Brazed Plate Heat Exchanger Operations Manual

Brazed Exchanger Operations Manual

Brazed Heat Exchangers from Polaris deliver exceptional strength and performance in a compact package. These versatile units are widely used in refrigeration, industrial and hydronics applications. The highly skilled Polaris engineering staff employs exclusive design software to be sure of providing you with exactly the brazed exchanger to fit your application. Equally helpful are Polaris' experienced field representatives, many of whom can provide the brazed exchanger you need from stock.

TABLE OF CONTENTS

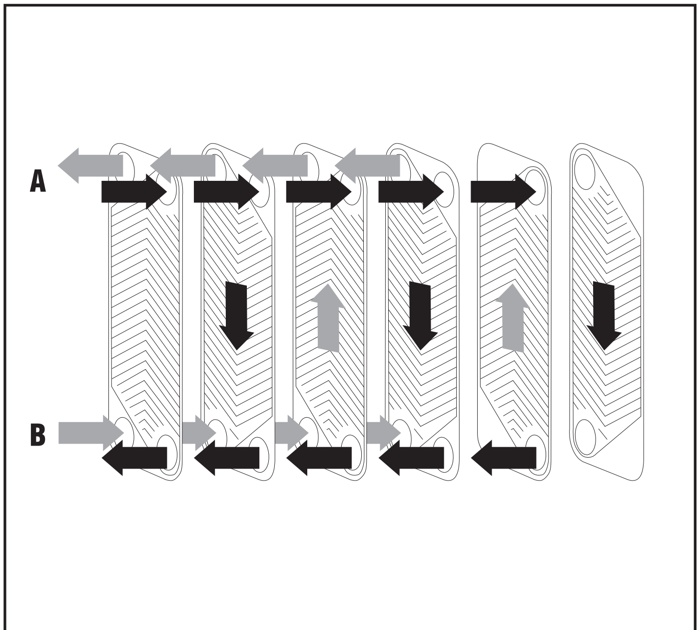


Fig. 1

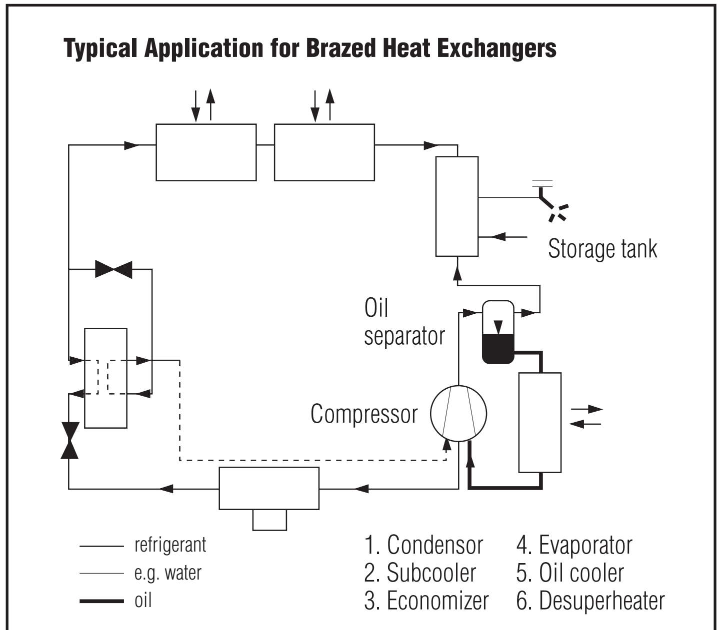


Fig. 2

A

How the Polaris Brazed Heat Exchanger operates

Each Polaris Brazed Heat Exchanger is assembled from embossed plates of high-quality stainless steel – up to 200 herringbone-patterned plates in a single exchanger. Adjoining plates are reversed so as to form a lattice of contact points from the ridges of the plates. With the plates vacuum-brazed together, a compact, pressure-resistant and very efficient heat exchanger is created. (See Fig. 1)

In the finished unit, the ridges and indentations in the plates form two completely distinct channel systems, allowing maximum heat transfer while keeping the transfer media rigorously separated. With the media flowing in true countercurrent and a complex plate pattern that creates vigorous turbulence, heat transfer is highly efficient. Our standard exchanger meets 390°F, 435 psi standards; maximum flow capacity in our largest unit is 250 gpm.

