PRODUCT MANUAL
TR200081

ADVECO

Packaged Plate Heat Exchangers

Adveco PPN, PPS Ranges

Installation, Operation, and Maintenance Manual

PRACTICAL, EFFICIENT & SUSTAINABLE
BUILDING SERVICES SOLUTIONS

Warnings

This manual should be read and understood prior to installation or operation of any Adveco PPN or PPS packaged plate heat exchanger system. Failure to read this manual or follow its printed instructions may lead to personal injury, damage to the equipment, and damage to the hot water system. These instructions should be kept in a safe and accessible place near the equipment.

Equipment should be stored in a safe place prior to installation to prevent damage.

Adveco Ltd. reserves the right to modify specifications in this manual at any time and without notification.

Adveco Ltd. accepts no liability for third party claims arising from unauthorised use and/or use other than as directed within this manual.

Contents

1. Product Description

Adveco PPN and PPS Ranges of Packaged Plate Heat Exchangers

The Adveco PPN and PPS ranges are pre-assembled packaged plate heat exchanger systems designed to heat domestic hot water using the building low temperature hot water (LTHW) heating system. The core component of each range is a stainless steel plate heat exchanger, supplied alongside pumps, controls, valves, plus all interconnecting pipework and plate insulation on a metal skid base.

Definitions of the two product ranges are as follows:

PPN: Packaged Plate Instantaneous

The Adveco PPN is designed to provide an instantaneous supply of domestic hot water to the building. The secondary output of the plate heat exchanger can be connected directly to the pipework leading to the building DHW outlets. An example system schematic of the Adveco PPN range is included in figure 18 on page 37 for reference.

PPS: Packaged Plate Semi-Storage

The Adveco PPS is designed to provide a high capacity dump load of domestic hot water, and is delivered alongside a potable water buffer vessel and integrated secondary shunt pump. An example system schematic of the Adveco PPS range is included in figure 19 on page 38 for reference.

All PPN and PPS models are available with either a single (-S) or twin (-T) headed primary circulation pump. The standard range of PPN and PPS units includes the following models, as identified by the exchanger data plate:

PPN 100S	PPS 100S
PPN 100T	PPS 100T
PPN 150S	PPS 150S
PPN 150T	PPS 150T
PPN 200S	PPS 200S
PPN 200T	PPS 200T
PPN 300S	PPS 300S
PPN 300T	PPS 300T
PPN 400S	PPS 400S
PPN 400T	PPS 400T
PPN 500S	PPS 500S
PPN 500T	PPS 500T
PPN 600S	PPS 600S
PPN 500T	PPS 600T

1. Product Description

1.1. Working Principle

Adveco PPN Range:

A standard PPN installation should be configured as shown in the system schematic provided in figure 18 on page 37 of this manual. In such an arrangement, the plate heat exchanger is fed on one side by the building LTHW system via the 4-port valve and circulator pump, and on the other side by the building DHW system.

Adveco PPS Range:

A standard PPS installation should be configured as shown in the system schematic provided in figure 19 on page 38 of this manual.
The packaged plate heat exchanger system is expanded from the PPN range to include a domestic hot water buffer vessel, a secondary shunt pump, and connecting pipework.

Common working principle:

The unit is designed to heat domestic hot water (DHW) using low temperature hot water (LTHW). The primary circulating shunt pump mounted on the plate heat exchanger is for heat exchanger control only, and is sized to pump the correct volume of LTHW through the exchanger to ensure efficient operation.

All controls are supplied within an IP-rated terminal housing suppled installed onto the skid alongside the plate heat exchanger. The temperature of the domestic hot water system is monitored by a control thermostat located on the DHW inlet pipe, and when there is a demand for heat input the control panel will emit a signal to open the 4-port control valve and activate the primary circulation pump, as well as the secondary shunt pump (PPS systems only). This produces LTHW flow through the plate heat exchanger, transferring energy into the building DHW circuit passing counterflow through the plates. The required DHW outlet temperature can be set on the unit controller.

The use of a 4-port control valve allows the appliance to maintain a continuous circulation of LTHW to and from the plate heat exchanger at all times. This prevents cold legs of pipework in circumstances where the exchanger is not calling for heat, allows other primary system safety and control functions to continue operating as expected, and enables the heat exchanger to be connected into the main primary loop as opposed to tapping into the main flow and return pipework. For more information, consult the drawings provided on pages 37-38 of this manual.

The system set-point temperature is adjustable via the control panel. When the set-point temperature is reached, the control valve will automatically modulate to maintain the desired temperature output from the plate, and when demand ceases the valve will close, isolating the LTHW supply from the plate.
In the event that the domestic hot water system goes over temperature, an included non-self-resetting overheat thermostat will send a signal to shut down the primary circulation pump.

BMS or Time Clock Operation:

The control panel features volt-free contacts for Building Management System (BMS) input and output signals, allowing integration of a BMS to automate the operation of pumps. As an alternative option, the unit can be supplied with an incorporated time clock.

During operation, all pumps present will run continuously. When in AUTO mode, using either BMS or a time clock, only the operation of pumps are controlled. The temperature set-point, overheat protection, and control valve modulation are still controlled by the panel.

Primary Pump Energy Saving Feature (if fitted):

The packaged plate heat exchanger can additionally be fitted with an energy saving feature for the primary shunt pump. During periods of low demand, the pump can shut down to conserve energy. As this corresponds to the valve closing, the boiler circuit is therefore closed as well, thus saving more energy from the primary heat source. The pump shuts down when the actuator is less than 4% open, and restarts when the actuator is more than 6% open.

This feature can be retrofitted, but does involve modifications to the actuator and the appliance control panel.

2. Installation Instructions

2.1. Safety Requirements

Following the commissioning of a system and in compliance with the procedures and advice contained within this manual, responsibility lies with the building controller to maintain a safe standard of operation and schedule regular maintenance procedures as required by any site risk assessment. This includes ensuring that the unit is not operated at temperatures or pressures in excess of those stated on the unit data plate. Nor should any part of the installation be exposed to a full or partial vacuum, such as can be present during draw-off or drainage of the system while the cold feed is closed or obstructed.

If the packaged plate heat exchanger system is to operate near personnel, it is recommended to install a metal spray shield over the gasketed plate to offer protection against the risks of scalding and potential spraying of corrosive fluid, if used, from a "blow out" failure. The surfaces of the plate heat exchanger, pumps, valves and pipework become hot during operation, and adequate consideration should be given to protect personnel from burns when deciding upon the location of the unit.

The Adveco PPN and PPS are designed to operate as part of a pressurised system. It is essential that the exchanger, as with all pressure containers, is protected from the effects of over-pressurisation should a fault arise in the operation of the system. Provision of suitable pressure relief devices such as relief valves or bursting discs should be considered - positioned local to the exchanger, with no control or isolating valves between the device and the exchanger.

Failure to maintain a minimum of annual maintenance may void any and all warranties. Full maintenance procedures should only be carried out by a suitably qualified person. Basic maintenance regimes, as determined through site risk assessment, should be carried out by the user as directed in section 4 of this manual.

Adveco Ltd. advise that heating and hot water systems located in unoccupied premises, or that are subjected to long periods of shutdown, should be drained down to remove the risk of failure and/or damage occurring while the system is not being monitored.

In compliance with the procedures and advice contained within this manual, responsibility lies with the installer to ensure that heating and hot water appliances are correctly and safely installed in line with all local regulations and laws. In all cases, the relevant laws and regulations must take precedence over the instructions contained within this manual.

The Adveco PPN and PPS ranges of packaged plate heat exchangers are suitable for installation in unvented installations up to a maximum pressure of 6 bar.

2. Installation Instructions

2.2. Long Term Storage

Less than 6 months from delivery:

- Seal up unit connections
- Store in an environment away from moisture, in temperatures that are between 15 and 20°C. Temperatures lower than 15°C should be avoided.
- Cover the plate pack with black plastic to exclude any sunlight, whilst still allowing air to circulate
- Suitable storage conditions are cool, dry, free from dust, moderately ventilated, relatively dark and away from direct sunlight.

Greater than 6 months from delivery:

- Apply a rust preventative agent to the tie bolts along the threads between the follower frame plate and the back support leg, the frame bars, and any other unpainted substance to touch the gaskets.
- Seal up unit connections
- Loosen tie bolts until the plate pack is relaxed - this is achieved when the pack is opened by 10% more than the initial tightening dimension. The tie bolts should not be removed or loosened to such an extent that dirt is allowed to enter in between the plates.
- Attach a warning label to advise personnel to not use exchanger in this partially opened condition and to act as a reminder to re-tighten to the correct assembly measure prior to use.
- Cover the plate pack with black plastic to exclude any sunlight whilst still allowing air to circulate.
- Store in temperatures that are between 15 and 20°C (avoid temperatures lower than 15°C) and away from any moisture or damp, and any sources of ozone (sunlight, welding, or salty atmospheres), and away from any other corrosive agents.

Note that any rubber gaskets that have been subjected to a low temperature during freight or storage can stiffen from the cold and should be "thawed" at approximately 20°C for at least 24 hours prior to use.

2. Installation Instructions

2.3. Location and Handling

Great caution should be exercised at all times during lifting and manoeuvring of packaged plate heat exchanger systems to minimise the risk of damage to the unit, to personnel, and to the surrounding area. Plate heat exchangers models from 400 kW to 600 kW feature lifting holes at the top of the head frame plates (shown in figure 1 on page 9).

Units should never be lifted while a secondary shunt pump is connected. If the system is still attached to a pallet base, lifting should be executed by lifting the whole pallet from underneath. The units can be removed from the pallet base using the following procedure:

- Attach suitable lifting equipment to the lifting holes provided in the head frame plate and gradually commence lifting.
- When the unit rises by approximately 30 degrees, cease lifting and check the security of lifting equipment, attachment points, and tackle. Place a block under the elevated end of the frame.
- Attach tailing crane lifting equipment to the top frame bar next to the support leg, and lift to take up slack in the lifting equipment.
- Continue lifting using both cranes. The main weight should be taken by the device fitted to the head frame plate. The tailing crane should only be used to steady the unit and to prevent the heat exchanger from falling back down onto the leg foot.
- Once the angle of the heat exchanger has reached greater than 45 degrees, the tailing crane can then be lowered slowly to stand the exchanger upright into the correct position.
- Care must be taken to ensure the safety of all personnel near to the exchanger during lifting. It is essential to take all necessary precautions to prevent the exchanger from crashing down onto the support leg foot when the angle of lift exceeds 45 degrees.
- Once the exchanger is upright, it can then be moved by attaching lifting equipment to the lifting holes in the head frame plate, and through the lifting holes in the follower frame plate. Before lifting, ensure that a wooden wedge is inserted in between the underneath of the top carrier bar and the follower end plate. Alternatively, attach a strap around the top carrier bar to support the leg end of the exchanger whilst it is being moved.

Plate heat exchangers should be lifted using the provided lifting holes where possible. Alternatively, the plate heat exchanger may be lifted using slings positioned under or through the base plate, whilst ensuring that the unit is steadied during manoeuvring.

The units can be steadied by additionally lifting via the top frame bar of the plate heat exchanger (valid for 400 kW to 600 kW units only) or by attaching a strap or sling around the top flanged pipe connection between the plate and the 4-port control valve. However, these steadying methods should only be applied in tandem with lifting from the lifting holes or base, and should never be used as standalone lifting methods.

The units should not be lifted from:

- The stainless steel threaded connections,
- the control panel, pump, valves, or any of the pipework or fittings not mentioned above,
- the follower or mobile frame plates unless wedges are blocked between the frame plate and the frame bars to prevent the plate from moving upwards,
- the intermediate frame plates/connection grids (if fitted), or
- the tie bolts near to, and after, the follower/mobile frame plate.

2. Installation Instructions

The unit is suitable for indoor installations only and must be positioned on a level floor or base capable of supporting the weight of the assembly when filled to capacity. When positioning the unit, suitable clearances for maintenance and access should be considered. A minimum clearance of double the width of the plate heat exchanger is required on either side of the exchanger to facilitate the removal and replacement of bolts and heat transfer plates.

The Adveco PPN and PPS ranges are supplied with insulation jackets as standard. These can be easily removed via zipper for the purposes of manoeuvring.

Gasketed plate heat exchangers do have the potential to leak at some point during their lifetime. Furthermore, any water storage equipment requires some provision against damage to surrounding infrastructure, electronics, and equipment in the event of a leak, damage, or unit failure. Acceptable methods of protection include drip trays, suitable bunding, a gulley, drainage, or a leak detection and warning system.

Additional precautions must be taken when the unit is installed in unheated spaces to prevent the risk of freezing during periods of shutdown.

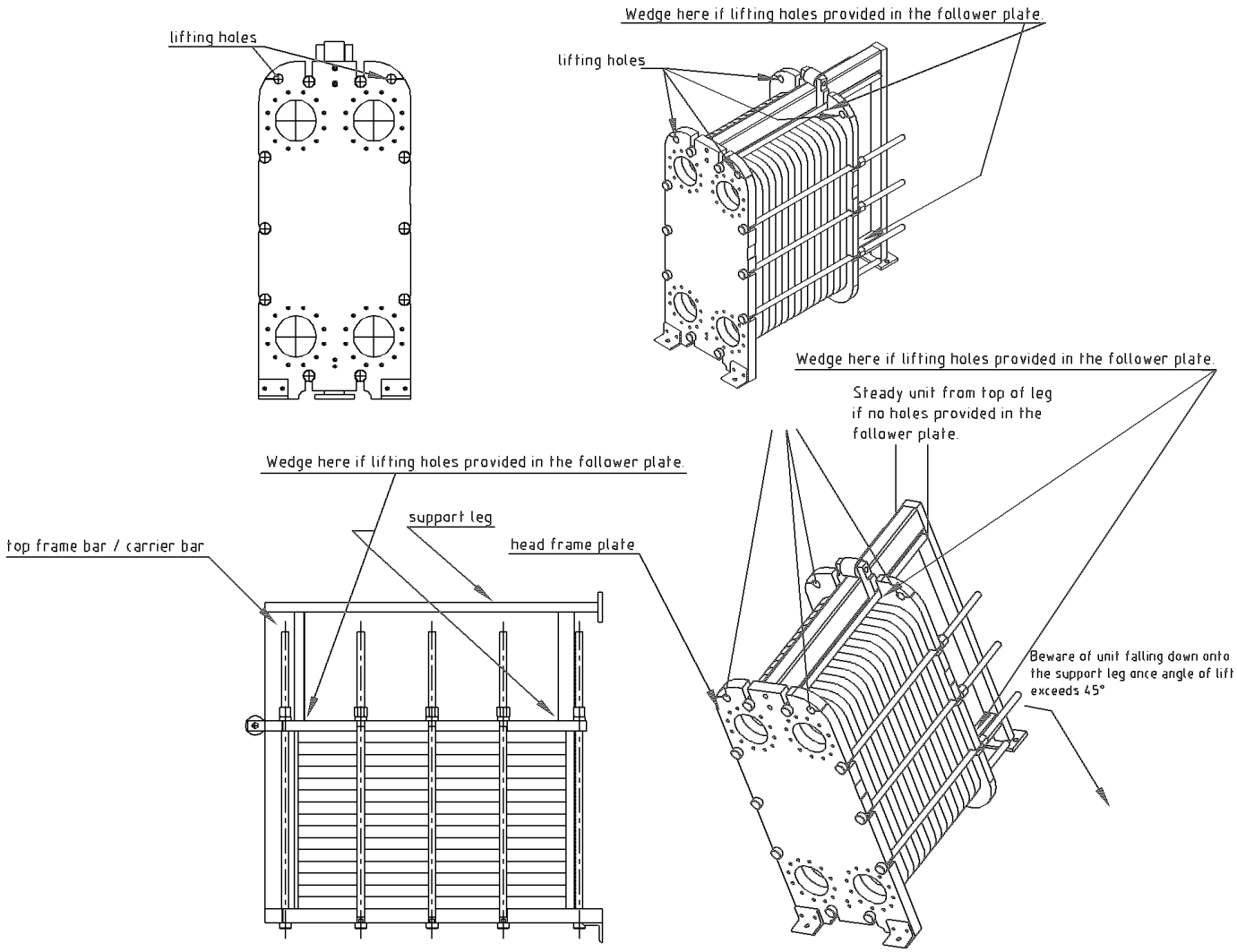

Figure 1: Lifting hole locations and instructions for 400 - 600 kW PPN and PPS units.

