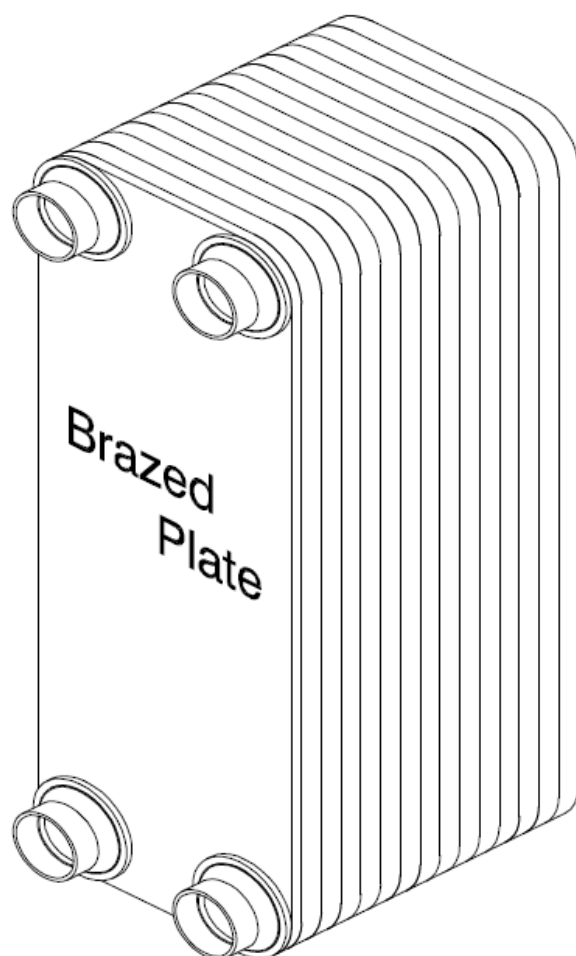


Strebel Brazed Plate Heat Exchangers

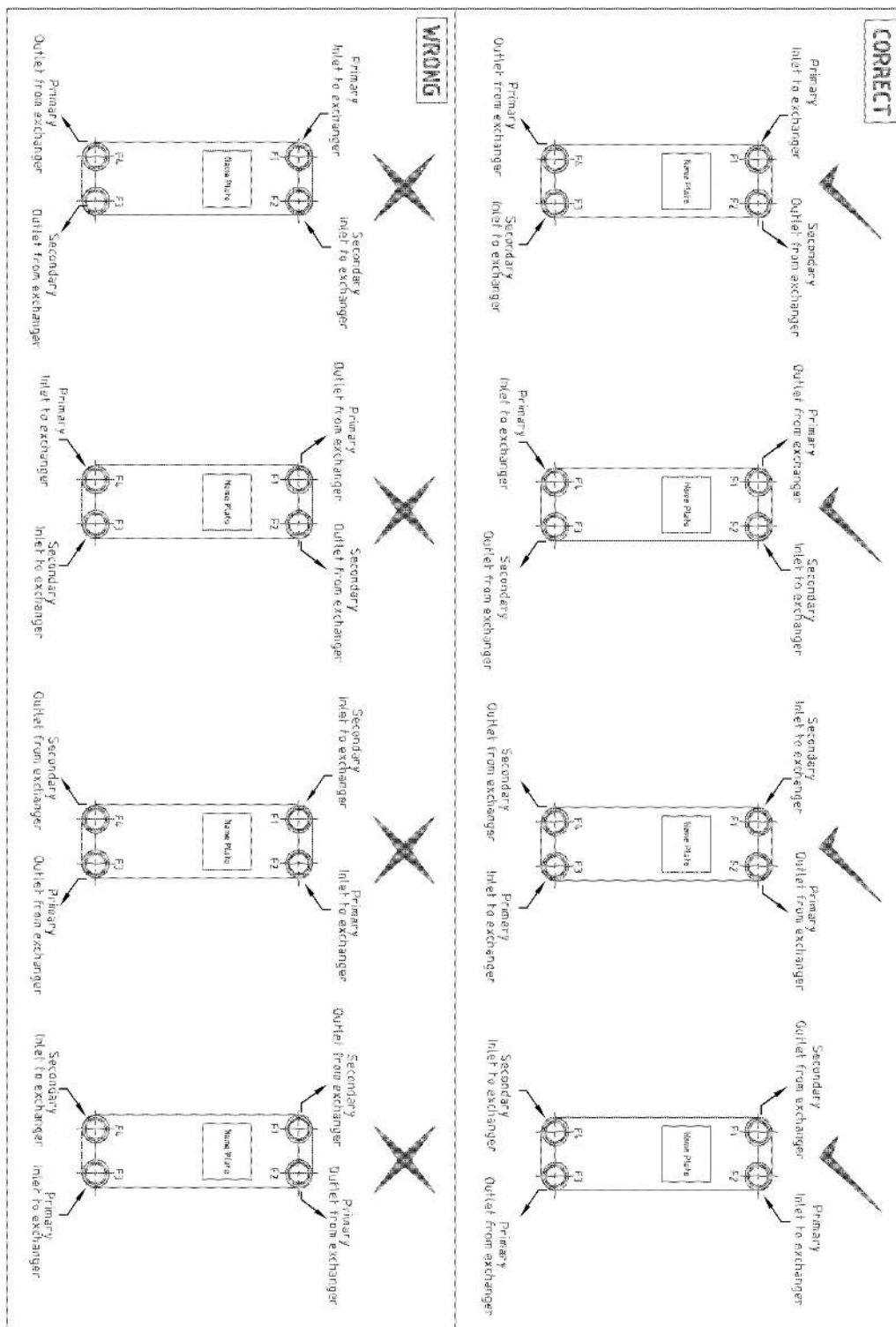
Technical Data, Installation, Operating



This manual contains essential information with regards to the safe handling, installation, operation and maintenance of the heat exchanger equipment. It is important that the relevant personnel are made aware of this document, and have fully read and understood its contents before becoming involved with heat exchangers of this type. Failure to read the manual may result in misuse, thus resulting in potential injury to personnel and damage to the equipment.