B

Applications

Polaris Brazed Heat Exchangers are cost-effective, easy to install or replace, providing a highly efficient means of heat transfer. Specify them for any of the following applications: (See Fig. 2)

Hydronics

- Snow melting – sidewalk or driveway
- Radiant heating
- Domestic hot water

Industrial

- Boiler blowdown
- Hydraulic oil cooling
- Heat recovery from hot waste streams
- Packaged systems

Refrigeration

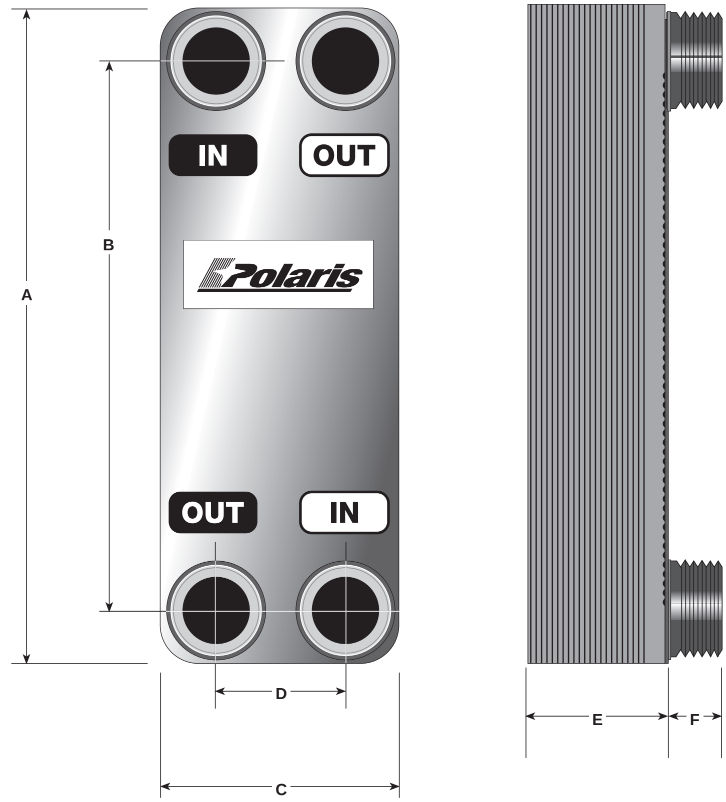
- Condensers
- Evaporators
- Economizers
- De-superheaters
- Subcoolers
- Heat pumps

C

Exchanger Specifications

STANDARD DATA
- Min. working temperature -300˚F
- Max. working temperature +390˚F
- Max. working pressure 435 psi
- Test pressure 652 psi

MATERIALS



TYPE	A	B	C	D	E	F	CONN. SIZE NPT	WEIGHT LBS.	AREA/PLATE SQ.FT.	VOLUME/CHANNEL GALLON
	(inch)									
SL34TL	11 1/2"	9 1/2"	4 5/8"	2 1/2"	(N x .08)+0.3	3/4"	1"	(N x .26)+ 1.3	0.366	0.014
SL70TL	19 5/8"	17 1/2"	4 5/8"	2 1/2"	(N x .09)+0.3	3/4"	1 1/2"	(N x .48)+ 3.0	0.753	0.023
SL70TK	19 5/8"	17 1/2"	4 5/8"	2 1/2"	(N x .09)+0.4	3/4"	1 1/2"	(N x .48)+ 3.0	0.753	0.023
SL140TL	23 7/8"	20 1/2"	9 3/8"	5 7/8"	(N x .10)+0.4	3/4"	2 1/2"	(N x .95)+10.0	1.506	0.084

(N = number of plates) (Solder connection available.)
Higher working temperatures/pressures available.