2. Installation Instructions

2.4. Unit Connections

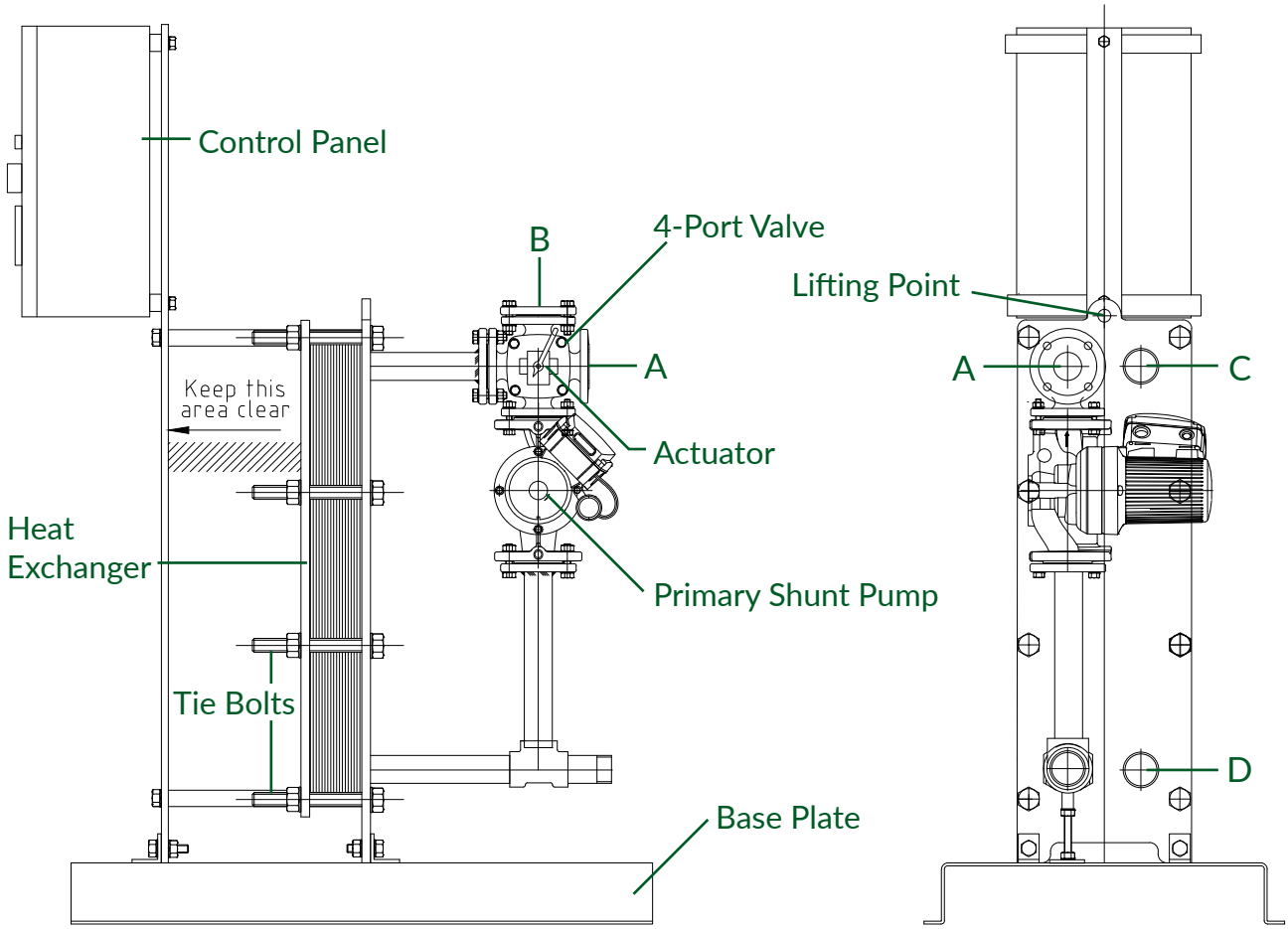

Figure 2: Unit connection positions and types. Example unit shown with single pump.

Table 1: Connections and sizes

Model	PPN-100S/T PPS-100S/T	PPN-150S/T PPS-150S/T	PPN-200S/T PPS-200S/T	PPN-300S/T PPS-300S/T	PPN-400S/T PPS-400S/T	PPN-500S/T PPS-500S/T	PPN-600S/T PPS-600S/T
A - Flow from primary (inch)	1.25" BSPT F	1.25" BSPT F	1.25" BSPT F	1.25" BSPT F	1.50" PN6 FLANGED	1.50" PN6 FLANGED	1.50" PN6 FLANGED
B - Return to primary (inch)	1.25" BSPT F	1.25" BSPT F	1.25" BSPT F	1.25" BSPT F	1.50" PN6 FLANGED	1.50" PN6 FLANGED	1.50" PN6 FLANGED
C - Secondary inlet (cold return) (mm)	1.25" BSPT M	1.25" BSPT M	1.25" BSPT M	1.25" BSPT M	2.00" BSPT M	2.00" BSPT M	2.00" BSPT M
D - Secondary outlet (hot flow) (mm)	1.25" BSPT M	1.25" BSPT M	1.25" BSPT M	1.25" BSPT M	2.00" BSPT M	2.00" BSPT M	2.00" BSPT M
Tie bolt size (mm)	19 (M12)	19 (M12)	19 (M12)	36 (M24)	36 (M24)	36 (M24)	36 (M24)

Full system schematics drawings are available in figures 18-19 on pages 37-38,

2. Installation Instructions

2.5. Pipework Installation

Connections on pipework must not be allowed to rotate. All pipework should be of an appropriate, non-corrosive material. Threaded connections are of type BS21, tapered male. It is necessary to install full support for all pipework and pumps beyond the unit to prevent excessive load bearing upon the unit connection points, which are not designed to bear additional weight.

Unless otherwise stated, the liquid circuits should be connected to flow in opposing directions through the exchanger, counter-current to one another. Refer to figure 2 on page 10 for connection positions and details.

To avoid damage to the unit, to prevent failure, and to ease maintenance, it is recommended to:

- Fit flexible couplings in the event that the pipework is subject to vibration
- Fully flush the pipework before attaching it to the exchanger. The exchanger acts as an effective filter, and will become blocked if pipework debris is allowed to enter the plate pack
- Fit suitable vents, isolation valves, and drains. Fit isolation valves as appropriate to allow servicing of the package without necessary draining of the complete system
- Fit non-return valves where appropriate
- Fit suitably sized pressure relief valves in the pipework on both circuits, as an essential safety requirement.

To avoid the possibility of thermal siphoning back from the primary return, it is recommended to incorporate non-return valves into the unit pipework. Due to the high efficiency of the heat exchanger, it is possible to over-heat the domestic hot water when there is no DHW circulation, causing the overheat thermostat to trip even when the primary shunt pump is not running.

Two wrenches should be used when attaching unions to threaded stub connections: One to tighten the union, and the other to prevent the stub end from rotating which prevents damage to the gasket inside the unit which seals against the back on the stub connection.

For best results, a non-hardening thread sealant should be used when attaching screwed unions, etc.

Flanged connections: If the connection nozzle hole is rubber lined, the liner will act as the flange gasket. Bolt the connecting flange directly to the end plate using the drilled and tapped holes provided. Tighten bolts evenly in a diametrically opposed sequence to avoid uneven loads across the connection, and avoid over-tightening which could strip the threads cut into the frame plate.

Bolt length: Before bolting flanged connections directly to the head plate, check to ensure that the bolts are not too long to avoid damaging the heat transfer plates in the pack. Bolts that are too long can cut through the back of the frame plate and piece the first number of heat transfer plates in the pack. This will cause the unit to leak around the connection areas at start up.

If stand-off, or loose backing flanges are fitted to the exchanger, a suitable gasket is required to seal the flange.

Vents and drains (not supplied as standard): Vents and drains need to be installed to allow adequate venting and draining of the exchanger. Locate vents and drains into the connecting pipework as close to the exchanger as possible.

2. Installation Instructions

2.6. Ancillary Installation

Pumps:

The primary circulation pumps rely upon water for cooling and lubrication purposes. To prevent damage, the pumps should never be run on a dry system.
If a domestic hot water shunt pump is supplied loose, the direction of the pump must be so that the water flows into the top right-hand side connections (connection C in figure 2, page 10). This pump should not be fitted until the unit has been installed in its final position, and the pump must be fitted with adequate supports so that no strain is put upon the heat exchanger connections.

Sensors:

There are two temperature sensors, one for control and one for overheat protections.
For the Adveco PPN range, both sensors are an in-line strap on type designed to be affixed lightly to the outside of pipework. Figure 3 is provided below for reference. In a standard system arrangement (as shown in figure 18 on page 37), the control sensor should be positioned on the DHW inlet pipe near to the exchanger (connection C in figure 2 on page 10). The overheat thermostat should be positioned on the DHW outlet (connection D), near to the exchanger.

If steel pipework is used, then for best results it is recommended that a section of steel pipe is replaced by copper, and the sensors attached to this section. Both sensors can be attached to the secondary flow pipework going to the services (flow from connection D shown on figure 2 on page 10). The control sensor must be attached to the pipe between 250 to 500 mm away from the exchanger, and the overheat thermostat should be located just after the control sensor.

For the Adveco PPS range, a probe type overheat thermostat can alternatively be installed into the top of the hot water buffer tank.

Route and clip the sensor wires as necessary. Do not attach any wires near, or onto the heat exchanger tie bolts, or along the length of the top horizontal frame bar of the heat exchanger.

The wires to both thermostats can be extended using 2-core flex for the sensor, and 3-core for the overheat sensor. Extending wires may impair the accuracy of temperature readings by up to ±2° due to the additional electrical resistance, at an increase of 0.1 ohms per metre, however this shall be consistent for all readings recorded by the panel.
Remove the wires directly from the panel, add a junction box, and then run the extended wires from the respective junction boxes to connect into the panel. If the original wires are cut, it will be necessary to add two junction boxes to increase the length. Due to the added electrical resistance, it is recommended to limit additions to one junction box.

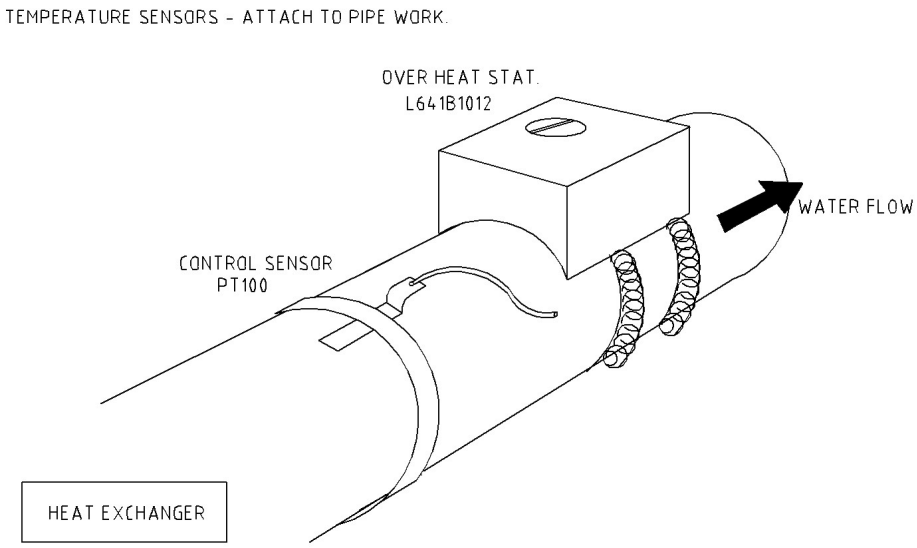

Figure 3: In-line strap type control and overheat thermostats and correct positioning (PPN systems)

The control sensor gives a resistance of 38 ohms. The sensor cables give a resistance of 0.1 ohms per metre.
The controller compares the resistance between an internal resistor and the sensor loop, then subtracts the difference to produce a reading. Therefore, if the length of the wires is increased, the comparison of resistances differs from the expected value, and a slightly different reading is recorded.

2. Installation Instructions

4-Port control valve (cast iron type) and actuator:

The 4-port control valve will be supplied pre-fitted to the packaged plate heat exchanger system. Prior to use, or if the system has been drained down for a period of time, it is important to check the operation of the valve. To do so, locate the button slide on the side of the actuator and push it forward to free the actuator drive from the valve. This will unlock the actuator drive from the valve stem, and allow the valve step to be moved manually from right to left, or left to right, depending on the initial position of the stem. The valve stem should rotate by approximately 90° before coming to a stop, and should move relatively easily.
If the valve stem cannot be moved, confirm that the button slide is pushed forward far enough and try again. If the stem still cannot be rotated, WD40 can be sprayed into where the valve stem goes through the valve body. If movement can still not be achieved, please contact Adveco Ltd. for advice.

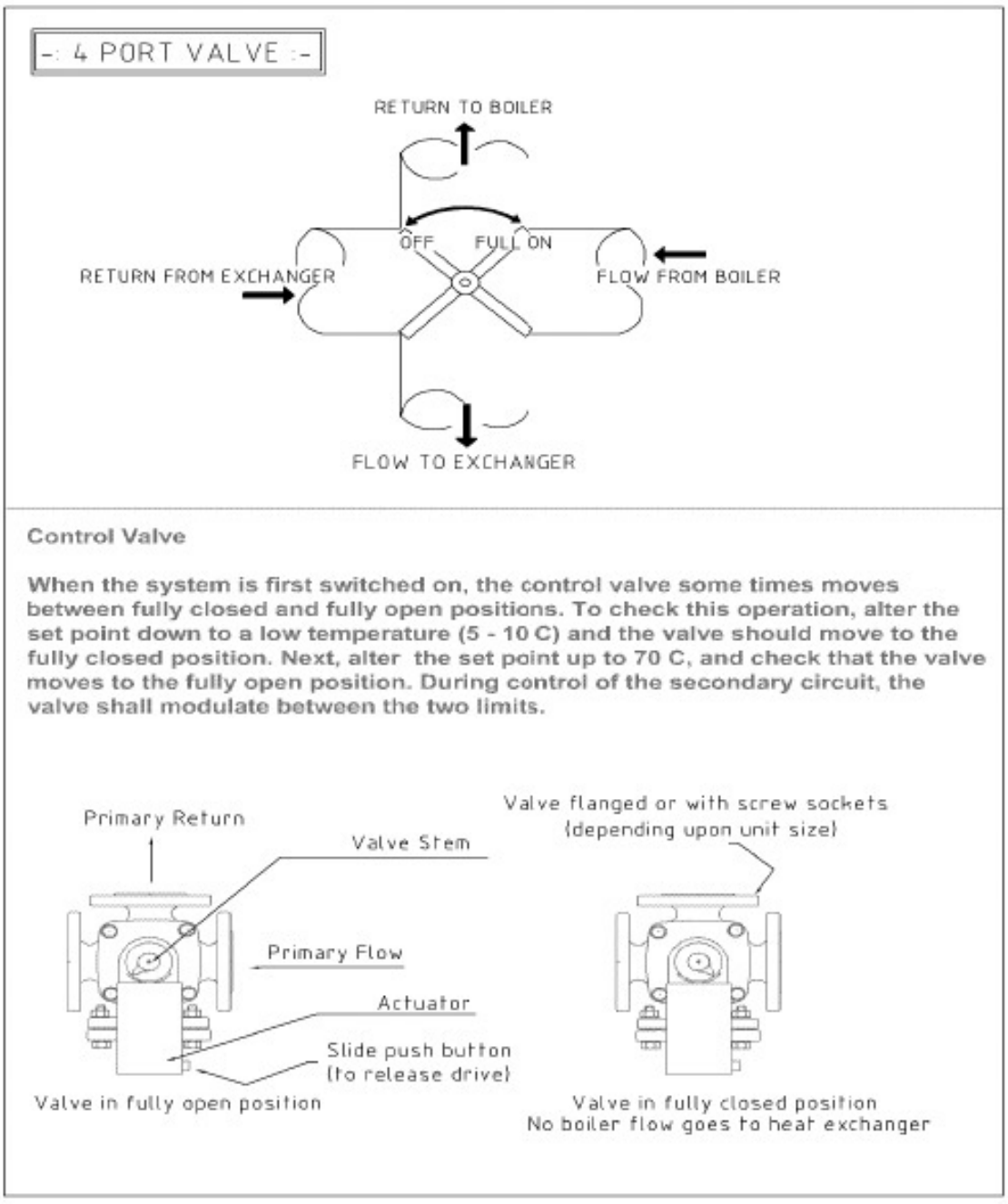

Figure 4: 4 port valve and control valve diagram and operation.

