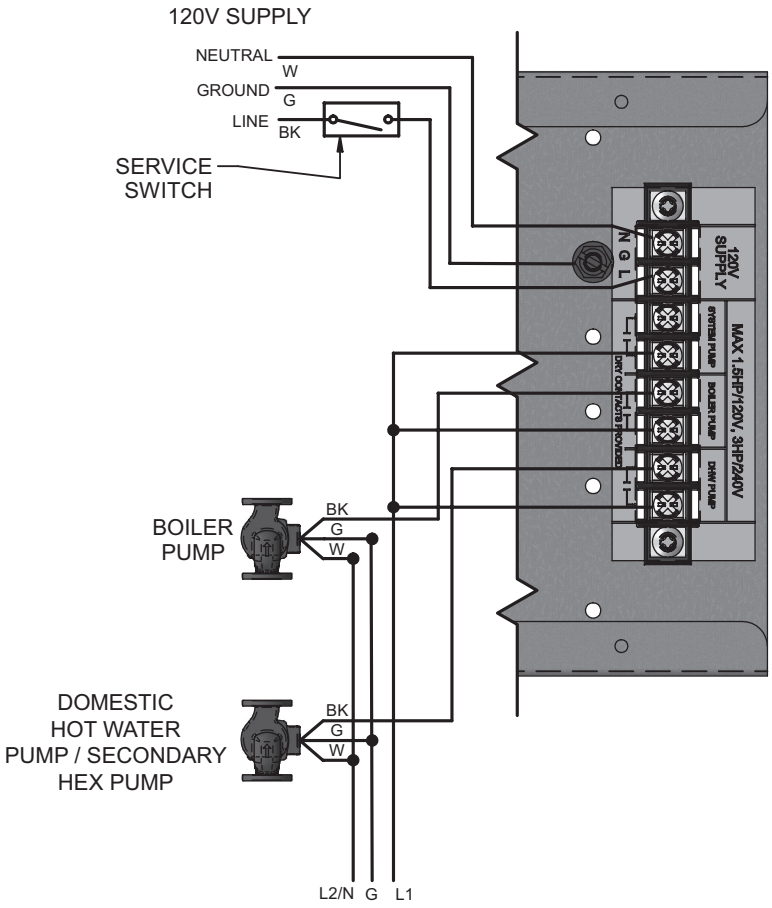
Line Voltage Connections

The AQUAS pool package has a single point line voltage connection for the boiler and the pump (FIG. 3). Connect 120 VAC wiring to the line voltage terminal strip in the junction box. Provide and install a fused disconnect or service switch (15 amp recommended) as required by local codes. Refer to Table C for total amps by model.

TABLE C

Model	400	500	650	800	1000
Total Amps	<12	<12	<12	<12	<12

Figure 3 *Line Voltage Field Wiring Connections*

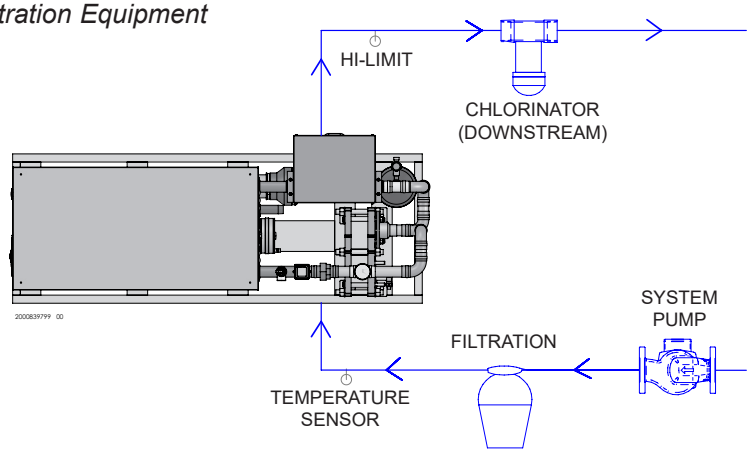


Indirect Heat Exchanger

Installation Instructions

Heat exchangers should be installed downstream of the pumping and filtration equipment (reference FIG. 4).

Figure 4 *Pumping and Filtration Equipment*



Pool Water Chemistry

It is essential that the instructions in this section along with the Ryznar Stability Index and/or Calcium Stability Index are followed to prevent corrosion / erosion of the indirect heat exchanger:

- Always keep pH to within correct levels. The ideal pool pH should be kept to within 7.4 to 7.6.
- Under no circumstances should the pH fall below 7.2 or rise above 7.8 (see FIG. 5). Check on a day-to-day basis. Alter pool condition as necessary.
- Ensure that chlorine levels are within the range recommended by the chemical manufacturer and are in accordance with the type of pool, for example; private, hotel, school or municipal.
- If a bypass is fitted to the indirect heat exchanger circuit, it is essential that any or all of the valves are correctly positioned to allow the recommended pool water flow to pass through the heat exchanger.
- The system filter unit should be checked regularly, especially sand filters (to detect sand and diatomaceous earth). Sand filters, if working incorrectly, can allow sand to pass around the pool circuit causing erosion of the pipework and heat exchanger. Keep the pool free from debris such as leaves, grass cuttings, etc. This foreign matter can cause decay and increase pH.
- It is essential that the correct amount of chlorine dosage is added to the pool. To allow proper dispersion of the dose in the pool water, distribute the chemicals to various areas of the pool. Do not dose in one area only, as this will create high acidic areas which can cause corrosion / erosion of the pool equipment.
- Chlorinators must feed downstream of the pool heater and have an anti-siphoning device to prevent chemical backup in the heater when the pump is shut off.

CAUTION High chemical concentrations from improperly adjusted feeders, chlorinators or salt levels above 5000 ppm can cause rapid corrosion to the heat exchanger.

Filling the System

The boiler is filled through the pressure reducing auto-fill valve. The operating pressure of this system is 15 psi between the heater and the indirect heat exchanger. There are no adjustments necessary to the fill valve cartridge (factory set). The expansion tank is set at 20 psi. It is necessary to check the pressure of the expansion tank when annual maintenance is performed. The boiler system operates off a city or potable water system which feeds a closed loop system. A hard line is piped from the potable water supply to the pressure reducing valve. This water is to remain on at all times when the system is in operation.

Pressure Reducing Valve

The valve is equipped with a fast-fill feature that can be used to override normal operation when filling and purging the system. To activate fast-fill, push and hold down the fast-fill knob on top of the cartridge as shown in FIG. 6.

Relieve air from the system through operation of the pressure relief valve by pulling the lever on top of the valve, causing it to open.

Figure 5 *pH Scale*

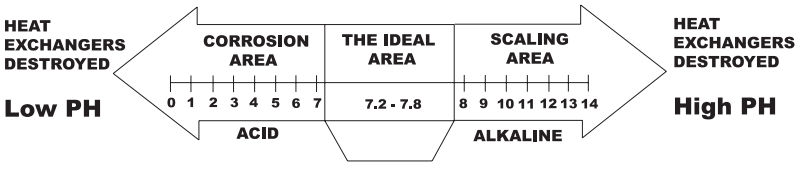
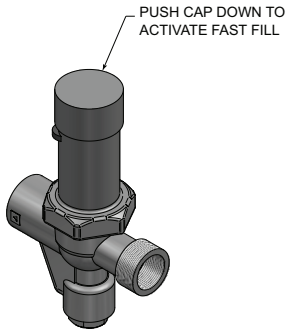


Figure 6 *Pressure Reducing Auto-Fill Valve*



Makeup Water Assembly

NOTICE

In the following steps, a backup wrench is necessary to properly attach the makeup water assembly.

1. Attach the brass reducer tee to the expansion tank as shown in FIG. 7.
2. Attach the assembly to the AQUAS system.
3. Attach the brass nipple to the brass tee as shown in FIG. 7.
4. Attach the makeup water fill valve to the open end of the brass nipple.

Figure 7 *Connecting the Makeup Water Assembly*

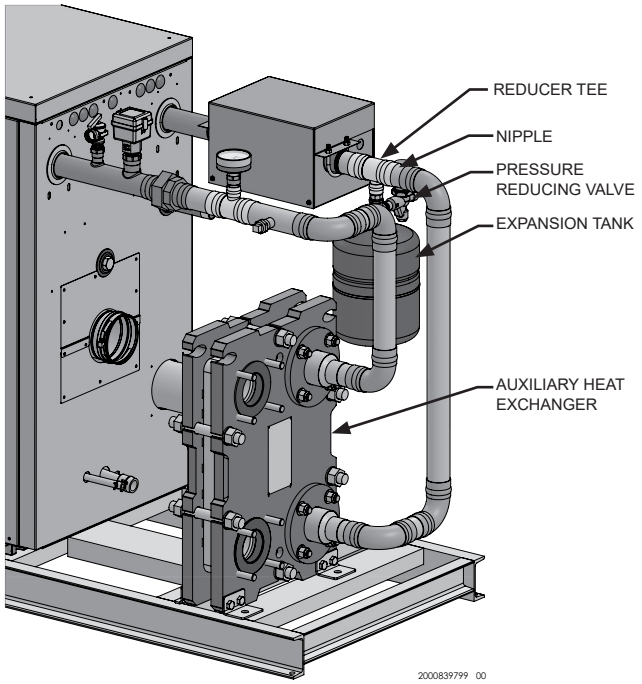
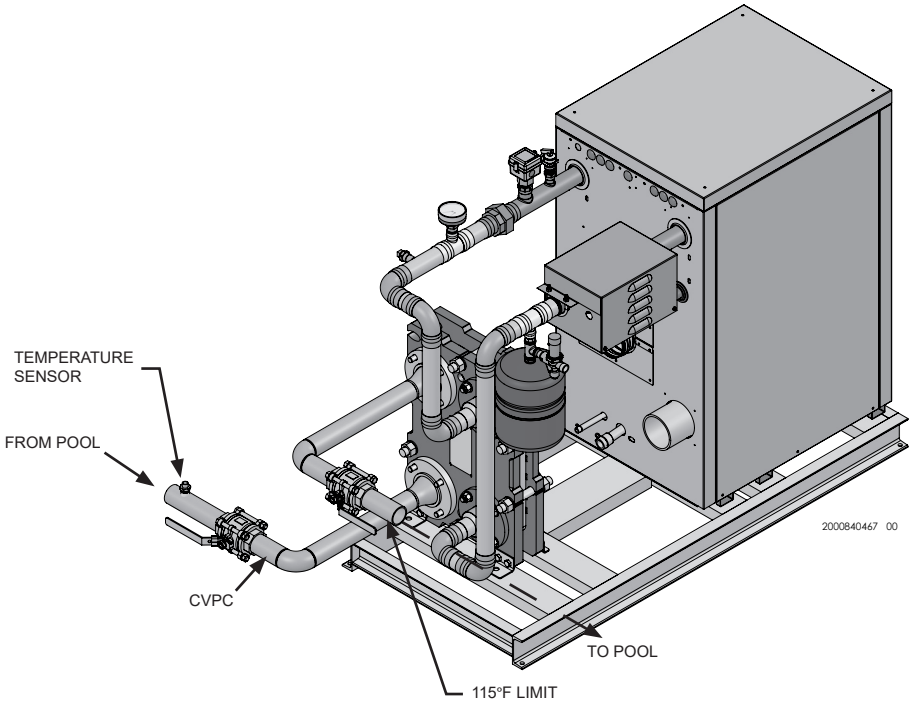


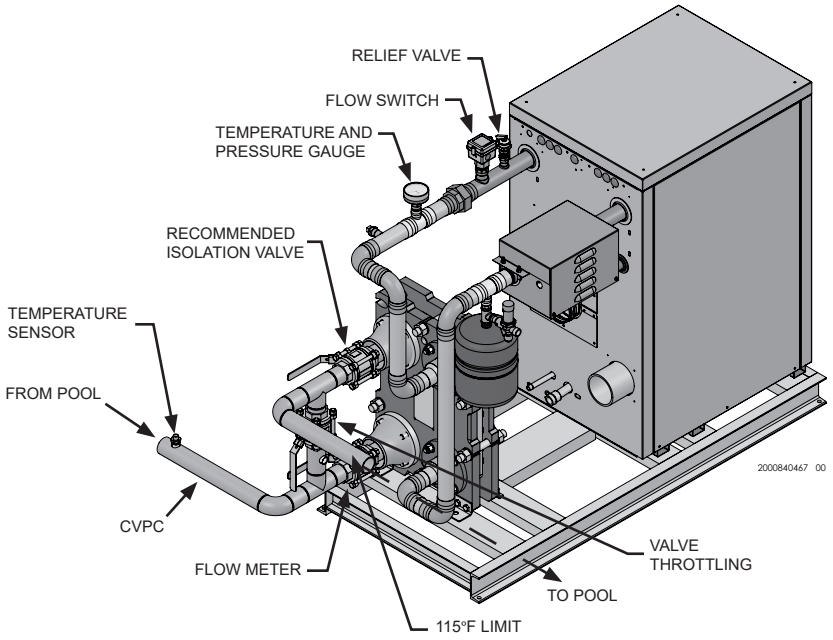
Figure 8 *Full Flow*



NOTICE

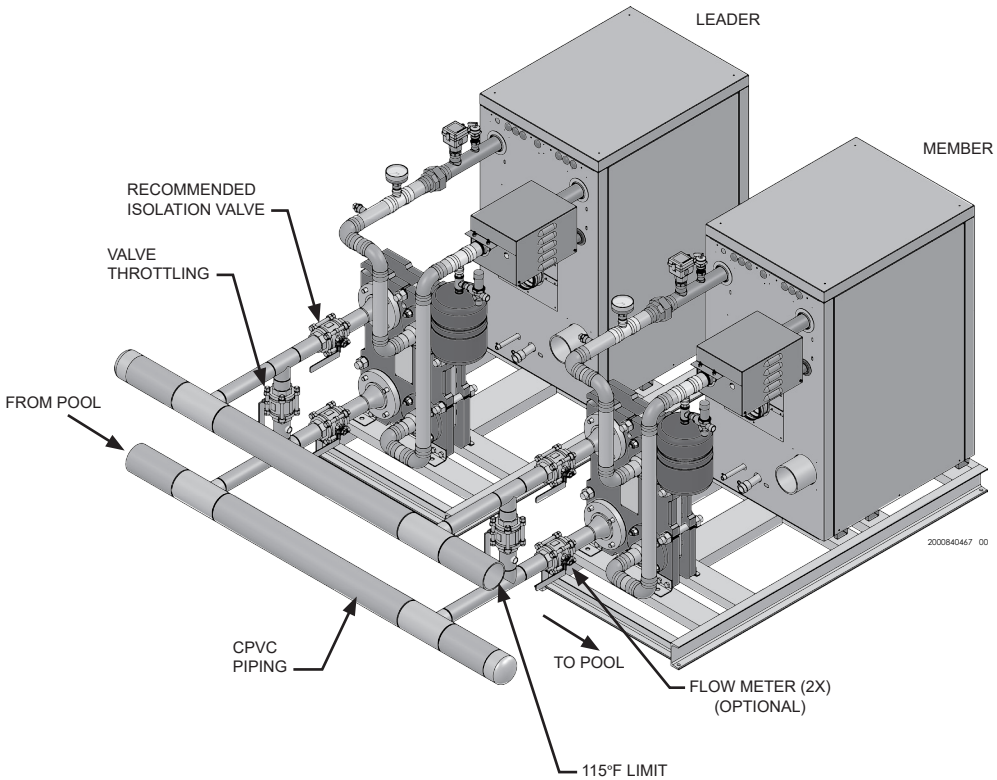
Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

Figure 9 *Bypass (if flow is greater than required by heat exchanger)*



NOTICE Adjust valves to provide suggested flow per Table A on page 1.

Figure 10 *Bypass Multiple Units (if flow is greater than required by heat exchanger)*



NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

NOTICE System flow should always remain higher than the required flow for the boiler(s) when the boiler(s) is in operation to prevent short cycling and high limit issues.

AQUAS Pool Setup

To access the Installer setting press and hold the Menu/Exit key until it requires the installer's code. Proceed and enter #5309 (reference Table D on page 11).

NOTE: NA = No adjustment necessary.

Standalone Operation

Temperature Settings

1. SH1 Set Point (Pool Temperature)
2. Minimum SH Set Point (Pool Temperature Minimum)
3. Maximum SH Set Point (Factory Set 104°F)
4. SH1 Offset (2°F Minimum) number of degrees above the set point the boiler will turn off.
5. SH1 differential (4°F Minimum) number of degrees below the turn off temperature the boiler must see before the boiler will turn on.

Example: Set Point 78°F
Offset = 2 *Boiler OFF at 80°F*
Differential = 4 *Boiler ON at 76°F*

Cascade Multiple Units Together

Temperature Settings

1. SH1 Set Point (Pool Temperature)
2. Minimum SH Set Point (Pool Temperature Minimum)
3. Maximum SH Set Point (Factory Set 104°F)

Control Modes

Cascade

1. Controlling Sensor (Not Applicable)
2. BMS Tstat Input (Active / InActive) (Not Applicable)
3. (Not Applicable)
4. BMS (Active / InActive) (Not Applicable)
5. ModBus (Active / InActive) (Not Applicable)
6. Cascade Address (Leader 0) (Member 1, 2, 3, etc.,)
7. Cascade Type (L/L/EFF) See the KBX I & O Manual for description and settings.
8. Max Cascade Outlet Set Point
9. Cascade Offset (2°F minimum, this is the warmest the pool will ever be above temperature)
10. Cascade Off / On Differential (This parameter determines how much the temperature must be below the turn off temperature (set point + offset) before the Lead boiler turns on. Four degrees is the tightest this setting can be.
11. Min On / Off Time (Not Applicable)
12. Min Next On Time (Not Applicable)
13. Boiler Size (Not Applicable)

Example: Set Point 78°F
Offset = 2 *Boiler OFF at 80°F*
Differential = 4 *Boiler ON at 78°F*

Cascade

When wiring the boilers for Cascade operation, select one boiler as the Leader boiler. The remaining boilers will be designated as Members. See "Configuration of the Cascade" for a detailed explanation of this procedure. Connect the system supply sensor and outdoor air sensor (if used) to the Leader boiler. For the Cascade system to work properly the system supply sensor must be installed. The location of the system supply sensor should be downstream of the boiler connections in the main system loop (see FIG. 7-4 through 7-8 in the KBX I&O manual). The system supply sensor should be wired to the low voltage connection board at the terminals marked for the system sensor (see FIG. 9-3 in the KBX I&O manual). The Leader control will use the water temperature at the system supply sensor to control the operation of the Cascade. If outdoor air reset is desired, the outdoor air sensor should be wired to the low voltage connection board at the terminals marked for the outdoor air sensor (see FIG. 9-3 in the KBX I&O manual). If the outdoor air sensor is connected, the Leader control will calculate the water temperature set point based on the programmed reset curve parameters. If the outdoor air sensor is not connected, the Leader control will maintain the fixed water temperature set point that is programmed into the control. If a Thermostat or Zone Control enabled output is available, it should be wired to the low voltage connection board on the Leader boiler at the terminals marked for one of the heat/loop demands 1-3 (see FIG. 9-3 in the KBX I&O manual). If the boilers are to run continuously, connect a jumper wire between the R and W terminals for the heat/loop demand input. This will initiate a call for heat on the Cascade. Communication between the Leader boiler and the Member boilers is accomplished by using shielded, two-wire twisted pair communication cable. Connect one of the twisted pair wires to Cascade terminal A on each of the low voltage connection boards, and the other wire of the twisted pair to Cascade terminal B on each of the low voltage connection boards. Connect the shield wires to one of the shield terminals on the low voltage connection boards (see FIG. 9-3 in the KBX I&O manual). If more than two boilers are on the Cascade, daisy chain the wiring from the Cascade terminals on the second boiler to the Cascade terminals on the third boiler, then from the third to the forth, and so on. The connections between boilers can be made in any order, regardless of the addresses of the boilers. Try to keep each cable as short as possible.

Configuration of the Cascade

NOTICE For more detailed instructions, please refer to the Knight XL Service Manual.

When installing a Cascade system, all units must be programmed for Cascade to operate. Access the Cascade Setup options as follows:

1. Press the SETUP button on the left side of the display screen.

2. Enter the installer password.

3. Select the Cascade option as shown in FIG. 11-5.

4. Each unit must have a unique address set. The leader has more options which are described in the Knight XL Service Manual.

5. Once all the updates are complete, press the Door Menu slider (top left) or the SETUP button.

6. Press the APPLY CHANGES button on the top of the screen.

NOTICE The APPLY CHANGES button must be pressed to complete programming of the controls. Failure to press the APPLY CHANGES button will result in an unprogrammed control. The Door Menu button will become highlighted when there are changes that can be applied.

SMART SYSTEM AQUAS control module

Use the control panel (FIG. 11) to set temperatures, operating conditions, and monitor boiler operation.

Figure 11 *Control Panel*

- The **Status** Section is located on the top left of the screen and displays how the unit is currently running (i.e. Off, Stand-by, Blocking, and Lockout) including: current driving demand, the next Hot Water Setback scheduled, the reason for any blocking or lockout, and a power button.
- The **Demand** Section is located on the bottom left of the screen and displays information about the targets and limits of the current demand being serviced.
- The **Modulation** Section is located on the top right of the screen and displays the target modulation of the unit. This section also includes target and actual fan speeds.
- The **Sensor** Section is located on the bottom right of the screen and displays both factory installed and field installed sensor including: Outdoor Air, Hot Water Temperature, System Supply, System Return, Inlet Water, Delta T, Outlet Water, Flue Temperature, and Flame Current.
- The **Navigation** Section is located down the left side of the screen. There are five (5) sections located below the Lochinvar icon: Home, View, Setup, Information (About), and Settings. The Home Section is the screen shown above. The View Section provides more detailed information including subsections for: History, Cascade, Graphing, and a complete list of current Sensor Values. The Setup Section has several screens to aid in setting up the appliance. The Setup Section includes screens for adjusting: Set Points, Pump Settings, Cascade, BMS, Ramp Delay, and Night Setback. The Information Section provides information about the hardware and software including the current software version of the interface, the version of the boiler control, and the CON·X·US device serial number. The Setting Section enables several interface setup features including: Time Setup, Temperature Unit Select, Loch'n Link, System Update, and WiFi Setup.

Pool Heat Exchanger Maintenance

⚠ WARNING To avoid hand injuries from sharp edges, protective gloves should always be worn when handling plates and protective sheets.

⚠ WARNING If the heat exchanger is hot, wait until it has cooled down to about 104°F (40°C).

Preliminary Procedures

To avoid any sudden issues, HEXONIC Sp. z o.o. recommends preventive maintenance. Plate heat exchangers must be serviced periodically. It is also recommended for the user to have a minimum number of spare parts at their disposal, such as plates and gaskets, should any unexpected issues be caused by those elements.

Before starting operation of the plate heat exchanger:

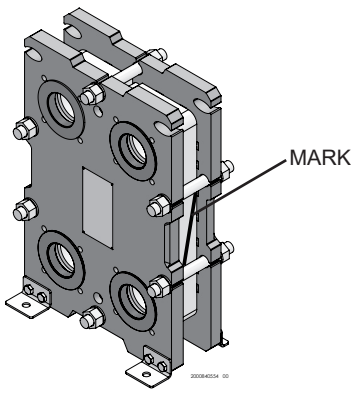
- wear safety clothing
- ensure the exchanger is separated from the power source
- ensure the exchanger has been cooled down to a temperature that enables servicing
- ensure the exchanger is dried or the media inside the exchanger are not hazardous in contact with skin or through aspiration
- ensure enough space to avoid injuries and allowing for free movement

NOTICE In order to disassemble the plate heat exchanger, carry out the PRELIMINARY PROCEDURES described above.

Opening the heat exchanger

1. Drain the plate heat exchanger.
2. Inspect the sliding surfaces of the carrying bar and wipe clean. Remove protective caps from the threaded rods. Clean and grease the stud threads in order to reduce friction during unscrewing;
3. Mark the outside of the plate assembly with a diagonal line to facilitate proper reassembly (FIG. 12).

Figure 12 *Mark Location on Plate Assembly*

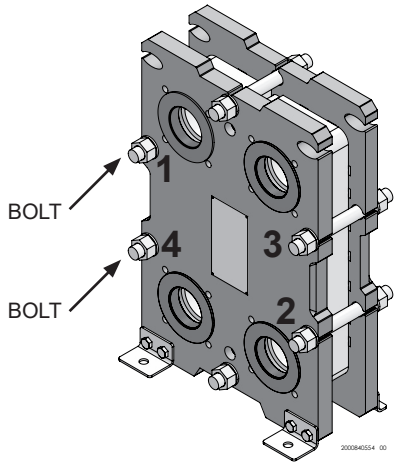


4. Measure and make note of dimension A (FIG. 13).
5. Using a set of wrenches, unscrew the nuts in the threaded rods of the rear plate as shown in Figure 13. In option the heat exchanger with blocked nuts with bolts, use these nuts to unscrew

Step	Bolt Number	To Dimension
1	1-2-3-4	1.05A
2	1-2 or 3-4	Opening

NOTE: Ensure that the plate and pressure plate are always in parallel. Skewing the pressure plate during opening must not exceed 10 mm (2 turns per bolt) across the width and 25 mm (5 turns per bolt) vertically.

Figure 13 *Measure Across the Plate Assembly*



6. Remove the threaded rods, pulling them through the openings in the front plate (or) on plates side. Store the removed elements in a clean and dry place. If plates are to be numbered, do this before removing the plates. Plates need not be removed if cleaning is done using water only (i.e., without cleaning agent).
7. Check the surface of the horizontal bearing bar and the rear (moving) plate roller for any obstacles/ clean the round rod of the upper bar from dirt and dust. Slide away the rear exchanger plate to the end of the rear support.

   Note: Due to sharp edges of the heating plates, grab them cautiously, wearing protective gloves.

⚠ WARNING The plate pack may still contain a small residual amount of liquid after draining. Depending on the type of product and type of installation, special arrangements may be necessary to avoid damages to personnel and equipment (e.g., drainage box).

8. For exchangers with the U-leg support version, slide the heating plate completely to the end of the lower bar and remove the plate in a perpendicular direction or at an angle toward you
9. For standard support exchangers, tilt the heating plate towards the rear plate and remove it, rotating it at an angle toward you.
10. Slide the rear plate away, in order to gain access to the plate pack.

Preparing the Starting Plate with a Gasket

The starting plate requires appropriate sealing with the connection, therefore a gasket must be prepared. The gasket is fitted with additional clips to facilitate installation in the plate. However for the starting plate these are cut off, therefore an adhesive is required (e.g.: Bostik 1782, 3MEC 1099, Bond Spray 77, Plibond 20 or 30 synthetic adhesive). A small amount of the adhesive is applied into the gasket seat only for the starting plate and then the gasket itself is mounted. Sealing requires two gaskets to be cut in half and use only the parts with rings for flow openings. Then, the two halves are connected on the plate as in the figure. If Rubberliner is the connection, it also acts as the gasket, so there is no need for additional sealing around the openings (it is cut off there).

If it is necessary to replace the gasket, the old gasket must be ripped off the plate. Remove any remaining adhesive (usually it requires a suitable non-chlorine solvent). Before applying a new gasket, assure that all sealing surfaces are dry, clean and free of foreign matter such as fat, grease or similar. Then apply a layer of adhesive again and glue the previously prepared gasket.

NOTICE When removing the glued gasket, do not use any sharp tools that could damage the plate. Adhesives other than those recommended may contain chloride or other substances that could damage the plates.

NOTICE Different types of tools, such as hydraulic and pneumatic tools, can be used in order to facilitate closing. Upon reaching the screwing dimension, it is recommended to wait 30 minutes and then adjust the tightening torque with a torque wrench.

Exchanger Installation

Following maintenance and repairs, assemble the heat exchanger according to following requirements:

1. Insert the heating plates one after another, following the order as per the installation card provided, checking each sealing surface to avoid any contamination between the plate and the gasket (make sure the plates are placed in their positions according to the line marked before disassembly or use the exchanger installation card).
2. After inserting all the plates between the frame, press/close the rear plate so that the plate pack remains still between the pressure plates.
3. Check whether the plate pack has a honeycomb structure which indicates correct positioning as in the figure.
4. Apply some grease on the stud and nut thread to reduce friction forces.
5. Holding the nuts on the front plate side with a wrench, tighten the exchanger nuts evenly on the rear plate side. In option the exchanger blocked nuts with bolts, use these nuts for evenly tightening keeping in the same time the opposite nuts blocked. Perform the final tightening in the order indicated in Figure 14. This order could be different depending on the number of threaded rods.

NOTICE Depending on the condition, the tolerance of the heating plates and the configuration of new and old plates, screw the exchanger together until full contact of the plates, which may result in different torque values indicated.

Appropriate compression of the plates will result in sudden torque increase during tightening.

NOTICE During the final phase of tightening, use a certified torque wrench.

NOTICE Inappropriate compression force may result in fluid leakage. Too low tightening torque may result in leakage. Too high tightening torque will damage the heating plates.

6. Assure that the final difference in tightening the individual threaded rods does not exceed 1 [mm] per every meter of the screwed exchanger.
7. Perform a pressure test before commissioning the heat exchanger in order to assure that there is no leakage. During test pressure, do not exceed maximum allowable working pressure (MAWP), as stated on the nameplate.
8. Follow the start-up procedure.

Cleaning

Most plate heat exchangers are exposed to soiling/contamination. Soiling/Contamination may occur at the inlet ports, in plates near the ports and on other plates. Contamination, if not cleaned, increases pressure drop and reduces heat exchange performance. Therefore, to avoid these issues, cleaning of the plates is necessary. Contamination on the heating plates can be removed manually or using CIP (cleaning in place). Plate heat exchanger cleaning may vary depending on the size, plates used and the gaskets material.

Frame Cleaning

- Clean the frame of the plate heat exchanger from the outside, especially the bearing column, the bearing bar and the threaded rods.
- Grease the threaded rods to prevent corrosion.
- Any defects of the paint coating should be repaired to prevent corrosion from spreading.

Plates Cleaning

Carefully choose the cleaning agent in order to remove contamination from the heating plates without damaging the plates or the gaskets. All stainless steel materials have a protective layer that must not be destroyed to provide protection of the steel against corrosion. We recommend requesting a confirmation from the cleaning agent supplier that the agent is appropriate both for the type of contamination and the material of the heating plates. Follow the instructions provided by the cleaning agent supplier.

CIP Cleaning

CIP (Cleaning in Place) is a method of cleaning a plate heat exchanger without disassembly. The cleaning agent is pumped through the channels to clean out mild/medium contamination from the plate surface. Depending on the application and contamination level, the CIP method may be the best solution. It is crucial to use an appropriate cleaning agent in order to effectively remove the contamination.
It is best to use cleaning agents recommended by HEXONIC Sp. z o.o.

Manual cleaning of the heat exchanger

1. Remove deposits from the plates using a soft brush and running water.
   NOTE: Plate removal is not required if deposits are removable by water and a brush.
2. Rinse with water using a high pressure hose.
3. If deposits are not removable with water and a brush, the plates must be removed from the plate heat exchanger. Brush the plates with a cleaning agent and rinse with water.

NOTICE Never use a steel brush on the heating plates. If a brush is required, use one made of hard plastic, which is soft and does not contain metal. Rubbing iron in a stainless steel surface may result in rust or corrosion.

NOTICE Be careful not to damage the gasket during manual cleaning.

Table E *Cleaning Agents - Incrustation, Scaling*

Incrustation - Scaling	Sediment	Cleaning Agent
Calcium Carbonate	Corrosion products	Nitric acid
Calcium sulphate	Metal oxides	Sulfamic acid
Silicates	Silt	Citric acid
	Aluminum Oxide	Phosphoric acid
	Methabolic Products	Complexing agents (EDTA, NTA), Sodium polyphosphates
Concentration Max 4% **Temperature Max 140°F (60°C)**		

Table F *Cleaning Agents - Biological Growth, Slime*

Biological Growth - Slime	Cleaning Agent
Bacteria	Sodium hydroxide
Nematodes	Sodium carbonate
Protozoa	Cleaning effect can be considerably increased by the addition of small quantities of hypochlorite or agents for the formation of complexes and surfactants.
Concentration Max 4% **Temperature Max 176°F (80°C)**	

Table G *Cleaning Agents - Oil Residues, Asphalt, Fats*

Deposit	Cleaning Agent
Oil residues Asphalt Fats	Paraffinic naphta-based solvent (e.g., kerosine) NOTE: Gaskets made of EPDM rubber swell in these materials. Contact time should be limited to 30 minutes.

Table H *Cleaning Agents - Gasket Adhesive*

Deposit	Cleaning Agent
Dried gasket adhesive	Methyl ethyl ketone (MEK), Acetone

CAUTION The following solutions should not be used:

- Esters (e.g., Ethylacetate, Butylacetate)
- Halogenated hydrocarbons (e.g. Chlorothene, Carbon tetrachloride, Freons)
- Aromatics (e.g., Benzene, Toulene)

Closing the heat exchanger

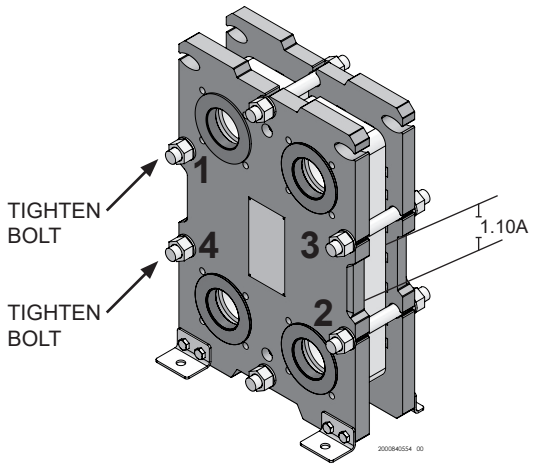
1. Ensure that all sealing surfaces are clean.
2. Use a steel wire brush to clean the threads of the bolts. Lubricate the threads using a thin layer of grease.
3. Attach gaskets to the plates and ensure that all gaskets are properly attached.
4. Insert the plates with the herringbone pattern positioned in alternating directions and with the gaskets turned towards the frame plate.
5. Press the plate assembly together. Follow the two-step process below to tighten the plate assembly. Ensure that the frame plate and pressure plate are always parallel.

Step	Bolt Number	To Dimension
1	1-2 or 3-4	1.10A
2	1-2-3-4	A

Tighten the two (2) diagonal pairs of bolts alternately until the plate package measures 1.10A (FIG. 14). Tighten the middle pair of bolts and the upper and lower bolts.

NOTICE The actual measurement must never be less than Dimension A (FIG. 13).

Figure 14 *Tighten the Bolts*



Pressure test after maintenance

Whenever plates or gaskets have been removed, inserted, or exchanged, it is strongly recommended to perform a pressure test to confirm the internal and external sealing functions of the PHE before starting-up the unit. During this test, one side must be tested at a time with the other side open to the atmosphere.

Pressure testing should be performed at a pressure equal to the operating pressure of the actual unit, but never above the design pressure as stated on the nameplate.

The recommended test time is 10 minutes.

Please note that PHE units for refrigeration applications and units with media that will not mix with water must be dried after hydrostatic pressure testing.

Please consult the local office / representative of the supplier for advice on the pressure testing procedure.

Revision Notes: *Revision A (PCP# 3000059663 / CN# 5000049465) initial release.*