D

Advantages of Polaris Brazed Heat Exchangers

- Close Temperature Approach – A small difference in the temperatures of the exchange media (for instance, between condensing and cooling water) can result in substantially higher efficiency to the overall system. It’s often possible with brazed exchangers to use smaller system components, such as compressors.
- High Working Pressures – Polaris Brazed Heat Exchangers are rated to pressures of 40 bar, making them well suited to high-pressure applications including the condensing side of refrigeration systems.
- Freeze Resistance – Because of the high turbulence in the channels, any tendency toward freezing of cooling water is minimized. As such, temperatures at the water side can be lower than in any other kind of heat exchanger. Should a system failure cause freezing in the unit, Polaris Brazed Heat Exchangers will recover better than other types of heat exchangers.
- Compactness – Polaris Brazed Heat Exchangers occupy as little as one-sixth the area of other types of exchangers – a tremendous advantage in many applications, especially prefabricated systems.
- Modularity – When systems are built in modules, Polaris Brazed Heat Exchangers can easily be arranged in parallel.
- Economy – Considering the advantages of brazed heat exchangers – low purchase price, fast and easy installation, low shipping cost, simple tubing installation, smaller cabinets and so on – Polaris Brazed Heat Exchangers are often considerably more economical than alternatives.

Correct Mounting Position

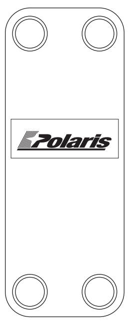
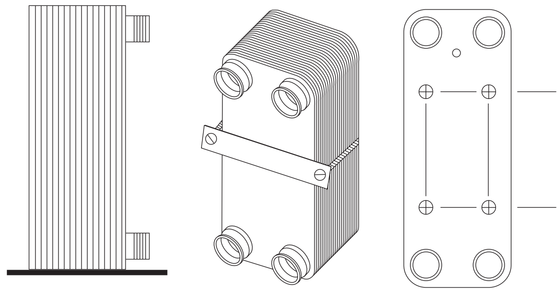


Fig. 3

Mounting Options



Bottom Support | Crossbar & bolts | Studbolts

Fig. 4

Maximum connection loads on brazed heat exchangers

Standard Connections for Brazed Heat Exchangers	Allowable Torque, Nm – Assembly conditions* – Bending	Allowable Torque, Nm – Assembly conditions* – Twisting	Allowable Torque, Nm – Operating conditions** – Bending	Allowable Torque, Nm – Operating conditions** – Twisting
SL 34	30	50	20	30
SL 70	60	150	40	90
SL 140	160	350	100	200

* Single assembly loading in cold condition

** Load due to piping forces during normal operation, not considering high cycle fatigue

Fig. 5

E

Installation guide

1. General

Where possible, Polaris Brazed Heat Exchangers should be mounted in the vertical position. (See Fig. 3) Install mufflers or vibration absorbers as necessary to make sure vibration cannot be transmitted to the heat exchanger. For larger connection diameters, use an expansion device in the pipeline. A rubber mounting strip can serve as a buffer between the unit and the mounting clamp. (See Fig. 4)

2. Connecting to the system

- Use flexible connectors. It's critical that vibrations from pipework and control valves not be transferred to the heat exchanger.
- Don't overtighten female unions onto the threaded connections; excessive force will shear the connection braze. The threads are parallel. Polaris advises use of a connection with the female part sealing against the top of the heat exchanger connection. (Check the chart below for maximum allowable torque.) Seal unions with O-rings or round gaskets at the end of the connection. Tape may also be used to seal the threads.
- Be sure that adequate expansion/safety valves are installed into the adjacent pipework. Polaris recommends the use of expansion tanks.
- If pipework is to be soldered into the nozzles on the exchanger:

– Fill the outer circuit with water; the circuit must be open to the air.
– Wrap a wet towel around the base of the connection to be soldered.
– Use solder containing at least 45 percent silver.
– Never weld connections onto or near the exchanger. (See Fig. 5)

3. Avoiding water hammer.

Sudden changes in the velocity of a noncompressible fluid (such as water) can result in "water hammer," a condition that damages pipes, valves, heat exchangers and other equipment. The quick closing of a solenoid valve in liquid lines is a typical cause. Sudden interruptions of the fluid flow increase pressure far above normal levels. High-intensity pressure waves then move back and forth in the pipe between closure and relief points. At a relief point such as a large-diameter header, these waves can strike at extremely high speed.