2. Installation Instructions

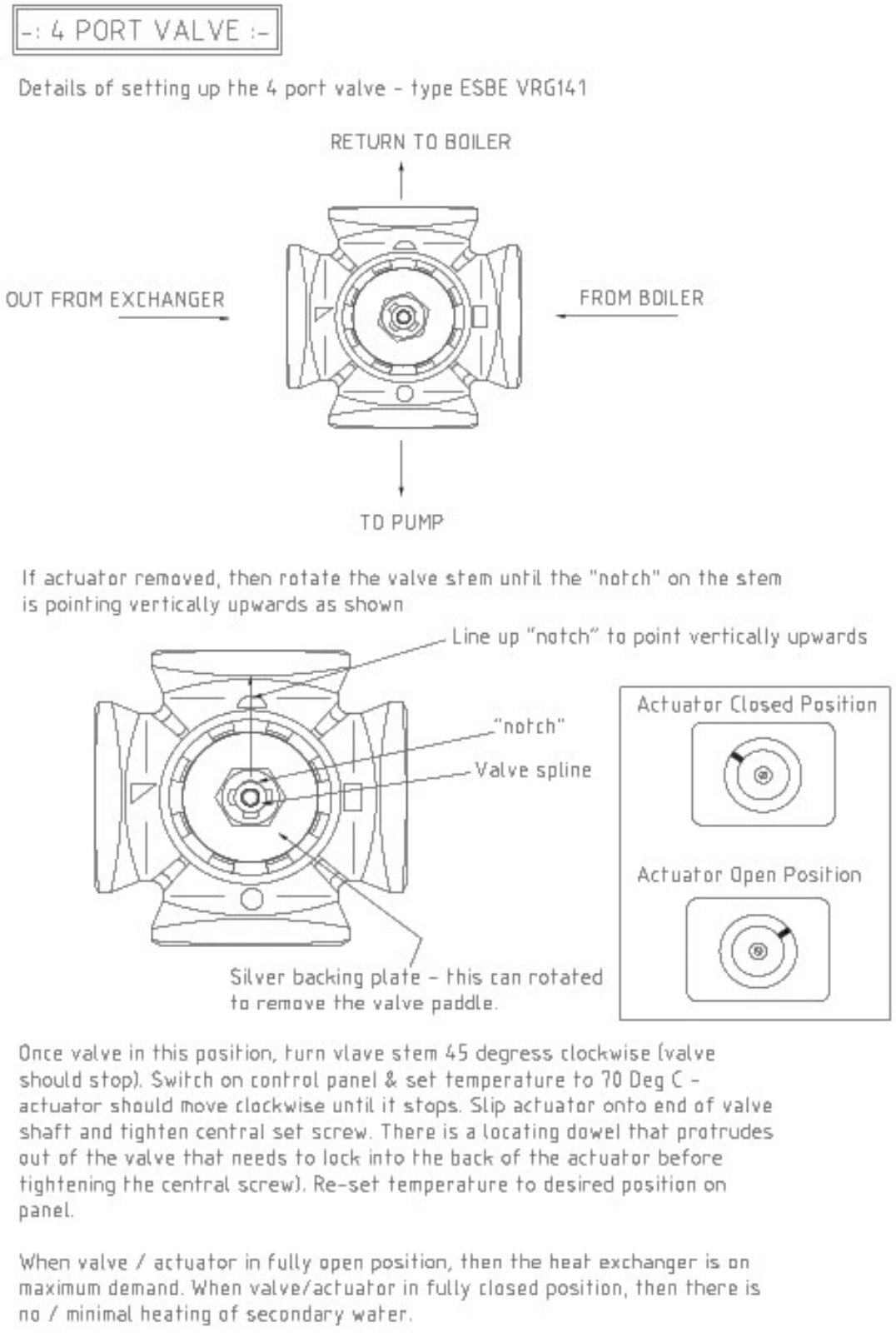

Figure 5: 4 port valve and actuator diagram and operation.

2. Installation Instructions

2.7. Electrical Installation

Connect the supply cable to the panel using a suitable isolation switch protected by a fuse or MCB rated at no more than 16 amps. The only connections required are the supply to the panel together with connection of secondary pump(s) if applicable. When a secondary pump is supplied with the package, the pump control cables are installed at the factory and clearly marked. They should be connected to the pump only after the pump has been fitted to the pipework. All other wiring is carried out at the factory. All wiring must be carried out by suitably qualified personnel in line with current regulations.

Panel enclosure:	IP 65, taking 240 volts.
Controller:	IP 54
Actuator:	IP 41 cover. Reduced to 24 volts
Pump terminal box:	IP 44. Takes full supply voltage from the control panel
Sensor:	Reduced to 24 volts. May be affected by moisture.
Overheat thermostat:	Reduced to 24 volts. Not designed for outside use, as internal rusting can occur.

The unit control panel can be installed in 4 possible orientations as shown below in figure 6. The standard arrangement features the panel facing towards the pump (1).

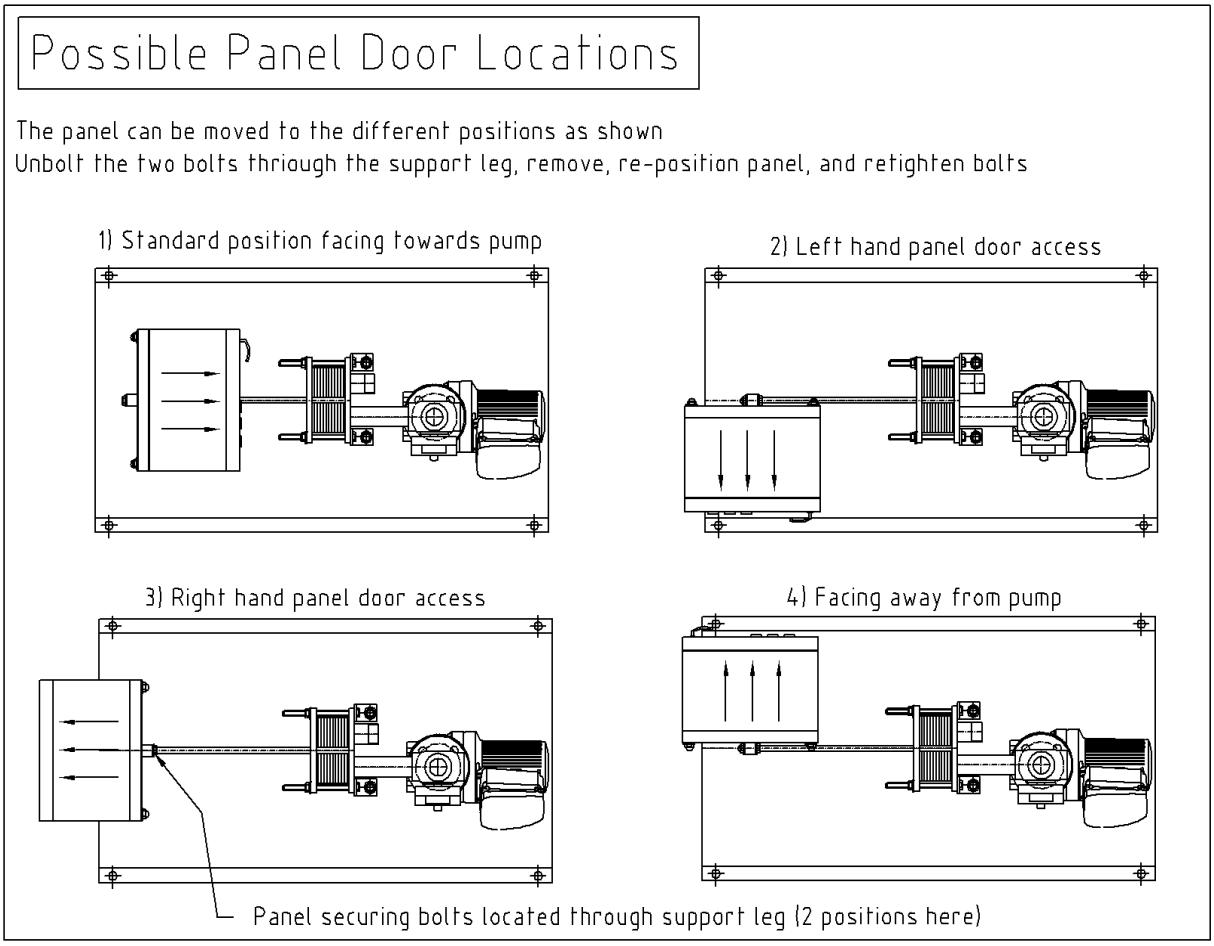

Figure 6: Alternative control panel configurations for the Adveco PPN and PPS ranges.

2. Installation Instructions

2.8. Controller Configuration and Start-Up

Shock: It is essential that the exchanger is not subjected to thermal or mechanical shock, as this could lead to premature gasket failure.

Operation in automatic mode: Once the pipework and electrical connections have been made, all miniature circuit breakers (mcbs) located in the panel should be set to "on" and the system filled and vented. The following procedure should then be carried out to start the unit:

1. The control panel should be switched on at the main isolator. The "controls healthy" lamp on the control panel will be illuminated to indicate that the panel is live with the control voltage available.
2. Each pump is fitted with a "Hand/Off/Auto" selector switch. If "Hand" is selected, the relevant pump will run. If "Off" is selected, the relevant pump will not run. If "Auto" is selected, the pump will run under the control of the time clock/ BMS interface.
3. The temperature controller is factory set at 10% proportional span and 5 sec integral time (auto reset). These settings should give reasonable results with most systems but, depending on the thermal response of the system, some adjustment may be necessary. Any such adjustment should only be carried out by a competent person. Full controller instructions are given in section 3.2 on pages 19-21.
4. Adjustment of the temperature set point can be carried out as follows:
   - From the normal run mode, press ↺.
   - The lower display will then show "SP", and the upper display will show the actual set point.
   - Press △ or ▽ to change the set point to the required value.
   - Finally, press ↺ to return to normal run mode.
5. The time clock (not fitted on BMS controlled panels) is factory set to the correct day and time. Should this need alteration, this can be done by pressing and holding the CLOCK key whilst pressing the DAY, HOUR, or MIN keys until the correct values are shown.
   The time clock (if fitted) is also factory set to switch ON at 07:30 and OFF at 20:00 every day. Should this need alteration, this can be done as follows:
   - Press the TIMER key once to enter program mode. The display will show "1 ON_:__C1"
   - Press the DAY key to choose one of the 15 different day combinations (see table on page 17) for the first ON time of channel 1.
   - Press the HOUR and MIN keys to select the desired first ON time for channel 1.
   - Press the TIMER key once. Display will now show "1 OFF_:__C1". Repeat the preceding steps to set the desired first OFF time for channel 1.
   - Repeat the entire sequence to set up four different ON/OFF times for channel 1.
   - When all required times are set, press the CLOCK key to return to run mode.

NOTE: On panels fitted with a time clock, twin head pump(s), and auto head changeover, channel 2 on the time clock is used with the panel to rotate the duty pump, and should not be altered from factory settings. Should this inadvertently be done, then it must be re-programmed as follows:

- Set the times for channel 1 as described above. Once this is complete, press the TIMER key so the display shows "1ON_:__C2".
- Press the DAY key until 14 is selected.
- Set the ON time to 00:01 using the HOUR and MIN keys.
- Press the TIMER key so the display shows "1OFF_:__C2".
- Set the OFF time to 23:59.
- Press CLOCK key to return to run mode.

2. Installation Instructions

Once all times are set, the clock must be put into AUTO mode by repeatedly pressing the CH A MANUAL key and CH B MANUAL key until the indicator bar on the display is above the word AUTO for both channels.

Reviewing the existing program can be done by repeated pressing of the TIMER key. When done, press the CLOCK key to return to run mode.

Timed operation can be overridden by pressing the MANUAL key to move the indicator bar on the display to the desired position (ON, OFF, or AUTO). Timed operation will not resume until the indicator bar is repositioned above the word AUTO.

All time clock adjustment can be done with the panel turned off.

The following table shows on days for DAY key settings:

Table 2: Operating days for DAY key controller settings (where × = ON).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mon	×	×	×							×		×		×	
Tues	×	×		×						×		×			×
Wed	×	×			×					×		×		×	
Thur	×					×				×			×		×
Fri	×						×			×			×	×	
Sat	×							×			×		×		×
Sun	×								×		×				

3. Commissioning Instructions

3.1. General Information and Start Up

Safety - Before starting:

- Ensure that all safety checks have been made and that all protective screens and safety devices are in place and fitted correctly.
- Check that the maximum working pressure and temperature of the system do not exceed the values stated on the unit data plate or design specification.
- Check that the liquids that are intended to be passed through the exchanger are all as per the design specification, and that they are suitable for the all wetted parts of the exchanger.
- Plate pack tightening: If the unit has been standing for some time before use, check the pack tightening dimensions. When the plate heat exchanger leaves the factory, the pack is not always set at the minimum assembly measure. It is recommended that the pack is tightened down to its minimum setting before use. For tightening dimensions and more information, consult section 4.5 on pages 25-27.

Water softening:

- It is ***essential*** to treat/soften the DHW prior to heating to reduce the build-up of scale inside the heat exchanger. Consult with a water softening specialist to determine the best method of treatment for the water in your area.

Avoid shocking the plate heat exchanger:

- It is essential that the exchanger is not subjected to thermal or mechanical shock.
- Both water hammer and thermal shock can be avoided by not using fast acting control valves, therefore sufficient consideration should be given to protecting the heat exchanger when designing the associated control systems.

Starting up the plate heat exchanger:

- Completely fill the system, ensuring that the pumps are primed/flooded.
- Fully vent the system, and then close vent valves.
- Close isolation valves between the pump and exchanger.
- Fully open valve fitted into return line from the exchanger.
- Start the circulation pump.
- ***Gradually*** open closed valve fitted to inlet line of exchanger.
- Vent circuit again if necessary.
- Repeat for other circuit(s).

Checks:

- Check system pressure and temperatures do not exceed exchanger design specification or the values stated on the unit data plate.
- Check for leaks, pressure pulses, and ensure that all pump and air vents are closed.

3. Commissioning Instructions

3.2. Temperature Controller Parameter List

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CAUTION: Installation should be only performed by technically competent personnel. Local Regulations regarding electrical installation & safety must be observed.

SELECT MODE

Select mode is used to access the configuration and operation menu functions.
It can be accessed at any time by holding down ↻ and pressing ↻.
In select mode, press △ or ▽ to choose the required mode, press ↻ to enter. An unlock code is required to prevent unauthorised entry to Configuration & Setup modes. Press △ or ▽ to enter the unlock code, then press ↻ to proceed.

Mode	Upper Display	Lower Display	Description	Default Unlock Codes
Operator	OPEr	SLCt	Normal operation	None
Set Up	SEtP	SLCt	Tailor settings to the application	10
Configuration	ConF	SLCt	Configure the instrument for use	20
Product Info	inFo	SLCt	Check manufacturing information	None
Auto-Tuning	AtUn	SLCt	Invoke Pre-Tune or Self-Tune	0

Note: The instrument will always return automatically to Operator mode if there is no key activity for 2 minutes.

CONFIGURATION MODE

First select Configuration mode from Select mode *(refer to section 2)*.
Press ↻ to scroll through the parameters, then press △ or ▽ to set the required value.
Press ↵ to accept the change, otherwise parameter will revert to previous value. To exit from Configuration mode, hold down ↻ and press △ to return to Select mode.

Note: Parameters displayed depends on how instrument has been configured. Refer to user guide (available from your supplier) for further details. Parameters marked * are repeated in Setup Mode.

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Input Range/Type	inPt	PT100 sensor		PtC
Scale Range Upper Limit	rUL	Scale Range Lower Limit +100 to Range Maximum		100
Scale Range Lower Limit	rLL	Range Minimum to Scale Range Upper Limit -100		0
Decimal point position	dPoS	0=XXXX, 1=XXX.X, 2=XX.XX, 3=X.XXX (non-temperature ranges only)		1
Control Type	CtyP	SnGL	Primary only	SnGL
		duAL	Primary & Secondary (e.g. heat & cool)	
Primary Output Control Action	CtrL	rEv	Reverse Acting	rEv
		dir	Direct Acting	
Alarm 1Type	AL1	P_Hi	Process High Alarm	P_Hi
		P_Lo	Process Low Alarm	
		dE	Deviation Alarm	
		bAnd	Band Alarm	
		nonE	No alarm	
High Alarm 1 value*	PhA1	Range Minimum to Range Maximum in display units		Range Max
Low Alarm 1 value*	PLA1			Range Min
Band Alarm 1 value*	bAL1	1 LSD to span from setpoint in display units		5
Dev. Alarm 1 value*	dAL1	+/- Span from setpoint in display units		5
Alarm 1 Hysteresis*	AHY1	1 LSD to full span in display units		1
Alarm 2 Type*	AL2	Options as for alarm 1		P_Lo
High Alarm 2 value*	PhA2			Range Max
Low Alarm 2 value*	PLA2			Range Min
Band Alarm 2 value*	bAL2			5
Dev. Alarm 2 Value*	dAL2	Options as for alarm 1		5
Alarm 2 Hysteresis*	AHY2			1
Loop Alarm	LAEn	diSA (disabled) or EnAb (enabled)		diSA
Loop Alarm Time*	LAt	1 sec to 99 mins. 59secs		99.59
Alarm Inhibit	Inh1	nonE	No alarms Inhibited	nonE
		AL1	Alarm 1 inhibited	
		AL2	Alarm 2 inhibited	
		both	Alarm 1 and alarm 2 inhibited	
Output 1 Usage	USE1	Pr1	Primary Power	Pr1
		SEc	Secondary Power	
		A1_d	Alarm 1, Direct	
		A1_r	Alarm 1, Reverse	
		A2_d	Alarm 2, Direct	
		A2_r	Alarm 2, Reverse	
		LP_d	Loop Alarm, Direct	
		LP_r	Loop Alarm, Reverse	
		Or_d	Logical Alarm 1 OR 2, Direct	
		Or_r	Logical Alarm 1 OR 2, Reverse	
		Ad_d	Logical Alarm 1 AND 2, Direct	
		Ad_r	Logical Alarm 1 AND 2, Reverse	
		rEtS	Retransmit SP Output	
		rEtP	Retransmit PV Output	
Linear Output 1 Range	tYP1	0_5	0 to 5 V DC output	0_10
		0_10	0 to 10 V DC output	
		2_10	2 to 10 V DC output	
		0_20	0 to 20 mA DC output	
		4_20	4 to 20 mA DC output	
Retransmit Output 1 Scale maximum	roIH	-1999 to 9999 (display value at which output will be maximum)		Range max
Retransmit Output 1 Scale minimum	roIL	-1999 to 9999 (display value at which output will be minimum)		Range min
Output 2 Usage	USE2	As for output 1		See or AI2
Linear Output 2 Range	tYP2	As for output 1		0_10
Retransmit Output 2 Scale maximum	ro2H	-1999 to 9999 (display value at which output will be maximum)		Range max
Retransmit Output 2 Scale minimum	ro2L	-1999 to 9999 (display value at which output will be minimum)		Range min
Output 3 Usage	USE3	As for output 1		A1_d
Linear Output 3 Range	tYP3	As for output 1		0_10
Retransmit Output 3 Scale maximum	ro3H	-1999 to 9999 (display value at which output will be maximum)		Range max
Display Strategy	diSP	1, 2, 3, 4, 5 or 6 *(refer to section 8)*		1
Serial Communications Protocol	Prot	ASCI	ASCII	rtbn
		rtbn	Modbus with no parity	
		rtbE	Modbus with Even Parity	
		rtbo	Modbus with Odd Parity	
Serial Communications Bit Rate	bAud	1.2	1.2 kbps	4.8
		2.4	2.4 kbps	
		4.8	4.8 kbps	
		9.6	9.6 kbps	
		19.2	19.2 kbps	
Comms Address	Addr	1	1 to 255 (Modbus), 1 to 99 (ASCII)	1
Comms Write	CoEn	r_W	Read/Write	r_W
		r_O	Read only	
Digital Input 1 Usage	diG1	di S1	Setpoint 1 / Setpoint 2 select*	di S1
		di AS	Automatic / Manual select	
Digital Input 2	diG2	di S1	Setpoint 1 / Setpoint 2 select*	di nS

Figure 7: Temperature controller parameter list (1 of 3)

3. Commissioning Instructions

Usage		d iAS	Automatic / Manual select	
		d rS	Remote / Local setpoint select	
Remote Setpoint Input Range	r inP	0_20	0 to 20 mA DC input	0_ 10
		4_20	4 to 20 mA DC input	
		0_ 10	0 to 10 V DC input	
		2_ 10	2 to 10 V DC input	
		0_5	0 to 5 V DC input	
		1_5	1 to 5 V DC input	
		100	0 to 100mV DC input	
		Pot	Potentiometer (2KΩ minimum)	
RSP Upper Limit	rSPu	-1999 to 9999		Range max
RSP Lower Limit	rSPL	-1999 to 9999		Range min
RSP Offset	rSPo	Constrained within Scale Range Upper & Scale Range Lower limits		0
Configuration Lock Code	CLoc	0 to 9999		20

SETUP MODE

Note: Configuration must be completed before adjusting Setup parameters.

First select Setup mode from Select mode *(refer to section 2)*. The MAN LED will light while in Setup mode. Press to scroll through the parameters, then press or to set the required value.

To exit from Setup mode, hold down and press to return to Select mode.

Note: Parameters displayed depends on how instrument has been configured.

Parameter	Lower Display	Upper Display Adjustment Range & Description	Default Value
Input Filter Time Constant	F iLt	OFF or 0.5 to 100.0 secs	2.0
Process Variable Offset	OFFS	±Span of controller	0
Primary Power	PPuJ	Current power levels *(read only)*	N/A
Secondary Power	SPuJ		
Primary Proportional Band	Pb_P	0.0% (ON/OFF) and 0.5% to 999.9% of input span	10.0
Secondary Proportional Band	Pb_S		
Automatic Reset (Integral Time)	Ar5t	1 sec to 99 mins 59 secs and OFF	5.00
Rate (Derivative Time)	rAtE	00 secs to 99 mins 59 secs	1. 15
Overlap/Deadband	OL	-20 to +20% of Primary and Secondary Proportional Band	0
Manual Reset (Bias)	b iAS	0%*(-100% if dual control)* to 100%	25
Primary ON/OFF Differential	d iFP	0.1% to 10.0% of input span centered about the setpoint. *(Entered as a percentage of span)*	0.5
Secondary ON/OFF Diff.	d iFS		
Prim. & Sec. ON/OFF Differential	d iFF		
Setpoint Upper Limit	SPuL	Current Setpoint to Range max	R/max
Setpoint Lower limit	SPLL	Range min to Current Setpoint	R/min
Primary Output Power Limit	OPuL	0% to 100% of full power	100
Output 1 Cycle Time	Ct 1	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 secs.	32
Output 2 Cycle Time	Ct2		
Output 3 Cycle Time	Ct3		
High Alarm 1 value	PhA 1	Range Minimum to Range Maximum	R/max
Low Alarm 1 value	PLA 1		R/min
Deviation Alarm 1 Value	dAL 1	±Span from SP in display units	5
Band Alarm 1 value	bAL 1	1 LSD to span from setpoint	5
Alarm 1 Hysteresis	AHY 1	1 LSD to full span in display units	1
High Alarm 2 value	PhA2	Range Minimum to Range Maximum	R/max
Low Alarm 2 value	PLA2		R/min
Deviation Alarm 2 Value	dAL2	±Span from SP in display units	5
Band Alarm 2 value	bAL2	1 LSD to span from setpoint	5
Alarm 2 Hysteresis	AHY2	1 LSD to full span in display units	1
Loop Alarm Time	LAt i	1 LSD to full span in display units	99.59
Auto Pre-tune	APt	d iSA (disabled) or	d iSA
Auto/manual Control selection	PoEn	EnAb (enabled)	
Setpoint Select shown in Operator Mode	SSEn		
Setpoint ramp adjustment shown in Operator Mode	SPr		
SP Ramp Rate Value	rP	1 to 9999 units/hour or Off (blank)	Off
Setpoint Value	SP	Scale range upper to lower limits. (when dual or remote setpoint options are used, SP is replaced by SP 1 & SP2 or LSP - or 2 before the legend indicates the currently active SP)	Scale Range Minimum
Local Setpoint Value	LSP		
Setpoint 1 Value	SP 1		
Setpoint 2 Value	SP2		
Setup Lock Code	SLoc	0 to 9999	10

AUTOMATIC TUNING MODE

First select Automatic tuning mode from Select mode *(refer to section 2)*.

Press to scroll through the modes, then press or to set the required value.

To exit from Automatic tuning mode, hold down and press to return to Select mode.

Pre-tune is a single-shot routine and is thus self-disengaging when complete.

If APt in Setup mode = EnAb, Pre-tune will attempt to run at every power up*.

Refer to the full user guide (available from your supplier) for details on controller tuning.

Parameter	Lower Display	Upper Display	Default Value
Pre-Tune	Ptun	On or OFF. Indication remains OFF if automatic tuning cannot be used at this time*	OFF
Self-Tune	Stun		
Tune Lock	tLoc	0 to 9999	0

Note: Automatic tuning will not engage if either proportional band = 0. Also, Pre-tune will not engage if setpoint is ramping, or the PV is less than 5% of input span from the setpoint.

Figure 8: Temperature controller parameter list (2 of 3)

3. Commissioning Instructions

PRODUCT INFORMATION

First select Product information mode from Select mode *(refer to section 2)*.

Press ↻ to view each parameter. To exit from Product Information mode, hold down ↻ and press △ to return to Select mode.

Parameter	Lower Display	Upper Display	Description
Input type	In_1	Un i	Universal input
Option 1 module type fitted	OPn1	nonE	No option fitted
		rLY	Relay output
		SSr	SSR drive output
		tr i	Triac output
		L in	Linear DC voltage / current output
Option 2 module type fitted	OPn2	As Option 1	
Option 3 module type fitted	OPn3	nonE	No option fitted
		rLY	Relay output
		SSr	SSR drive output
		L in	Linear DC voltage / current output
		dc24	Transmitter power supply
Auxiliary Option A module type fitted	OPnA	nonE	No option fitted
		r485	RS485 communications
		diG i	Digital Input*
		rSP i	Remote Setpoint Input *(basic)**
Auxiliary Option B module type fitted	OPnb	nonE	No option fitted
		rSP i	Remote Setpoint Input *(full)* and Digital Input 2*
Firmware type	FLU	Value displayed is firmware type number	
Firmware issue	ISS	Value displayed is firmware issue number	
Product Revision Level	PrL	Value displayed is Product Revision level	
Date of manufacture	dOM	Manufacturing date code *(mmyy)*	
Serial number 1	Sn1	First four digits of serial number	
Serial number 2	Sn2	Middle four digits of serial number	
Serial number 3	Sn3	Last four digits of serial number	

Messages & ERROR INDICATIONS

These messages indicate that an error has occurred or there is a problem with the process variable signal or its wiring.

***Caution:* Do not continue with the process until the issue is resolved.**

Parameter	Upper Display	Lower Display	Description
Instrument parameters are in default conditions	Goto	Conf	Configuration & Setup required. This screen is seen at first turn on, or if hardware configuration has been changed. Press ↻ to enter the Configuration Mode, next press △ or ▽ to enter the unlock code number, then press ↻ to proceed
Input Over Range	[HH]	Normal	Process variable input > 5% over-range
Input Under Range	[LL]	Normal	Process variable input > 5% under-range
Input Sensor Break	OPEN	Normal	Break detected in process variable input sensor or wiring
RSP Over Range	Normal	[HH] **	RSP input over-range ** *also seen wherever RSP value would be displayed*
RSP Under Range	Normal	[LL] **	RSP input under-range
RSP Break	Normal	OPEN **	Break detected in RSP input signal
Option 1 Error	Err	OPn1	Option 1 module fault
Option 2 Error		OPn2	Option 2 module fault
Option 3 Error		OPn3	Option 3 module fault
Option A Error		OPnA	Option A module fault or RSP in both A & B
Option B Error		OPnb	Option B module fault

OPERATOR MODE

This mode is entered at power on, or accessed from Select mode *(see section 2)*.

Note: All Configuration mode and Setup mode parameters must be set as required before starting normal operations.

Press ↻ to scroll through the parameters, then press △ or ▽ to set the required value.

Note: All Operator Mode parameters in Display strategy 6 are read only (see d iSP in configuration mode), they can only be adjusted via Setup mode.

Upper Display	Lower Display	Display Strategy and When Visible	Description
PV Value	Active SP Value	1 & 2 *(initial screen)*	PV and target value of selected SP. *Local Setpoints are adjustable in Strategy 2*
PV Value	Actual SP Value	3 & 6 *(initial screen)*	PV and actual value of selected SP (e.g. ramping SP value). *Read only*
PV Value	*(Blank)*	4 *(initial screen)*	Process variable only. *Read only*
Active SP Value	*(Blank)*	5 *(initial screen)*	Target value of selected setpoint only. *Read only*
SP Value	SP	1, 3, 4, 5 & 6 if digital input is not d iS I and RSP not fitted	Target value of SP. *Adjustable except in Strategy 6*
SP1 Value	_SP1	Digital input = d iS I. _ lit if active SP = SP1	Target value of SP1. *Adjustable except in Strategy 6*
SP2 Value	_SP2	Digital input = d iS I. _ lit if active SP = SP2	Target value of SP2. *Adjustable except in Strategy 6*
Local SP Value	_LSP	RSP fitted. _ or ¯ lit if the active SP = LSP	Target value of local setpoint. *Adjustable except in Strategy 6*
Remote SP Value	_rSP	RSP fitted. _ or ¯ lit if the active SP = rSP	Target value of remote setpoint. *Read only*
d iG i, LSP or rSP	SPS	RSP is fitted, digital input is not d iS I and SSEn is enabled in Setup mode	Selects local/remote active setpoint LSP = local SP, rSP = remote SP d iG i = selection via digital input (if configured). *Note: selecting LSP or rSP will override digital input, active SP indication changes to ¯* *Adjustable except in Strategy 6*
Actual SP Value	SPrP	rP is not blank	Actual (ramping) value of selected SP. *Read only*
Ramp Rate	rP	SPr enabled in Setup mode	SP ramping rate, in units per hour *Adjustable except in Strategy 6*

Manual Control

If PoEn is set to EnAb in Setup mode, manual control can be selected/de-selected by pressing the AUTO MAN key in Operator mode, or by changing the status of a digital input if d iG i or d iG2 have been configured for d iAS in Configuration mode.

While in Manual Control mode, the MAN indicator will flash and the lower display will show Pxxx (where xxx is the current manual power level). Switching to/from manual mode is via Bumpless Transfer. Press △ or ▽ to set the required output power.

***Caution:* Manual power level is not restricted by the OPuL power limit.**

Figure 9: Temperature controller parameter list (3 of 3)

4. Maintenance Instructions

4.1. Maintenance Requirements

Maintenance interval:	Once a year as a minimum
Performance:	Check temperatures and flows against commissioning data
Plate pack:	Check the tightening dimension, and look for any signs of leakage from heat exchanger. Tighten down to the minimum assembly measure if not already at this measure
Nozzles:	Check general condition, and for any signs of leakage
Frame:	Wipe clean all painted parts, and check surfaces for signs of damage - "touch up" if necessary
Bolts and bars:	Check for rust, and clean. Lightly coat threaded parts with molybdenum grease, or a corrosion inhibitor (it is important to ensure that no grease or oil comes into contact with the plate gaskets).
Electrical:	Check the security of all electrical connections and inspect the wiring for damage
Actuator/valve:	Spray WD40 or similar into valve spindle where it enters the valve
Rollers:	If fitted to the follower frame plate, lubricate bearings with light machine oil

4.2. Plate Shut Down

Tools: Ratchet spanners and ring or open-ended spanners, plus light machine oil. M24 (36 mm across flats).

Procedure:

- Slowly close the control valve on the "hot" circuit whilst maintaining the full flow on the "cold" circuit, then switch off the hot circuit pump.
- Slowly close the control valve on the cold circuit, then switch off the cold circuit pump.

WARNING: Water hammer and thermal shock can damage the exchanger, resulting in loss of fluid from one or more of the liquid circuits.

- Turn off the rotary isolator on the unit control panel and close all isolation valves on the pipework.
- Allow unit to cool, and drain the exchanger.
- Release all pressure from the inside of the exchanger.
- Lightly oil the tie bolt threads down either side of the exchanger.
- Undo the clamping bolts uniformly - keep the frame plates as parallel as possible during this operation.
- Push / pull back the mobile frame plate away from plates pack and secure if necessary.
- Separate heat transfer plates carefully, avoiding damage to gaskets.

For plate start up procedures, please see section 3.1. of this manual on page 18.

4. Maintenance Instructions

4.3. Opening the Plate Heat Exchanger

Warning: On some frame models, the heat transfer plates are supported by the lower frame bar as opposed to being "hung" from the top frame bar (DN65-2" and DN100-4" connection frames in particular). The plates can fall back when the follower frame plate is moved - take extreme caution while pulling back the follower plate on these models. This warning does not apply to other frame types, especially those where the plates are hung from the top frame bar.

Tools: Good quality friction / ratchet spanners and ring or open-ended spanners, plus light machine oil.

Safety: Wear gloves and any other protective gear necessary depending upon the types of fluids within the exchanger. The edges of plates are sharp and can easily cause injury.

Procedure:

- Allow the unit to cool, and clean off the tops of the plates using a brush or air line.
- Release all pressure from inside the exchanger by venting and draining in a safe manner according to the fluids that are contained within.
- If fitted, remove the pipework connected to the follower frame plate and the intermediate frame plates.
- Lightly oil tie bolt threads, and along the top of the frame carrier bar (uppermost frame bar).
- Undo the clamping bolts uniformly. Keep the frame plates as parallel as possible during this operation.
- Push / pull back the mobile frame plate away from plates pack and secure if necessary.

Separate heat transfer plates carefully, avoiding damage to gaskets.

4.4. Plate Types

Each plate is identified by the gasket arrangement, the number of port holes open, and the angle of the pressing. Consult figure 11 on page 24 for a visual reference.

Example plate code: L1234 High
Where:

L:	Left hand flow (No gasket O-rings around port holes on the left-hand side of the plate)
1234:	All port holes (#1, #2, #3, #4, counted clockwise from the top left port)
High:	Thermal length / theta type of the plate (angle of the pressing).

A left hand plate and a right-hand plate are effectively the same, except that one is rotated 180 degrees to the other.

The plates are always arranged in the pack so that they alternate between left and right-hand plates.

If any of the plates become damaged, these can be removed, however in order to respect the alternate handed plate rule, if a damaged plate is removed and not replaced, then the next plate in the pack must also be taken out (this shall be opposite handed to the damaged plate).

4. Maintenance Instructions

Plate Types

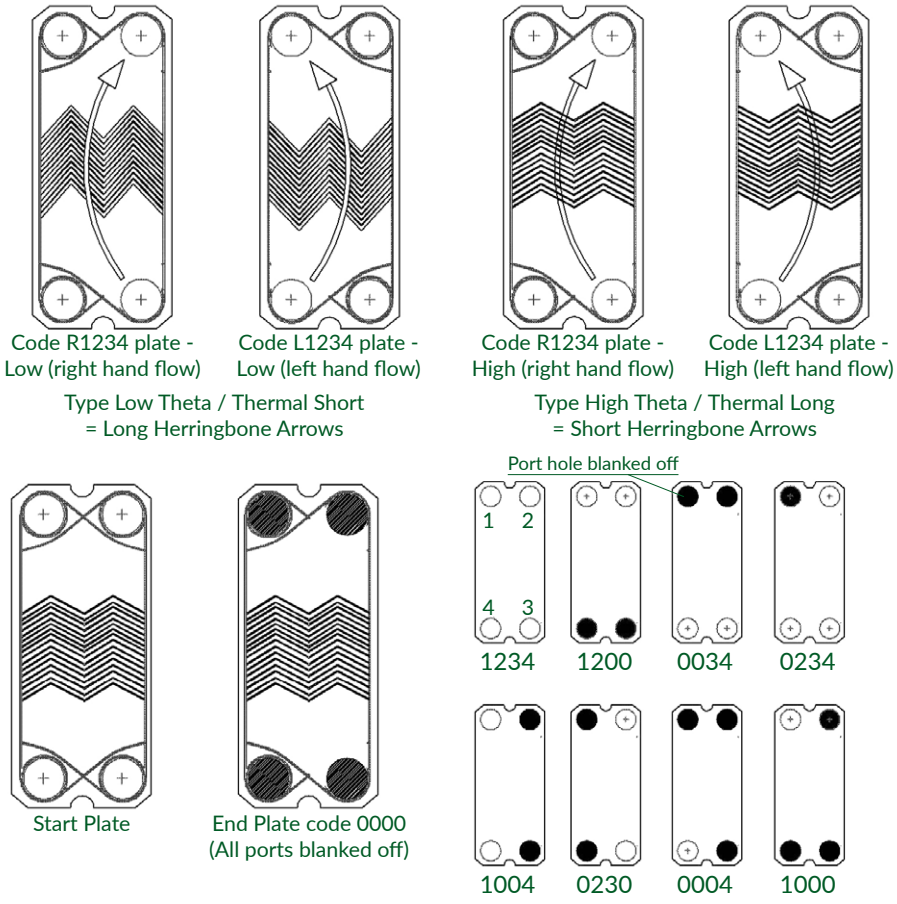


Figure 10: Plate types and identification.

Example plate code: L1234 High

Where:

L: Left hand flow (No gasket O-rings around port holes on the left-hand side of the plate)

1234: All port holes (#1, #2, #3, #4, counted clockwise from the top left port)

High: Thermal length / theta type of the plate (angle of the pressing).

Double Wall Plate Types:

Double wall plates are available upon request, and have the same appearance as the standard single wall plate types, as shown below in figure 11.

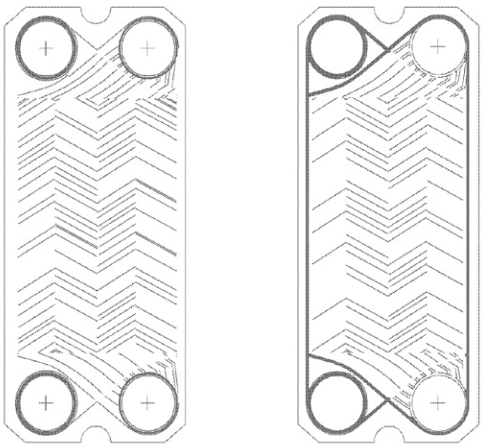


Figure 11:
Left hand plate view: "Back" plate with 4× O-rings fitted
Right hand plate view: "Front" plate with flow gasket fitted

The back plate locks in place behind the front plate. The four O-rings provide the seal between the front and back plate around the port holes.

Other types have 2× rings - the two plates lock into each other and the thicker O-rings act as the ring sections of the gasket as shown in the right-hand view (the ring section from the main gasket having been removed first so that the thicker / separate rings can replace this removed section).

Some types are not fitted with O-rings, instead the plates are laser welded together around where the O-ring seal would have been placed. These have standard plate gaskets fitted.

4. Maintenance Instructions

4.5. Plate Assembly

Warning: The edges of plates are sharp. Wearing gloves is recommended during assembly.

Plates must be clean, dry, and free from oil or grease before assembly. If there are any oil deposits on the gaskets, or on the gasket seating area, then there is a strong likelihood that the plates shall slip out of place when the unit is being tightened. If the gaskets are contaminated with dirt or grit, then leakage can occur.

On some frame models, the heat transfer plates are supported by the lower frame bar as opposed to being "hung" from the top frame bar. In this arrangement, the plates can fall back when they are loaded into the frame. Therefore, an assistant may be required to hold the plates in the frame until the follower plate can be pushed forward.

Please refer to table 3 on page 27 for the correct number of plates for the relevant PPN or PPS model, and section 4.4. on pages 23-24 to determine the plate types and arrangements required. Plates should alternate between left- and right-handed arrangements. If the plate edges form a regular honeycomb pattern, such as that shown in figure 12 on page 26 then the left-right sequence is correct. A standard installation will contain single-wall plate types only. Once identified, the plate assembly instructions are as follows:

- Fit the start plate, ensuring the plate pattern is pointing in the correct direction. If rubber liners are fitted into the head frame plate, check to see that the O-ring portion of the plate gasket around the port holes which position against the liner have been removed.
- Fit plates according to the determined plate arrangement. For some units, it may be necessary to ensure that plates do not fall backwards during pack assembly.
- Ensure that all gaskets face towards the fixed / head frame plate, unless stated otherwise in the gasket information on page 28. Ensure all gaskets are seated correctly and that all location tabs are correctly attached.
- Check that all plates are hanging correctly. Gently knock down the top of the plates if some are out of line.

Tightening:

- Lightly oil tie bolt threads. Ensure that oil and grease does not contaminate the gaskets or the gasket seating faces on the back of the plates. Wet or oil contaminated plates can become misaligned during tightening. In such a situation, all areas in contact with the gaskets should be dismantled, cleaned, and dried thoroughly before reassembly.
- Evenly tighten all bolts. The use of ratchet spanners is recommended. Bolts should be tightened in an opposing sequence as indicated in figure 12 on page 26.
- Ensure clamping is as uniform as possible, thus keeping the frame plates parallel throughout the operation. Avoid skewing the frame plates by more than 10 mm.
- Check to ensure that no plates have lifted out of line.
- Tightening is complete when the distance between the inside faces of the two frame plates equals the "A" dimension (see figure 12 on page 26) for the relevant model plate as given in table 3 on page 27. In some situations, application specific drawings may be provided that supersede this dimension. Any bespoke drawings or instructions should take precedence over the general guidelines contained within this manual.
- Perform a final check to ensure that all bolts are in tension, and clean any spilt oil or grease off the frame plates.
- Upon completion of tightening, the unit can be pressure tested (at working pressure only).

4. Maintenance Instructions

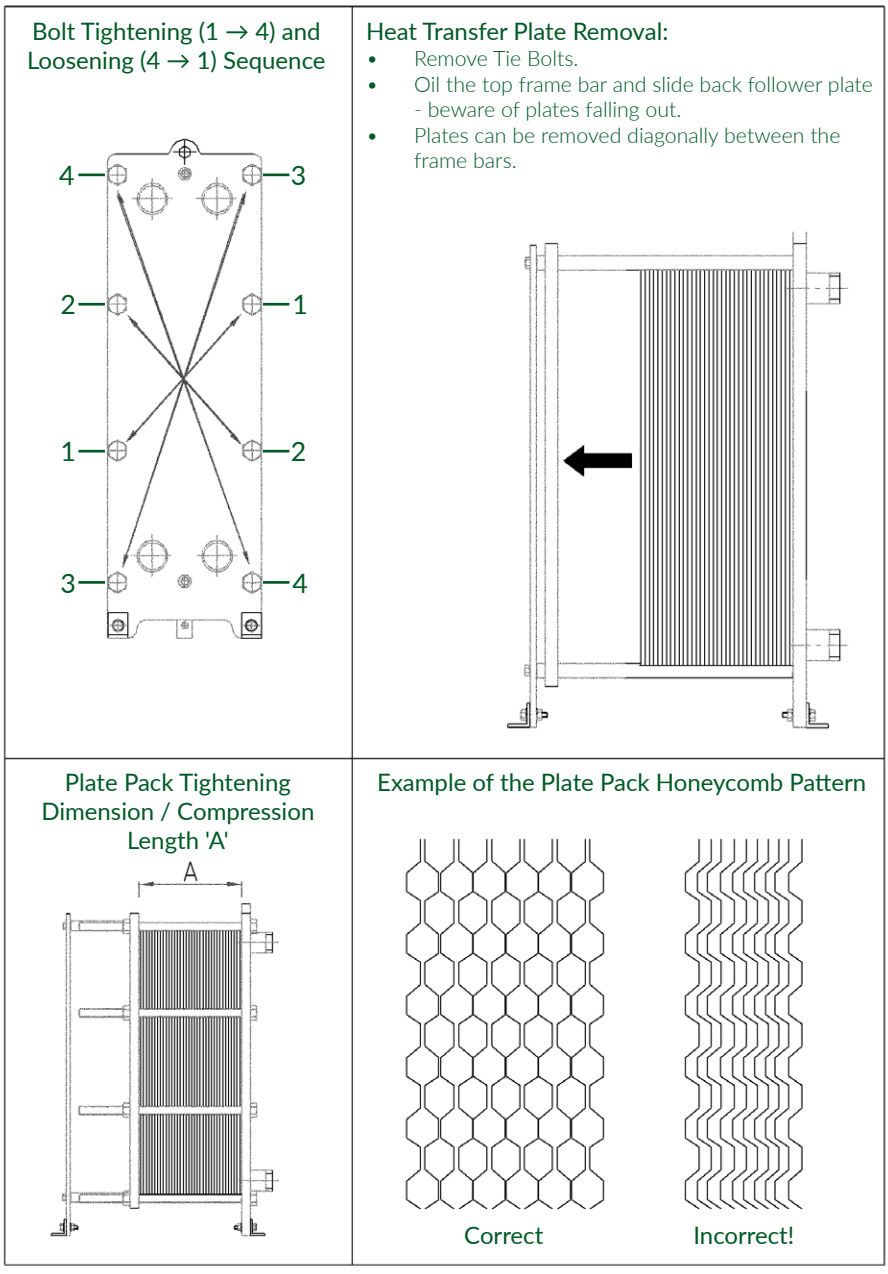


Figure 12:
Upper left: Plate bolt tightening and loosening sequence.
Upper right: Plate removal diagram.
Lower left: Plate pack compression dimension 'A'
Lower right: Plate pack honeycomb pattern for correct left-right arrangement.

4. Maintenance Instructions

Table 3: Plate pack tightening dimensions and plate quantities for PPN and PPS models.

Model	Number of Plates	A: Maximum Dimension (mm)	A: Minimum Dimension (mm)
PPN 100S/T PPS 100S/T	17	47	46
PPN 150S/T PPS 150S/T	25	70	68
PPN 200S/T PPS 200S/T	29	81	78
PPN 300S/T PPS 300S/T	40	112	108
PPN 500S/T PPS 500S/T	27	80	77
PPN 600S/T PPS 600S/T	29	86	83

4. Maintenance Instructions

4.6. Gasket Information

Rubber gasket types are shown in figure 13 on page 29.

O-rings: Where these are fitted, the flat side of the gasket is fitted into the circular gasket groove. If the O-ring is not flat on one side, then the thinnest part / side of the ring should be positioned into the gasket groove. It may be necessary to apply a small amount of gasket glue, or "Locktite" to hold the O-ring in place whilst the plate pack is being assembled.

For double-walled plates fitted with O-rings located between each pair of plates - the O-rings are around each port hole and prevent liquid from entering the gap between the plates. These rings are glued into position. Use adhesive sparingly when attaching these rings to the plates and ensure that they are located central inside the circular gasket groove in the plate around each port hole. Adhesive only needs to be applied to one plate (usually the "back" one as opposed to the "front" one) out of the pair of double walled plates. The adhesive is only applied to hold the ring in place during assembly. There are four O-rings per pair of plates.

Plate gaskets: If the gaskets are to be replaced, ensure that the same plate port holes remain "open" as with the old gasket. If several gaskets are to be replaced, and the plates have been cleaned so that the outline of the old gasket is no longer visible, then before attaching the gaskets, stack the plates with all the pressing / herringbone patterns facing in the same direction - the "arrow heads" facing towards you. Fix all gaskets to the plates so that the two port holes on the right-hand side of the plate are surrounded by the gasket O-rings.

Adhesive: Use chlorine-free glues only, such as Plioboard 20 or 30, Bostic 1782, 3 M EC 1099, Scotchgrip 847. Use adhesive in a well-ventilated area and wear gloves to prevent skin contact with the glue.

If no instructions are provided by the adhesive manufacturer, then it is recommended to apply a thin layer of glue spread into the plate Gasket groove, using either a narrow paint brush on a syringe. Contact adhesives also require a thin layer of adhesive to be applied to the flat faced side of the gasket. Check that, once stuck, the gasket will be correctly positioned, then fix the gasket to the plates, ensuring that all parts are seated into the gasket grooves, with no parts of the gasket stretched or "bunched". Stack the plates and then leave to set. Warm oven curing accelerates the drying process.

Snap in types: These require no adhesive - they are positioned by pushing the gasket fully down into the gasket groove, or by pushing the gasket lugs through holes in the plate (depending on type). Some of the lugs may need to be pulled through by using thin nose pliers to ensure correct seating.

Snap in types: These are fitted with "clips" made up of two or three prongs. These locate around the outside edge of each plate.

Rubber liners: If the rubber frame plate nozzle liners have an O-ring moulded into the liner itself, then this moulded O-ring fits into the gasket groove in the first heat transfer plate. Therefore, if new gaskets have been fitted, the O-ring portion of the plate gasket around the plate port holes shall have to be cut off and removed prior to assembly back into the frame. The start plate gasket then shall look like the lowest diagram in figure 13 (page 29).

NOTE: If there is no moulded ring in the back of the liner (the liner in this case would be thin and flat) then the start plate gasket would remain intact as per the middle sketch in figure 13.

Start plate: These are usually made up of 2 flow plate gaskets cut lengthways in half (see figure 13). They are usually glued into place - even if the other plates are adhesive free. Ensure that when preparing the start plate gasket, all lugs and webbing are cut off to allow the start plate to sit flat against the back of the frame plate. Units with rubber lined ports require the O-ring portion to be removed from the start plate gasket - see note above. Start plate gaskets for gasket systems that are either snap in or the clip-on type are usually supplied with the start plate gaskets glued into place.

4. Maintenance Instructions

EPDM gaskets: This material is harder than nitrile and therefore must be compressed gradually the first time it is used, to prevent distortion of the plates around the port hole region. This only applies to plates with port holes of 100 mm and above, and a thickness of less than 0.6 mm.

Compression 1: Minimum tightening dimension + 15%. Leave for 2 hours.

Compression 2: Minimum tightening dimension + 7.5%. Leave for 12 hours.

Compression 3: Tighten down to either maximum tightening dimension or, alternatively, the minimum.

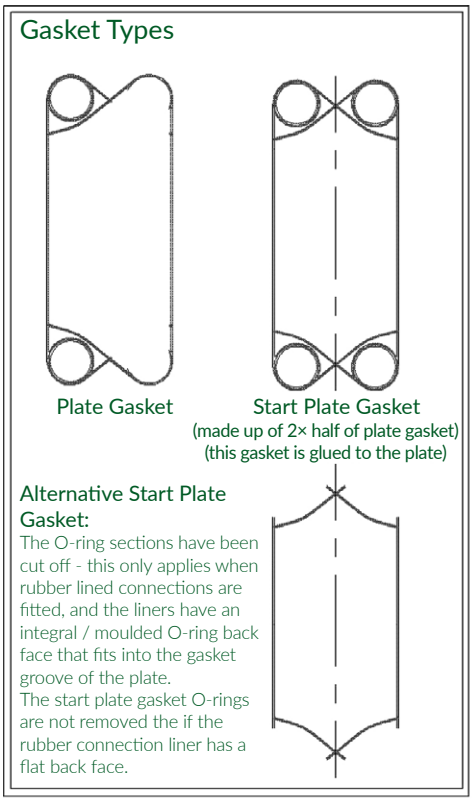


Figure 13: Plate gasket types.

4. Maintenance Instructions

4.7. Plate Cleaning

Safety: Wear gloves and eye protection when using cleaning detergents.

Brushing: Use nylon or other types of "soft" scrubbing brushes with detergent. Never use a metal brush, steel wool, or sand or glass paper.

Gasket glue: Removal - use acetone. Alternatively, use a LP gas flame, heating the reverse side of the plate. Do not use any other type of gas which may produce a "harder" flame. A tank of boiling water can be used to soften the glue.

Detergents: Consult a cleaning specialist for a suitable choice of detergent. Ensure that all detergents used are compatible with the plate (316 stainless steel) and gasket (Nitrile rubber or EPDM-WRAS) material before use.

Clearing deposits:

- Oxide or chalk deposits - use a 2-5% nitric acid solution.
- Organic, protein containing deposits - use a 2% solution of sodium hydroxide at a temperature of 50°C.
- Grease deposits - use neat kerosene, or an emulsifying agent (Jizer or Gunk).
- Lime deposits - using a 10% nitric acid solution, soak at room temperature for 10 minutes, followed by a caustic soda wash.

C.I.P.: If the solution requires recirculation, select a flow that is as high as possible, and certainly no less than the service or product flows. Follow the instructions as given by the detergent supplier / cleaning specialist. It is recommended that for recirculated cleaning detergent methods, the fluid should be pumped through the exchanger for no less than 30 minutes.

- Milk deposits - circulate 1.5% nitric acid at 65°C (2.4 litres of 62% HNO in 100 litres of water).
- Organic or grease deposits - circulate 1.5% sodium hydroxide (NaOH) at 85°C (5 litres of 30% NaOH in 100 litres of water).

Rinsing: After using any type of cleaning agent, always rinse thoroughly with fresh water. If cleaning in place, then circulate fresh water for at least 10 minutes.

"Roughing": This is a red, or if high temperatures are involved, a black, sometimes hard and shiny, coloured coating on the plate surfaces. This can only be removed by citric acid dipping as mechanical cleaning is not effective unless a polishing type machine is used. The coating is formed if high chlorides are present in the fluid being passed through the exchanger, and is part of the corrosion of the stainless steel plates. It is most likely that the plate surface shall become pitted, and passivation of plates is a necessity if the chloride levels cannot be reduced. However, continued use of the stainless steel plates in this environment shall lead to a complete failure of the material and a plate pack replacement shall be necessary.

4. Maintenance Instructions

4.8. Troubleshooting

Heat exchanger plate pack assembly:

1) Nuts too tight to turn:	On assembly: Insufficient oil on threads On disassembly: Pressure still inside unit. Isolate, drain, and vent.
2) Plates move out of alignment:	Remove plates and degrease, then dry. Inspect plate hanging system for damage.
3) Plates ride up during tightening:	Loosen the plate pack, knock down the plates, and re-tighten with the top of the frame plate slightly in further than the bottom. Even out when close to assembly measure.

Excessive pressure drops:

1) Liquid flows higher than design:	Check and adjust.
2) Plate channels blocked:	Back flush, C.I.P., or dismantle to clean.
3) Inaccurate measurement:	Check pressure gauge for accuracy. Ensure measurement does not include any bend, valve/fitting, and pipe run losses.
4) Liquid temperature below design:	Viscous media generate higher resistance to flow at lower temperatures.
5) Media not used as per design:	The addition of glycol or other additives can increase the pressure drop.

Leakage:

1) Leakage near connection:	Check condition of nozzle liner (if fitted). Check condition of O-ring gaskets on first plate (O-ring can be damaged or pulled out of place if the connection has rotated). Check the flange gasket (if fitted). First heat transfer plate damaged - dismantle heat exchanger plate pack, and check condition. Crack in weld at joint - Dye pen. Check and repair (remove plates out of heat exchanger before welding). Check the stub connection backing flange for splits. Check length of bolts used to bolt flanges directly to the head plate - bolts that are too long can cut through the head plate and pierce the first heat transfer plate in the pack. Isolate, drain down, remove flange bolts that are too long and replace with shorter ones, replace pierced plates, and reassemble.
2) Cross contamination:	Check all plates for cracks and / or holes.
3) Leakage from plate pack:	Check tightening dimension (see table 3 on page 27). Check condition and of gaskets. Check that all gaskets are seated correctly. For double wall plates, check plate O-rings or welds.
4) Leakage between plates (double wall plates):	O-ring or plate failure. Replace ring, or replace plate pair if welded type. Check for cracks or holes in plate.

For nearly all leakage problems, it is necessary to dismantle the plate pack before any attempts to rectify the fault can be made. Mark the area(s) from where the leaks are occurring before taking apart the exchanger to assist in fault finding once plates are taken out of exchanger.

Cold leakage: Caused by a sudden change in temperature. The sealing properties of certain elastomers can be temporarily reduced during sudden temperature changes. No action is required as gaskets should re-seal upon stabilisation of temperature.

Gasket failures are generally a result of old age, ozone exposure, operating temperatures in excess of the material limit, pressure surges, chemical attack, or physical damage arising from poor assembly or misaligned plates.

4. Maintenance Instructions

Decrease in performance:

1) Plate surfaces require cleaning or de-scaling.

2) Pumps or associated controls have failed.

3) Plate channels are blocked.

4) Liquid flows not as per the design specification.

5) Associated boiler, cooling tower or chiller is under-sized.

6) Primary temperature is lower than the design figures.

7) Cooling water flow temperature to the exchanger is higher than design.

8) Plate pack has been assembled or installed incorrectly.

9) Unit running in co-current flow, instead of counter current. Check with contract drawing and alter pipework if necessary, and check direction of pump flows.

10) Air lock has been developed in the plate pack.

11) Sensors faulty (check first that they are securely fastened around pipework).

No secondary flow:

1) Electrical fault	Check electrical supply to control panel together with the mcbs fitted within the panel.
2) Pump tripped (trip lamp illuminated on control panel)	Reset overload within the control panel using the blue reset button fitted on the relevant overload: F112 - Primary pump 1 F132 - Primary pump 2 (if fitted) F152 - Secondary pump 1 (if fitted) F172 - Secondary pump 2 (if fitted) Should the pump fail to restart, a problem may exist elsewhere in the system, and advice should be sought from the installer/supplier. For a twin-headed pump, switch the control dial to "manual" to change over the pump head that is currently in operation.
3) High limit shutdown (high temperature lamp illuminated on control panel facia)	The system will need to be reset after a high limit shutdown. Wait for a few minutes to allow the temperature to cool slightly and then press the manual reset button. Should the problem fail to reset or frequently reoccur, advice should be sought from the installer/supplier.
4) Air lock in system	Vent air from system.
5) Not in correct mode of operation	Check main control switch / time clock.

Primary or secondary pump fails to activate:

1) Circuit breaker tripped or set to "off"	Check circuit breakers inside the panel.
2) Pump has tripped out of a fault	Could be indicative of an excessively high current. If the unit is new, check the direction of the pump rotation and check to see if the pipework has been connected correctly. The current drawn should be checked by an electrician and compared against the pump manufacturer's technical data sheets.
3) The overload setting of the panel is too low	The setting can be adjusted by a qualified electrician only. The wiring diagrams included in figures 20-25 on pages 39-41 can be consulted to find the location of the overload and the factory setting. There is a scaled dial on the overload which can be rotated to increase or decrease the overload current. Caution: Too high a setting reduces the protection on the pump.
4) Pump motor burnt out or faulty	Contact the Adveco sales department for replacement parts.

4. Maintenance Instructions

Secondary water temperature too high / low, or unit cuts out on overheat:

1) Wrong set point on controller	Adjust controller. Consult section 2.8 on page 16 for details.
2) Air lock in pipework	Vent the system.
3) Primary water temperature too high or too low	Ensure that boiler or source of primary temperature water is functioning correctly, and rectify as required.
4) Primary water flow too high / too low, or secondary flow not correct	Ensure that primary and/or secondary water pump(s) source is/are performing correctly, and rectify as required.
5) Fault in temperature sensor	A qualified electrician is required to check the sensor and the wires. Isolate the panel, then disconnect the temperature sensor wires (not the overheat stat) from the panel and measure the resistance. The resistance should be around 110 Ω (depending on temperature). If a reading of "infinite" is shown then there is an open circuit, and the most likely cause is that the wires leading to and from the circuit are broken. If the reading is zero, then there is a short circuit. Check and replace the wires/sensor.
6) Actuator fault - the valve does not modulate, or move during operation	Actuator failed - remove from valve (see page 34 for details). Alter set point to low temperature and check to see if actuator drive turns to fully closed position, and then alter set point to a high temperature and check to see if the drive rotates a full 90° from the fully closed position. If not, or insufficient travel of the drive is observed, then the actuator requires replacement.
7) Control valve seized or binding	Check for binding and seizure. Remove actuator (see page 34 for details) and then try to rotate valve stem. You can use grips on the end of the stem as an aid, but ensure that the stem is protected from damage from the grips. The valve should rotate freely throughout the range of travel. Sediment build up can block the action of the valve and this rotating action can sometimes be enough to free the component. If binding persists, isolate the unit, shut down, and drain the primary circuit. The inner parts of the valve can be removed without taking the complete valve off the pipework. a) Cast iron valve type: Loosen the 4 bolts on the side of the valve body and pull the body back to the side panel. This may require a lever, but damage to the sealing face should be avoided. Inspect, clean and lubricate or replace with new components. If it looks as though the paddle is binding against the valve body, any "proud" or high points can be shaved down by using wet and dry, or emery, paper. b) Brass valve type: Rotate the silver disk until the lugs on the disk are no longer underneath the brass noggins and then pull out the stem and valve paddle. There is a sealing O-ring which needs to be protected from damage. If the paddle is tight to remove, replace the central bolt into the stem and use the bolt to aid in pulling out the paddle part of the valve. If it looks as though the paddle is binding against the valve body, any "proud" or high points can be shaved down by using wet and dry, or emery, paper. A possible remedy without taking out valve inners may be to spray lubricant (such as WD40) onto the valve shaft bearing (see page 13 for details) and then locate the stem a few times to work in the lubricant.
8) Primary circuit pressure feeding PHE too high	If the pressure of primary circuit is too high, it can be greater than what the primary shunt pump on the exchanger control loop is capable of pumping against. If this is the case, the primary shunt pump fails to pump back against the loop of the main primary circuit as it is effectively "fighting" against the pressure of the primary circuit. The primary circuit pressure must be reduced to allow the shunt pump to circulate water through the exchanger.

4. Maintenance Instructions

Actuator Replacement:

1) Switch off and isolate panel

2) Undo the central bolt holding the actuator to the valve stem, and pull off the complete actuator assembly.

3) Spray WD40 or similar into the valve stem bearing to lubricate the valve, and rotate a few times from left to right.

4) Remove the cover on the new actuator, and set the dip switches and links as shown in figures 14 and 15 below. Plug in wires and refit the actuator cover.

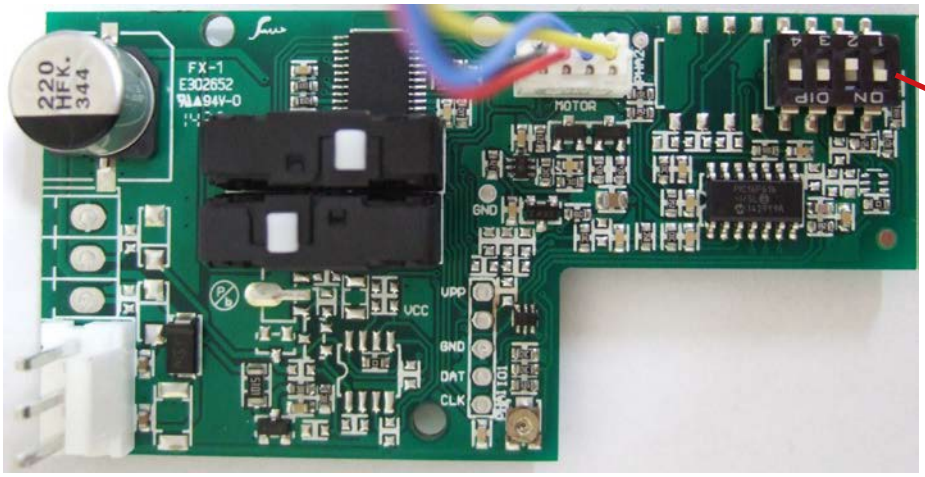


Figure 14: ARA659 Actuator switch settings:

Dip Switch positions

- Switch No.1 towards ON for fastest speed.
- Switch No.2 away from ON for clockwise operation.
- Switch No.3 and No.4 both towards DIP for 4-20 mA.

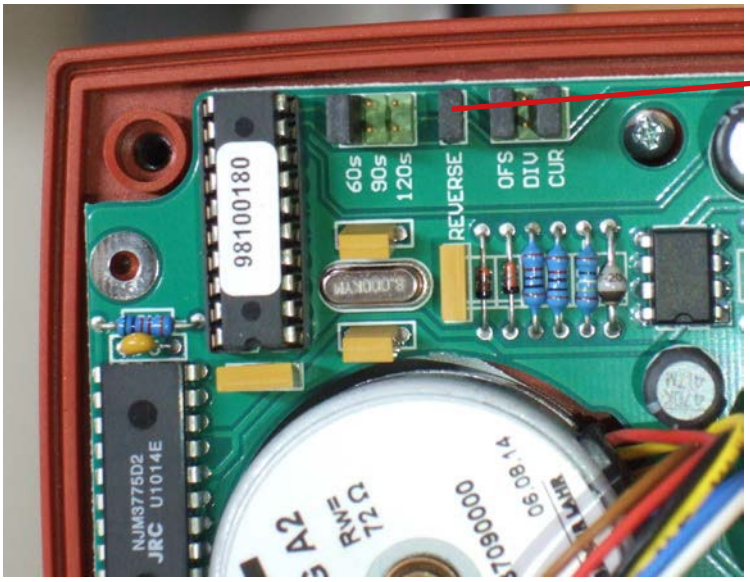


Figure 15: 92P Actuator link settings:

Link positions

- Link across both "60s" pins for fastest speed.
- Link across both "REVERSE" pins for clockwise operation.
- Link across "OFS" and "CUR" pins for 4-20 mA.

5) Rotate the control valve stem fully until it stops.

6) Switch on the panel, set the temperature to high to force the control system to rotate the actuator to the fully open position, install actuator (note: ensure that the back of actuator locks into the locating dowel protruding from the valve body) and then tighten the central screw. Do not over tighten, and ensure that the pointer is to the right (valve fully open), and that the actuator knob is fully pushed in.

7) Alter the control set point to a low temperature. The actuator should move until it stops at the fully closed position. Alter the control set point to a high temperature, and the actuator should move to the fully open position. If all OK, then reset the control temperature to the desired value.

5. Spare Parts List

For visual parts reference, consult figures 16 and 17 on page 36.

Number	Quantity	Description	Part Number (PPN-PPS 100-300)	Part Number (PPN-PPS 400-600)	Notes
1	1	Pipe end stop	UKE8-ES-1.25	as serial no.	Painted RAL9005
2	1	OH thermostat strap	717-strap	717-strap	
3	1	Overheat thermostat	20-90 C range	20-90 C range	Strap on type
4	1	Control sensor strap	716-strap	716-strap	
5	1	Control thermostat	716	716	1.5 m wire
6	1	Actuator	721	722	24 volts
7	1	4 port valve	703	as serial no.	DN32
8	1	Primary pump	as serial no.	as serial no.	240 V / 1-phase
9	2	Panel Unistrut	as serial no.	as serial no.	to suit panel
10	1	Control panel	as serial no.	as serial no.	Painted
11	8	Tie bolt	as serial no.	as serial no.	
12	varies	HX plate	as serial no.	as serial no.	For plate types see pages 23-24.
13	varies	Plate gasket	as serial no.	310	WRAS
14	1	Head endplate	1190	1195/96	Painted RAL9005
15	1	Follower plate	1191	1197	Painted RAL9005
16	1	Leg fixing set	--	--	
17	1	Column end plug	PPC111200	--	22x22 I.D., plastic
18	1	Support column	1192	1198	100-300: 25x25x1.5x1320 400-600: 30x12
19	1	Base plate	--	--	100-300: 1000x560x5 400-600: 1000x620x5 Painted RAL9005
20	2	End bar nut	--	--	
21	1	Bottom bar	1073	1060	100-300: D.12 x 437 mm AISI 304 400-600: D.28 x 333 mm BZP
22	1	Top frame bar	1073	1060	100-300: D.12 x 437 mm 400-600: D.28 x 333 mm
23	2	Head foot bolt	--	--	
24	2	Head feet	--	--	IG type. AISI 304
25	2	Connections	201	210	100-300: 1.25" BSPT Male 400-600: 2.00" BSPT Male AISI 316
26	1	Valve flange gasket	--	as serial no.	Fibre
27	2	Pump gasket	as serial no.	as serial no.	Fibre

5. Spare Parts List

Figure 16: Adveco PPN and PPS - 100-300 kW models part diagram.

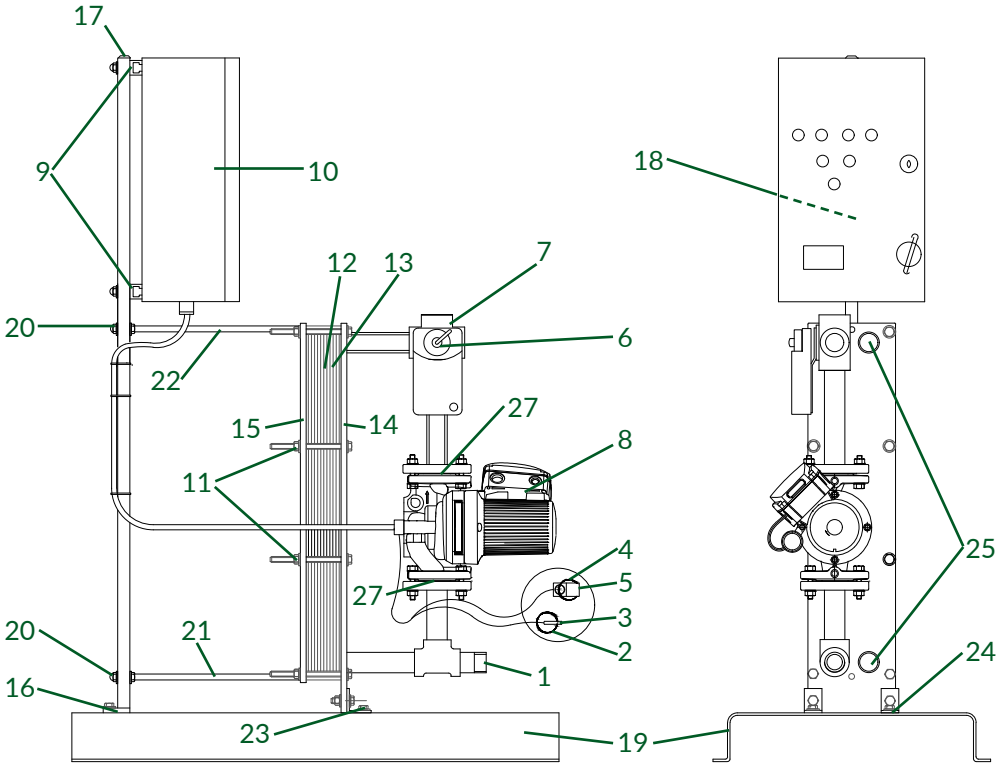
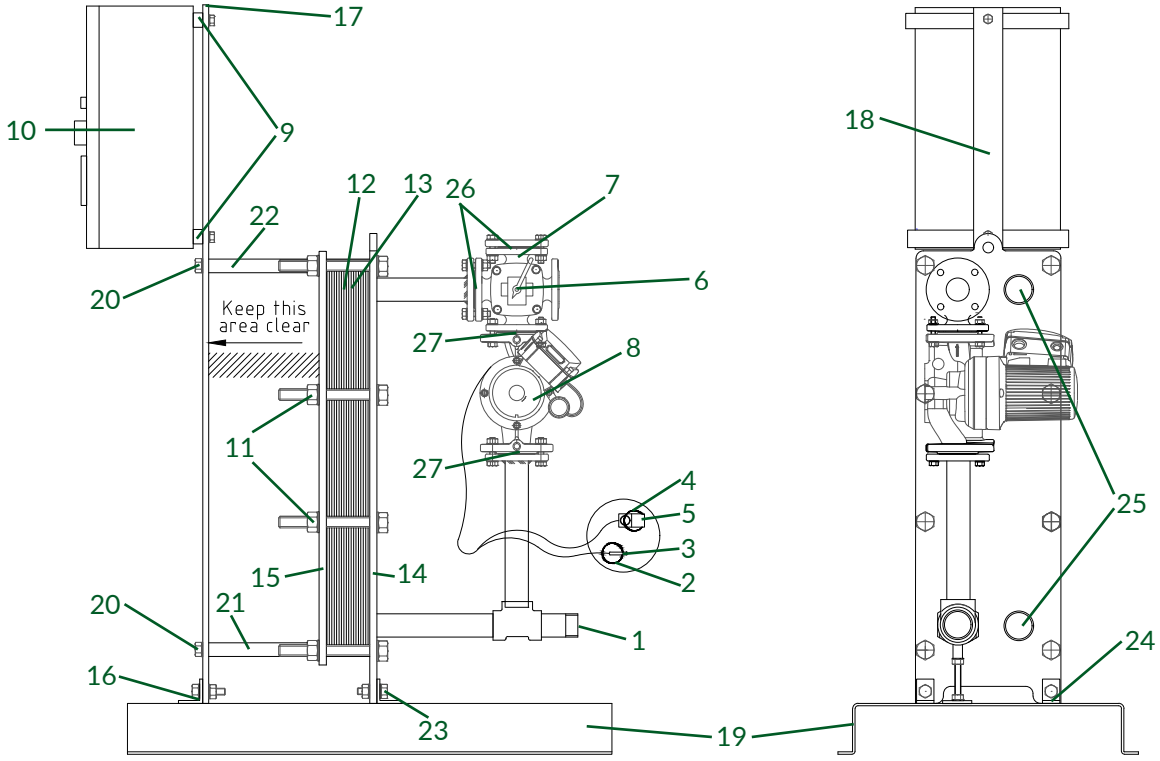


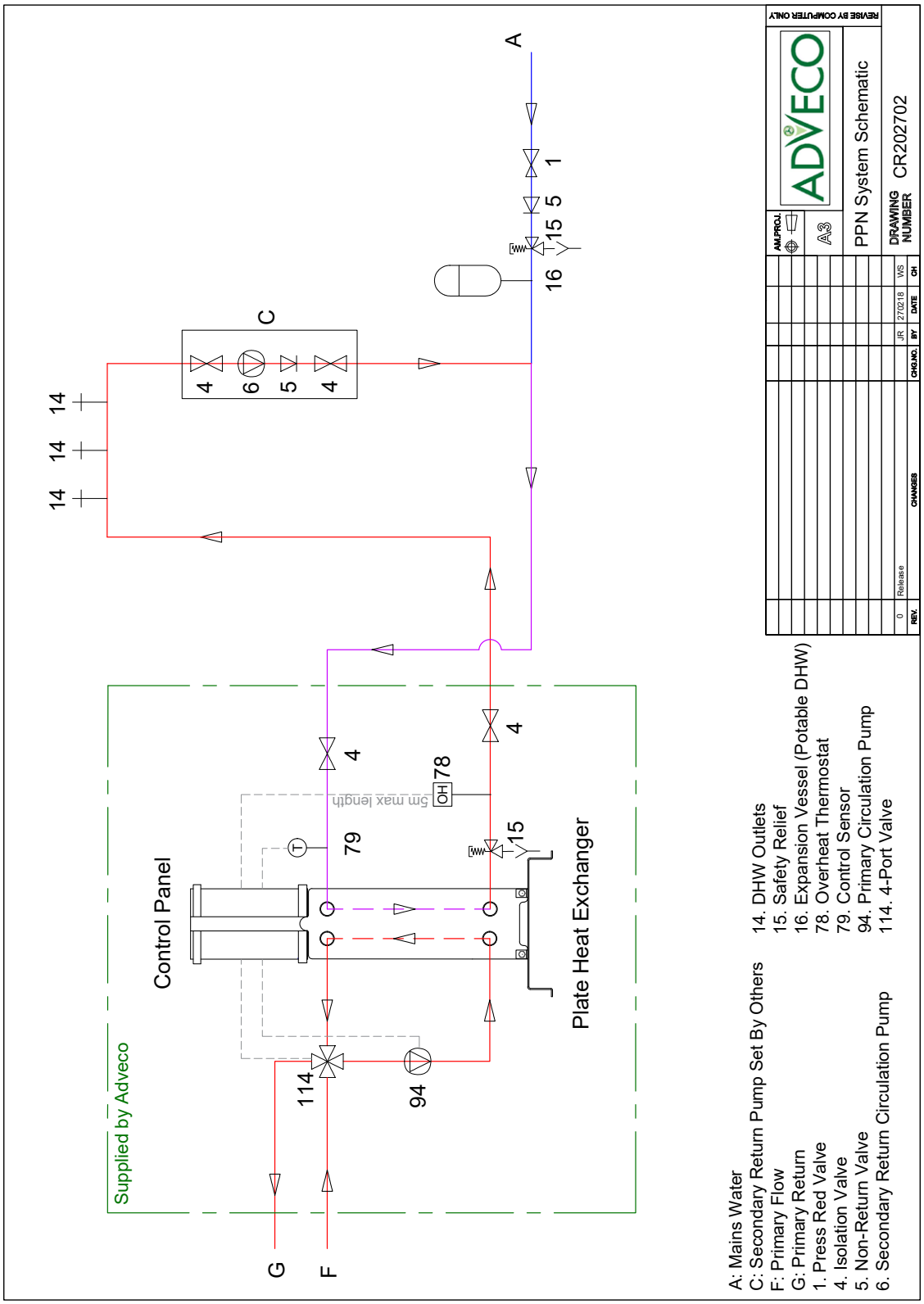
Figure 17: Adveco PPN and PPS - 400-600 kW models part diagram.



6. Drawings

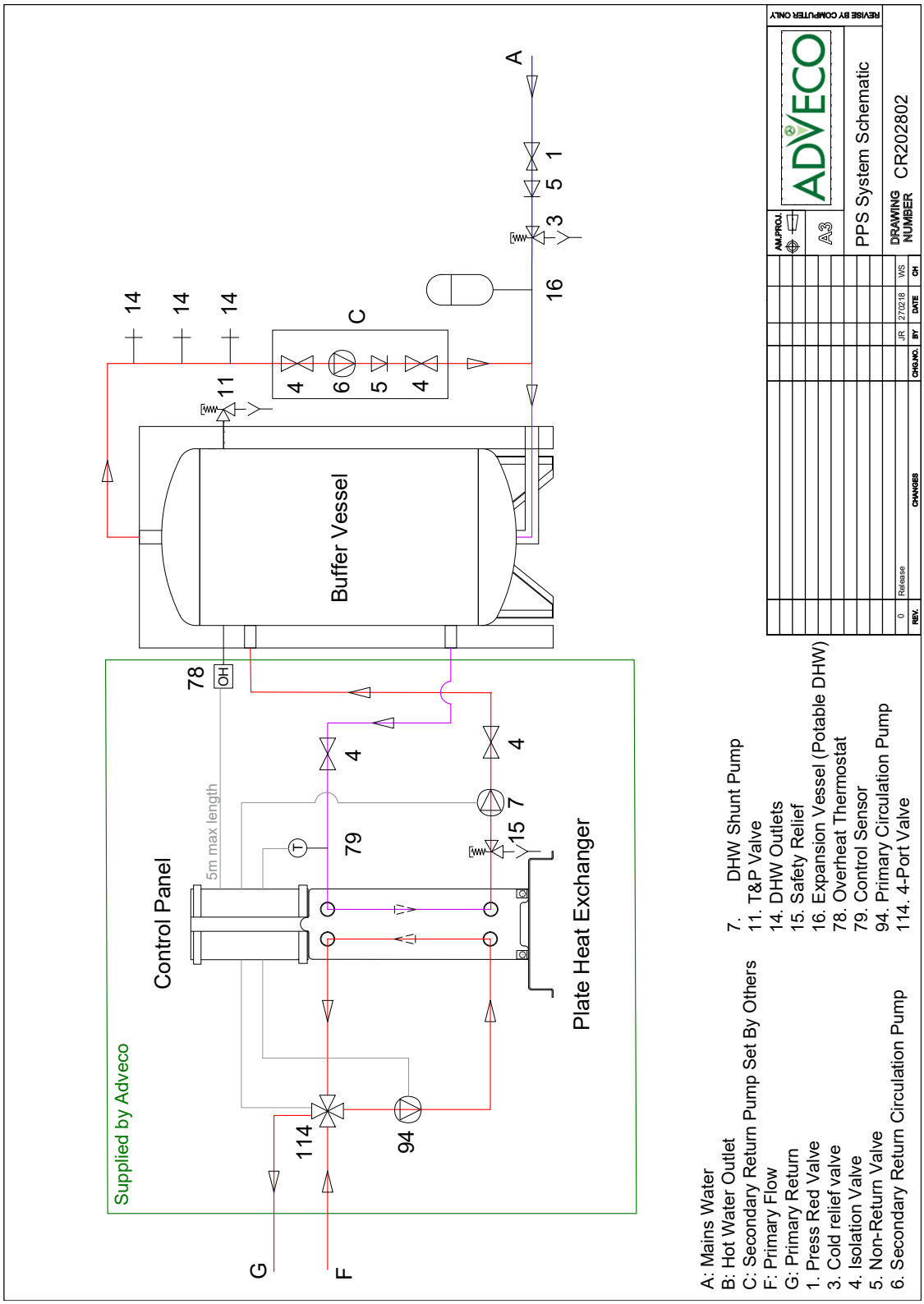
6.1. System Schematics

Figure 18: Adveco PPN range generic system schematic:



6. Drawings

Figure 19: Adveco PPS range generic system schematic:



6. Drawings

6.2. Wiring Diagrams

Figure 20: Adveco PPN range wiring diagram (page 1 of 3):