2018-01-01 V1

1. Connection Designation and Use:-



Connection Designation and Use continued:

Connecting up to the PHE – use the sketch on the previous page as a guide.

In general, the primary circuit is labelled red in/out, and the secondary circuit is labelled blue in/out.

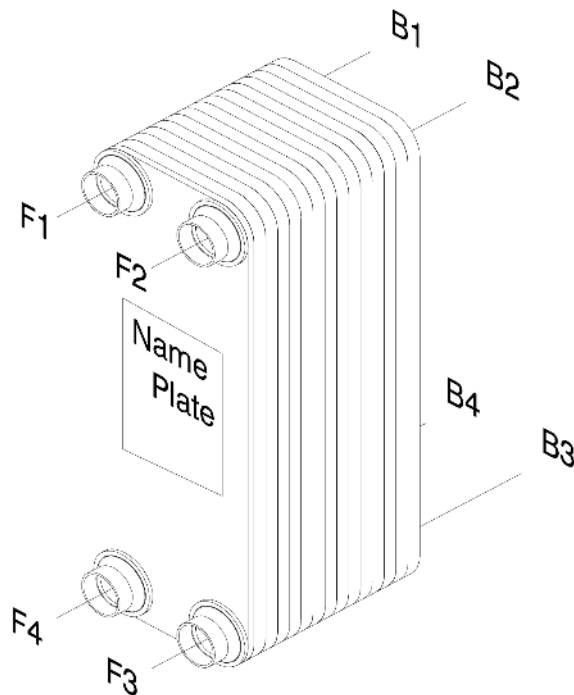
Primary flow	= F1	(red in)
Primary return	= F4	(red out)
Secondary return	= F3	(blue in)
Secondary flow	= F2	(blue out)

Refrigerant condensing:

Refrigerant inlet/outlet	= F1 / F4
Water inlet / outlet	= F3 / F2

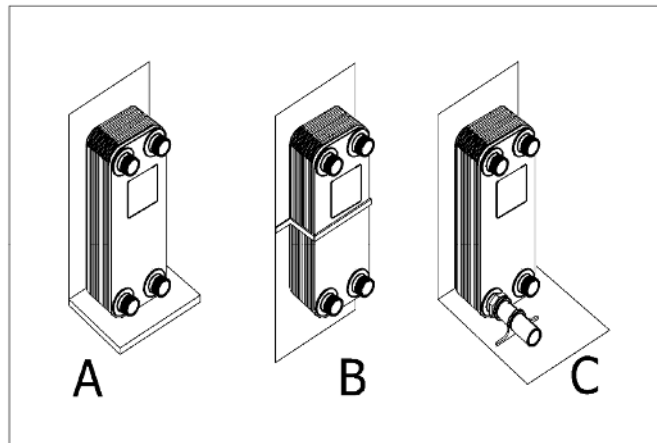
Refrigerant evaporation

Refrigerant inlet / outlet	= F4 / F1
Water/glycol inlet / outlet	= F2 / F3 for max. amount of superheating, if the temperatures are close to the fridge Evap. temperature. F3 / F2 for quickest boiling



2. Installation - General Points:-

- Supporting:**
- A) Place on a suitable shelf.
 - B) By brackets.
 - C) By using the pipe work (providing weight of unit taken by another support) .



Avoid: Drilling through any part of the exchanger.

Safety: Pressure – it is essential that the exchanger, as with all pressure containers, is protected from the effects of any over pressurisation should a fault in the operation of the system arise. Provision of suitable pressure relief devices such as relief valves, or bursting disks should be considered and installed in the pipes close to the PHE.

Pipe work: We recommend the following

- 1) that the pipe work is fully supported to avoid weight/forces acting upon the unit.
- 2) the fitting of flexible couplings if the pipe work is subject to vibration.
- 3) the fitting of flexible couplings if operating over 80 Deg. C. (to absorb expansion).
- 4) that the pipe work is completely flushed before attaching to exchanger.
- 5) the fitting of suitable vents & drains.
- 6) the fitting of isolating valves / by-pass valves to facilitate easier inspections, etc, should the need arise.

Fittings: The use of thermometers and pressure gauges to record temperatures and pressures in the inlet and outlet pipes of both circuits of the PHE is recommended. Periodic checking of these devices shall allow the performance of the exchanger to be monitored, plus, give a visual warning that the internal passages are becoming fouled up through service.

Welding: None allowed, either onto, or near the exchanger.

Filtration: Unless otherwise stated, a filter mesh should be used to remove all particles greater than 0.5 m.m. diameter.

Connections: **AVOID** over tightening onto the threaded connections. Excessive force shall shear the connection braze. The threads are BSPT. Although the best method is to seal by the use of an O-ring, or a ring gasket located at the end of the connection, the threads can be sealed by a suitable tape / paste.

Soldering:

- Ensure connection and pipe work are thoroughly cleaned
- Apply flux to protect from oxidising & to help cool the temperature
- PHE to be horizontal
- Fill the other circuit with water (ensure open to atmosphere).
- Wrap a wet towel around the base of the connection to be soldered.
- Use solder containing no less than 45% silver.

Steam:

The steam supply should be of good quality, dry saturated, & at the design pressure. Attention should be paid to the sizing of the steam traps – these must be of adequate size (the steam consumption figures are given in the design data sheets), and along with any strainers, must be located below the lower most level of the exchanger.

It is **essential** that only good quality steam enters the exchanger - a strainer and trap set should be positioned within the steam supply line. See FIG 2 for suggested system lay out.

NOTE – although the PHE offered is safe to use when operated as above, there is a potential issue between the differences in the expansion rates of the stainless and the copper materials. This can result in cracking of the braze which shall lead leakage from the PHE and a shorter than expected service life of the unit. For this reason, we do not give any service life guarantee for the above equipment when used with steam.

Refrigerants:

Insulate unit to avoid condensation freezing on the plate pack for low temperature use. Quick acting refrigerant controls are best suited for use with the brazed plate.

Evaporating – position the expansion valve as close as possible to the liquid connection. The valve should be of a slightly higher capacity than the unit, and should have an external pressure equalising connection to avoid unnecessary heating. The sensor bulb located on the suction side should be well insulated from the effects of the ambient air temperature, and should be sensitive enough to respond quickly to changes in the gas temperature.

Condensing – regulate and control via, or on the service medium circuit.

3. Commissioning & Starting :-

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

Start up:

- Fully vent pipe work system and the PHE.
- Close isolation valves between pump & exchanger.
- Fully open valve fitted into return line from the exchanger.
- Start the circulation pump (coldest circuit first).
- **Gradually** open closed valve fitted to inlet line of exchanger.
- Vent circuit again if necessary – special consideration must be given to discharge of hot fluids.
- Repeat for the other circuit.

- Checks:**
- 1) Check for pressure pulses in system caused by the pumps or control valves. If found, stop operation, and rectify. Continuous pressure pulses will result in fatigue failure of the plates.
 - 2) Check that all pump vents are closed to prevent air being sucked into system.

Steam: Use only slow acting control valves and mechanisms.

Before start up :-

- a) ensure that the steam control valve is fully closed.
- b) ensure that the exchanger, and supply line, is fully drained of condensate.

Start cold circuit first, then the steam side.

Open steam control valve slowly - this prevents water hammer of any condensate in the steam line, and reduces the pressure / thermal shock to the exchanger.

Ensure that the steam trap is correctly sized to allow full condensate discharge - this prevents water clogging inside the exchanger.

4. Shutting down the Exchanger :-

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

Water hammer occurs when a flowing liquid is suddenly halted. Pressure waves then travel along the pipes creating a hammering effect as they bounce off any restrictions within the pathway.

Thermal shock occurs when the bulk temperature of the exchanger is suddenly raised or lowered. The resulting expansion or contraction of the unit can result in damage to the plate pack.

Both water hammer & 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.

Shut down:

- SLOWLY close the control valve on the “hot” circuit whilst maintaining the full flow on the “cold” circuit. (**shut down cold side first if “hot side” liable to freeze**)
- Switch off hot circuit pump.
- SLOWLY close the control valve on the cold circuit.
- Switch off the cold circuit pump, and close all isolating valves.

Storage: If the unit is to taken off line for an extended period of time, then the following procedure can be followed :-

- Allow unit to cool, and then drain both circuits after the release of any pressure.
- Flush through with clean water, drain and then seal the connections (if pipes removed).

5. Cleaning of the Exchanger :-

A reduction in the performance of the exchanger – especially combined with an increase in the pressure drop across either circuit indicates that the heat transfer surfaces have become fouled.

The chemicals selected is the choice of the operator of the plant, and shall depend on the type of deposit – we recommend that the services of a cleaning specialist company be employed for further advise. This type of organisation shall be able to determine the nature of the deposit to be removed, and shall furnish the correct solvents, and equipment, plus comply with all Health & Safety regulations.

Suggested cleaning fluid: 5% phosphoric acid, or 5% oxalic acid circulated at ambient temperature, followed by large amounts of fresh water to flush.

Safety: Wear gloves & eye goggles when using cleaning detergents.

Rinsing: **After using any type of cleaning agent, always rinse thoroughly with fresh water. Circulate fresh water for at least 10 mins.**

6. Trouble Shooting :-

Excessive

- pressure drops:**
- | | | |
|----|---------------------------------|--|
| 1) | Liquid flows higher than design | :- check & adjust |
| 2) | Plate channels blocked | :- back flush or C.I.P. |
| 3) | Inaccurate measurement | :- check pressure gauge for accuracy
:- ensure measurement does not include any bend, valve / fitting, & pipe run losses. |
| 4) | Liquid temp. below design. | :- viscous media generate higher resistance to flow at lower temperatures. |
| 5) | Media used not as per design | :- the addition of glycol or other additives can increase the pressure drop. |

Leakage:

- | | | |
|----|--|---|
| 1) | cross contamination or leaks from the plate pack | :- plate pack failure
replace exchanger as repairs not possible. |
|----|--|---|

Decrease in the performance:

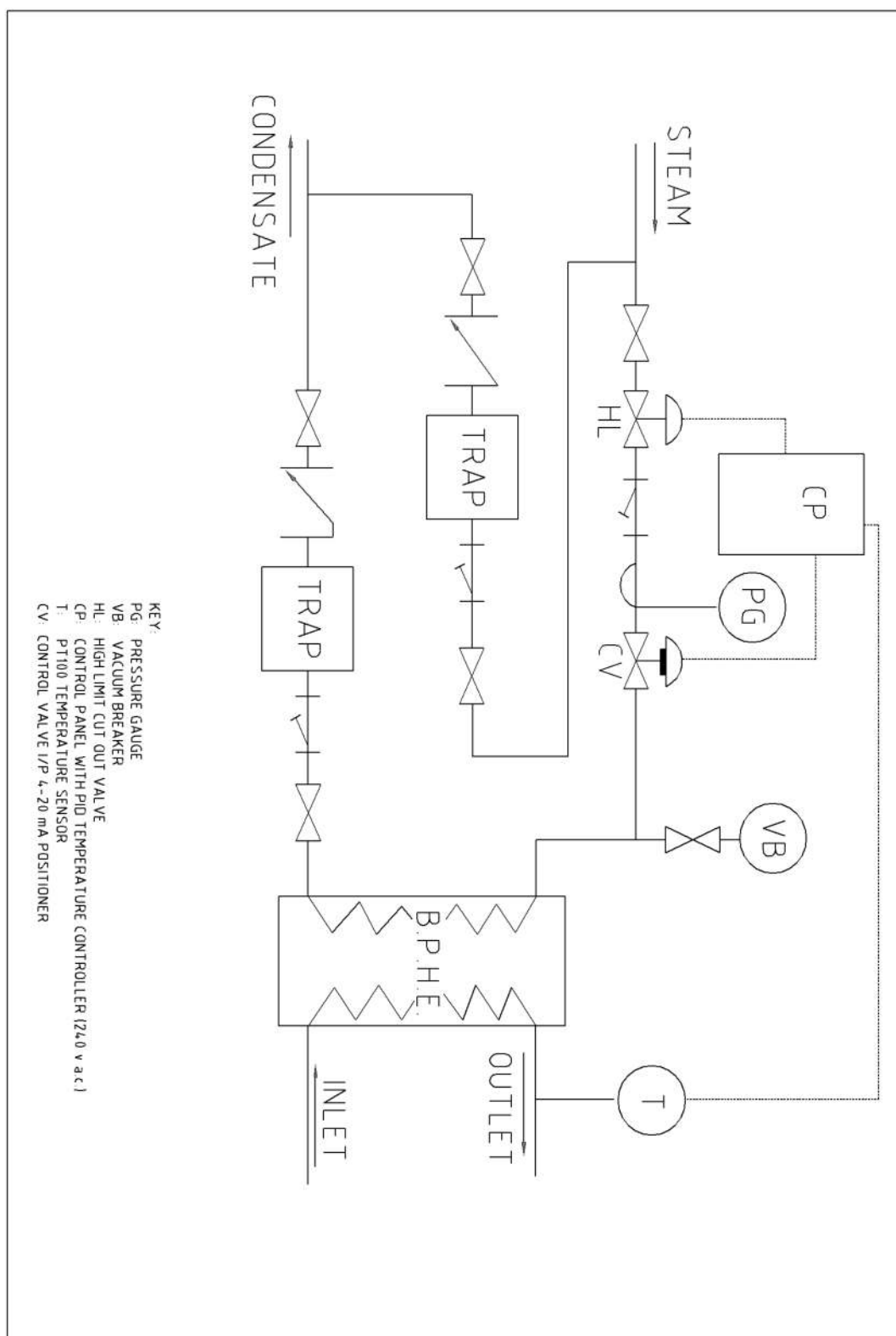
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|-----|---|
| 1) | plate surfaces require cleaning or de-scaling. |
| 2) | pumps or associated controls have failed or faulty |
| 3) | plate channels blocked. |
| 4) | liquid flows not as per the design specification. |
| 5) | associated chiller / cooling tower / boiler under sized or faulty. |
| 6) | cooling water flow temperature to the exchanger is higher than design. |
| 7) | heating media temperature lower than design figures. |
| 8) | steam flow not sufficient - control valve malfunction or starvation . |
| 9) | steam trap defective - this can cause the unit to fill with condensate. |
| 10) | unit running in co-current flow, instead of counter current - check with contract drawing and alter pipe work if necessary., and check direction of pump flows. |
| 11) | air lock has developed in the plate pack. |

Bulges / distortions

In back plate:

- | | |
|----|---|
| 1) | Unit has been subjected to a pressure shock – investigate system and remove / dampen source of pressure wave / spike – if unit still intact then it can be continued to be used. Repeated shocking shall destroy the exchanger. |
|----|---|

FIG 2: Recommended Steam system incorporating steam feed line drainage trap set.





We reserve the right to change the specification and dimensions without prior notice.