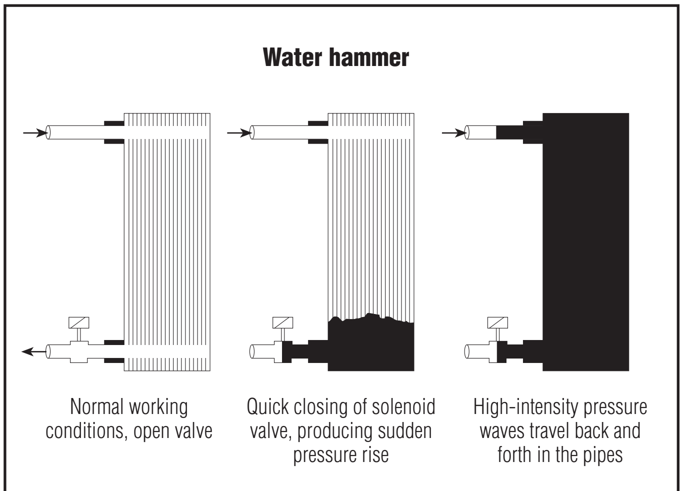


Fig. 6

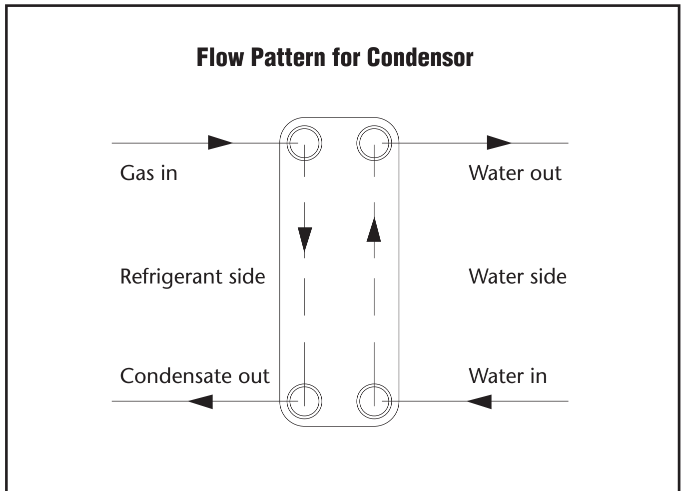


Fig. 7

The shock wave produced in this way can cause substantial damage as it alternately expands and contracts the pipe lines. In brazed heat exchangers, water hammer can deform the front or back plate into a bulb shape, with resulting internal or external leakage.

An air chamber or water hammer arrestor can avoid or eliminate these problems. Valves with controlled closing times or characteristics can also control the problem. (See Fig. 6)

4. Refrigeration details

Condensers

Refrigerant gas flows in at the top left. Condensate liquid flows out at bottom left. Water inlet is at the bottom right and water outlet at the top right. Connect water and refrigerant for countercurrent flow. Regulate and control the system via the service medium circuit. Solder connections to the refrigerant side when using Polaris Brazed Heat Exchangers as condensers. (See Fig. 7)

Evaporators

The mixture of liquid and refrigerant gas flows in at bottom left. Gas flows out at top left. Water inlet is at the top right and water outlet at bottom right. Connect water and refrigerant for countercurrent flow in most cases.

Place the expansion valve near the inlet connection. The valve should be of slightly higher capacity than the unit, and should have an external pressure equalizing connection to avoid unnecessary heating.

The sensor bulb located on the suction side should be insulated from ambient air. It must be sensitive enough to respond quickly to changes in gas temperature. Allow at least 500 mm between bulb and the refrigerant outlet connection.