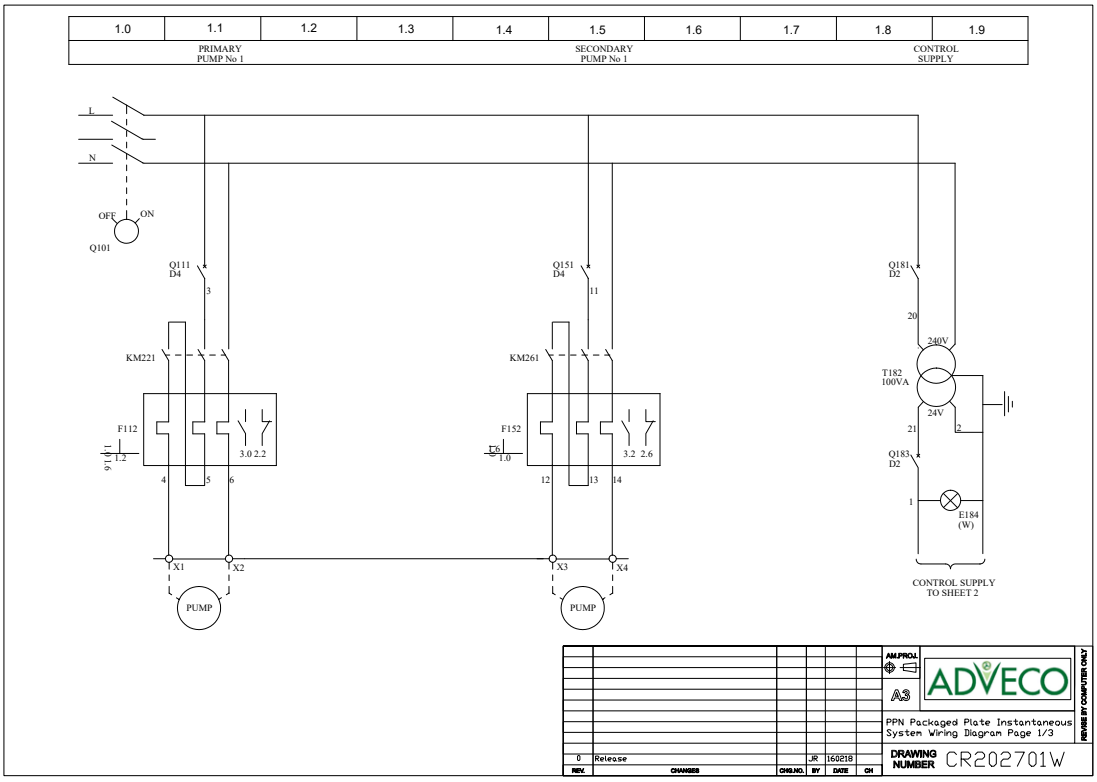
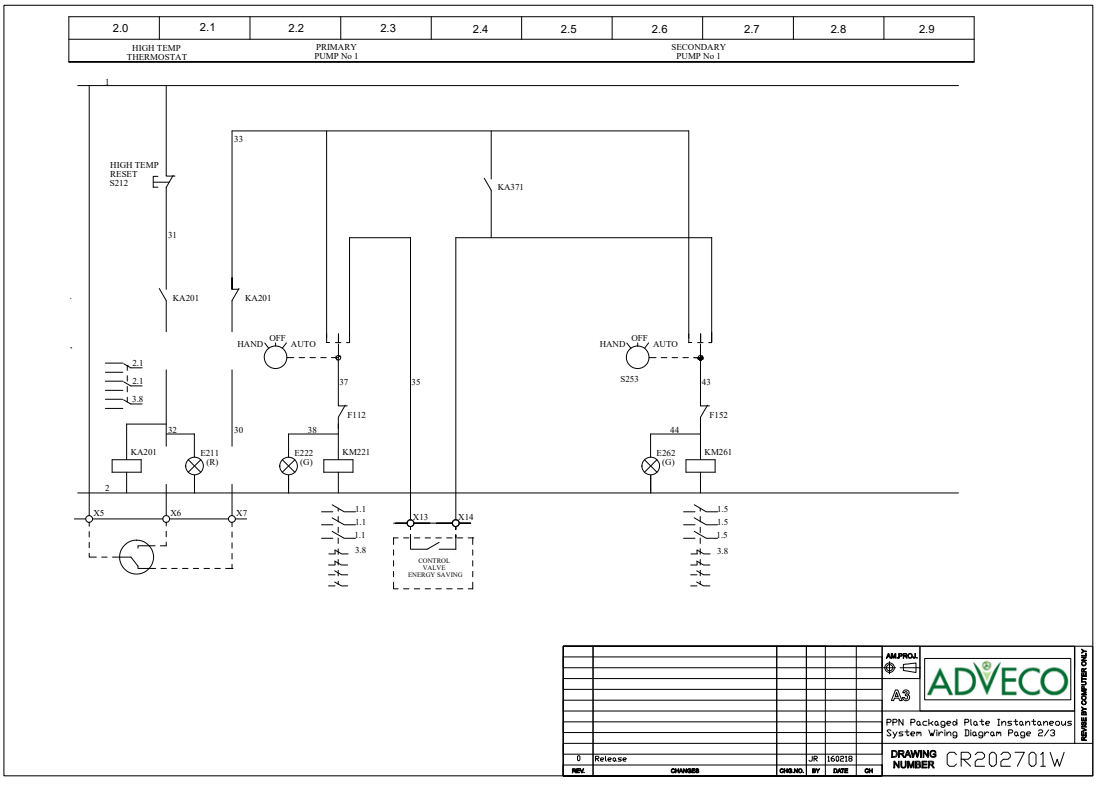


Figure 21: Adveco PPN range wiring diagram (page 2 of 3):



6. Drawings

Figure 22: Adveco PPN range wiring diagram (page 3 of 3):

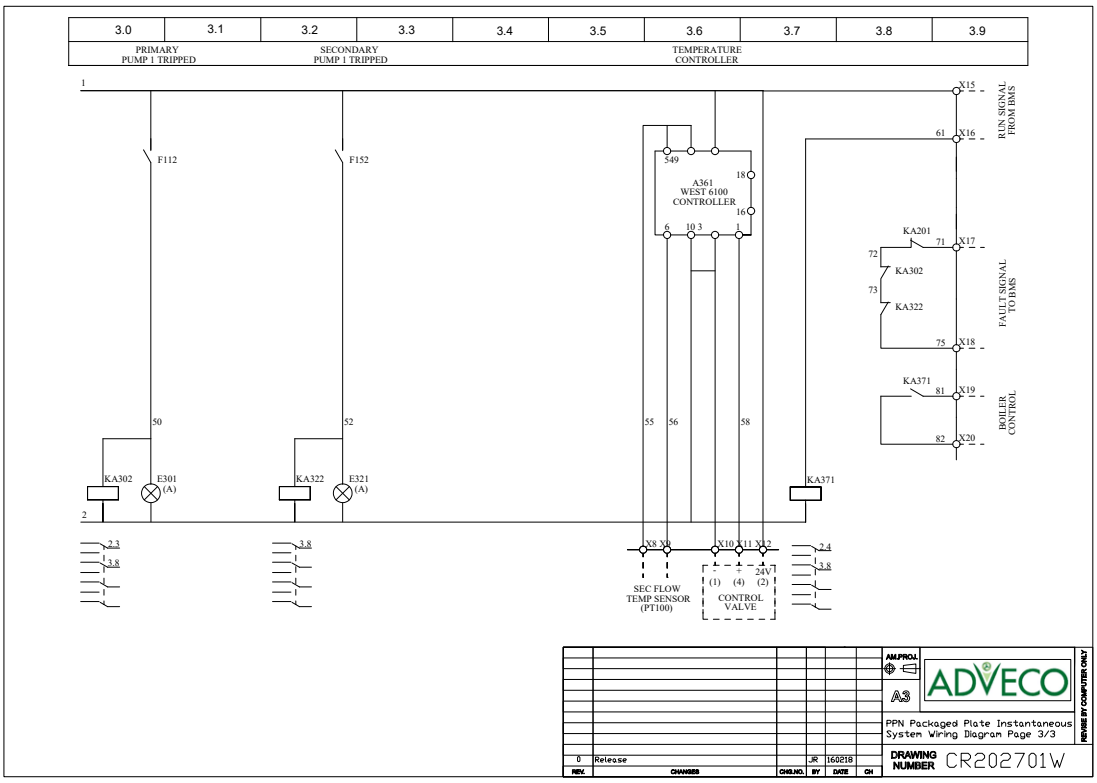
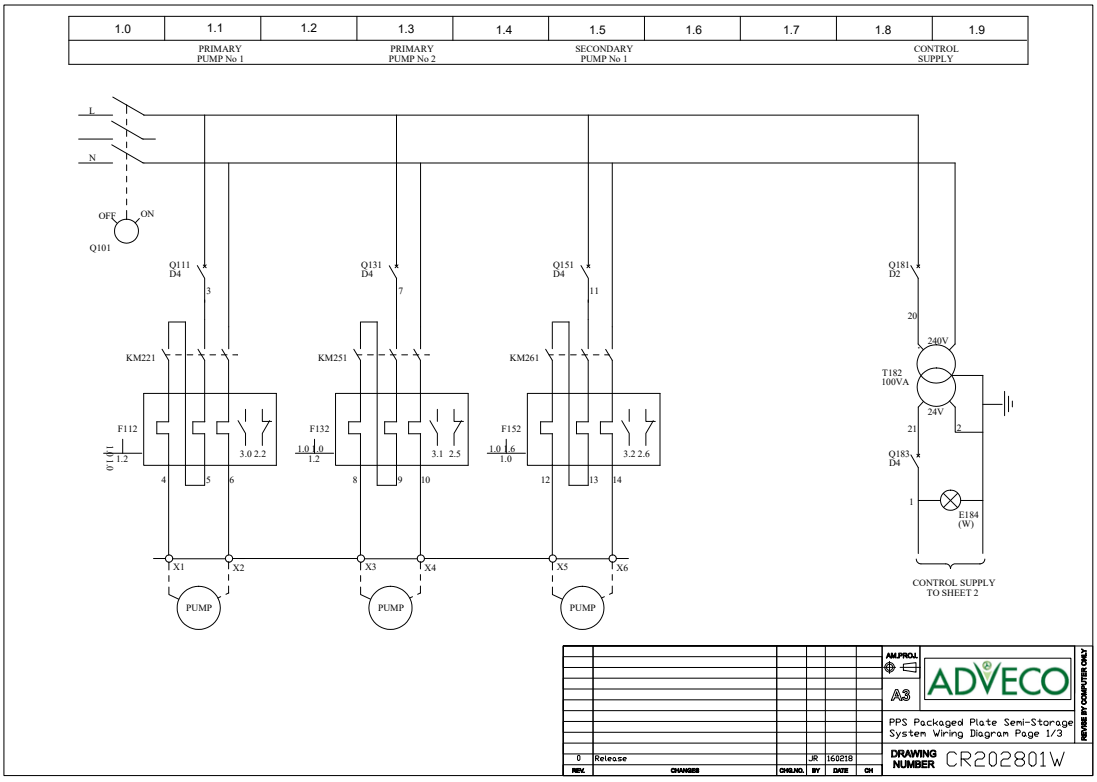


Figure 23: Adveco PPS range wiring diagram (page 1 of 3):



6. Drawings

Figure 24: Adveco PPS range wiring diagram (page 2 of 3):

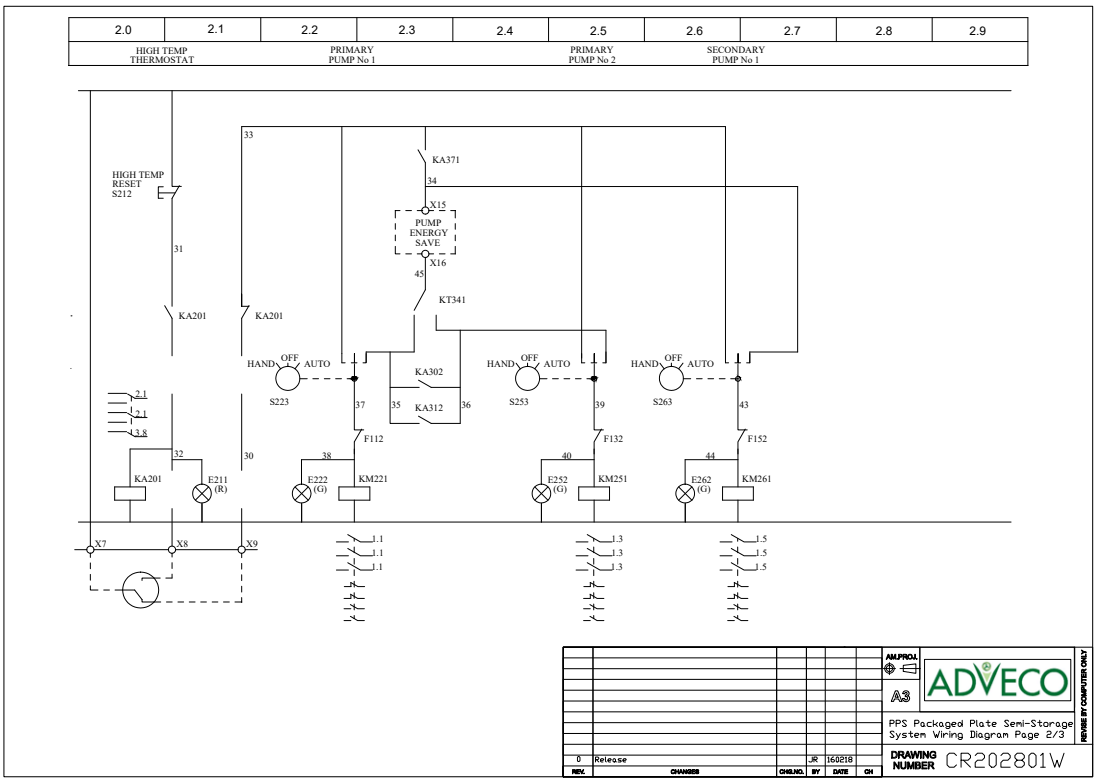
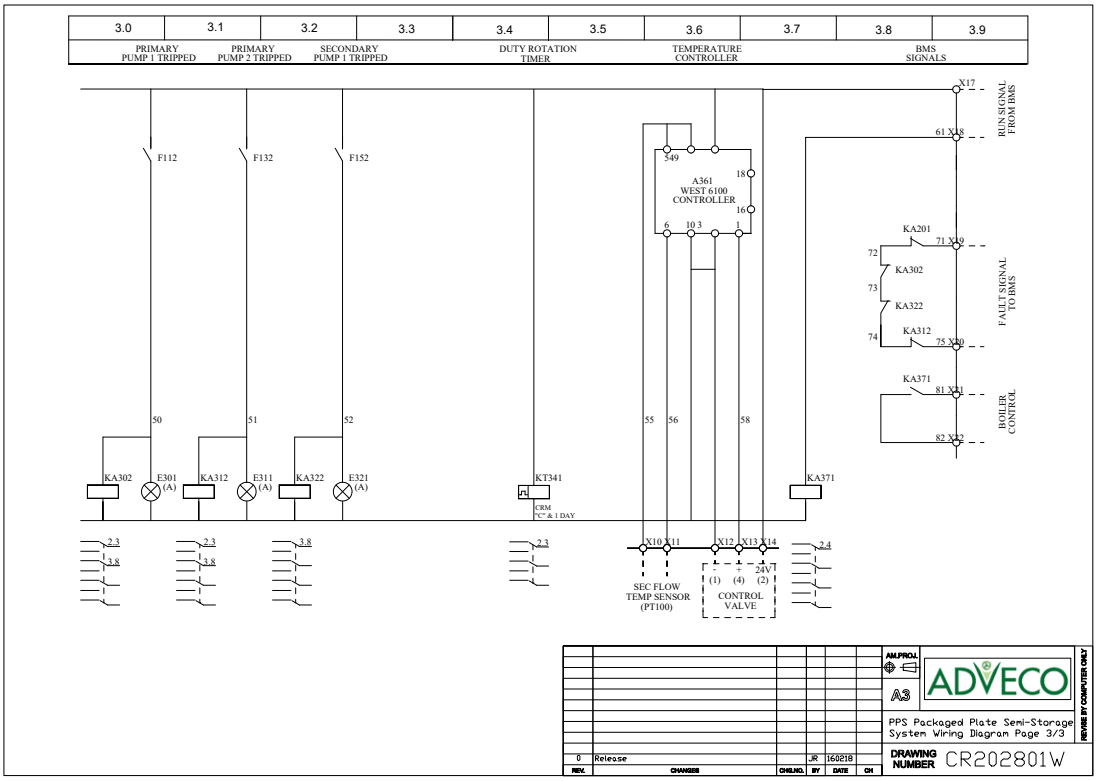


Figure 25: Adveco PPS range wiring diagram (page 3 of 3):



Contact Details and Warranty Information

The Adveco PPN and PPS ranges, this manual, and all information contained within, are supplied by Adveco Ltd.

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The Adveco PPN and PPS heat exchanger and supplied equipment is guaranteed for thermal and mechanical performance when operated at the design conditions as specified within this manual or technical performance information upon which the project was based.

The heat exchanger and supplied equipment is guaranteed against manufacturing defects, faulty design, or poor workmanship.

This guarantee extends for a period of 12 months from delivery.

Adveco Ltd. assumes no responsibility for excessive fouling of the apparatus by material such as coke, silt, scale or any foreign substance that may be deposited.

Adveco shall not be held liable for any indirect or consequential damage or loss.

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