Pipe diameter between the expansion valve and the brazed exchanger should be the same as that of the liquid line. Solder connections to the refrigerant side when using Polaris Brazed Heat Exchangers as evaporators. (See Fig. 8)

F

Additional Information on Refrigeration Applications

a. When operating temperatures are low, insulate the unit to keep condensation from freezing on the outer surface of the plate pack.

b. Use quick-acting controls for most refrigeration applications.

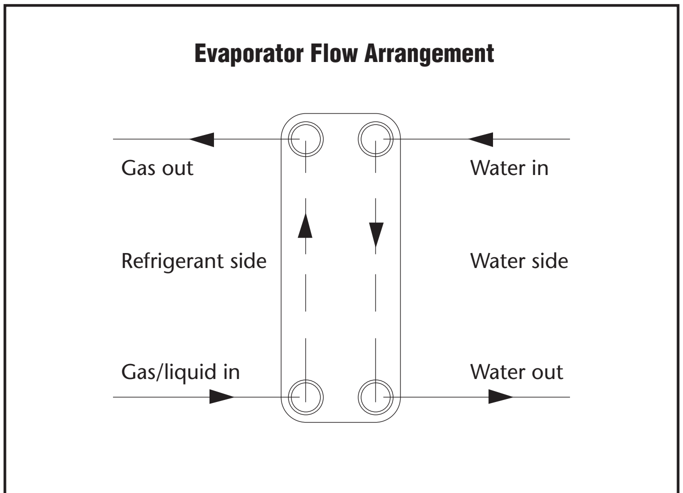


Fig. 8

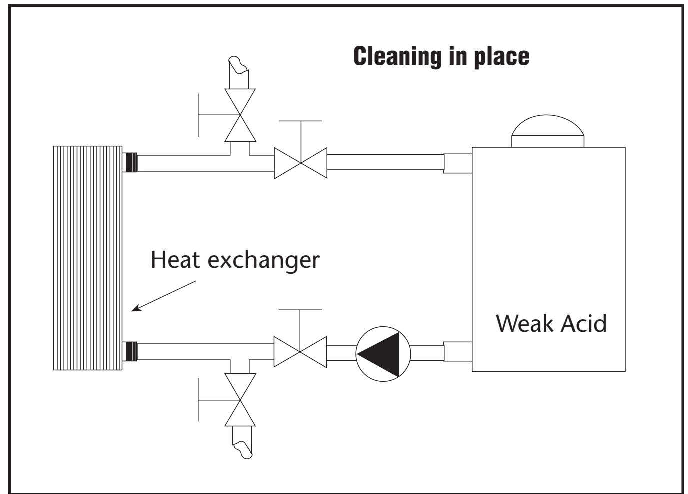


Fig. 9

G

Start-up Procedures

1. Close all isolation valves.
2. Fill and vent the coldest circuit first.
3. Start circulation of the cold circuit, opening isolation valves gradually.
4. Repeat the process with the hot circuit.
5. Start automatic control regulation.
6. In steam systems, drain the steam circuit before opening steam valves. This precaution helps reduce the chance of water hammer and damage to the exchanger.

H

Shut-down Procedures

1. Close down the hot circuit by slowly adjusting the control valve. Maintain full flow on the cold circuit.
2. When the control valve is fully closed, switch off the pump.
3. Slowly close down the cold circuit, then switch off the pump.
4. Close all isolation valves.
5. When the unit is cool, drain it completely.

I

Cleaning

When the likelihood of fouling is high (for instance, when hard water is used), clean the exchanger by circulating a cleaning liquid through it. Use a tank with a weak acid for this clean-in-place (CIP) process. A five-percent solution of phosphoric acid is a safe and effective choice for most units. If the exchanger is cleaned frequently, use a five-percent solution of oxalic acid.

For best results, the cleaning solution flow rate should be at least 1.5 times the normal flow rate, preferably in backflush mode. Before restarting, flush the unit with plenty of fresh water to purge any remaining acid. Clean at regular intervals.
(See Fig. 9)

Polaris

28 May Street, Edison, NJ 08837
Phone: 732-225-3100 • Fax: 732-225-9155
Email: sales@polarisphe.com

For more information please contact: