BP and BPSW SERIES

BRAZED PLATE HEAT EXCHANGERS

Brazed Plate Heat Exchangers
for Fluid Power Applications

COOL what you **POWER**

IndustrialHeatTransfer.com
+1.888-226-8522

BP & BPSW SERIES

Brazed Plate Heat Exchangers
for Fluid Power Applications

Optional **Mounting Bracket**
(except 8x3 plates)
Constructed of Carbon Steel

Our brazed plate heat exchangers are rugged, compact, cost-effective and reliable performance over long periods of time with minimal maintenance – an optimal heat transfer solution for compact industrial applications.

316 stainless steel construction and standard SAE connections are features of this highly efficient technology. The compact design and multiple mounting options lead to optimization of heat transfer when space is limited. High plate channel turbulence means effective performance even with close approach temperatures. Our wide offering of standard models ensures fast delivery worldwide. **Custom applications are always welcome!**

BPSW (BPMW) Series - Standard Model

Features

- Short Lead Time
- High Performance
- Compact Design
- Copper-free alternative
- Stacked Plate
- Oil to Water Applications
- Corrosion Resistant Type 316 Stainless Steel Plates
- Mounting Studs Standard (except 8x3 plates)
- SAE Oil Connections & NPT Water Connections (BSPP Oil & Water Connections on BPMW)

Materials

- Plate Material - Fluid Contact 316 Stainless Steel
- Braze Material Copper
- Connectors 316 Stainless Steel
- Stud Bolts 304 Stainless Steel
- Optional Foot Mounting Bracket Carbon Steel

Ratings

- Maximum Working Pressure 450 PSI (31 BAR)
- Test Pressure 650 PSI (45 BAR)
- Minimum Working Temperature -320ºF (-196ºC)
- Maximum Working Temperature 437ºF at 450 PSI (225ºC at 31 BAR)

BPW Series - Built to Order

Features

- Highly Customizable Sizes and Options
- Special Port Sizes
- Optimized Pressure Drops
- Special Parts Match to OE Needs
- Fluids/Plate Application Match
- Mass OE Volume Customizing
- Non-Standard Plate Stacks
- Traceable Materials

Materials

- Plate Material - Fluid Contact 316 Stainless Steel
- Braze Material - Copper, Nickel on select models
- Connectors 316 Stainless Steel
- Stud Bolts 304 Stainless Steel
- Optional Foot Mounting Bracket Carbon Steel

Ratings

- Maximum Working Pressure 450 PSI (31 BAR)
- Test Pressure 650 PSI (45 BAR)
- Minimum Working Temperature -320ºF (-196ºC)
- Maximum Working Temperature 437ºF at 450 PSI (225ºC at 31 BAR)

Pressure rating is for copper brazed only.
Consult factory for alternatives.

Applications beyond Hydraulics Oil Cooling—chillers, fuel heaters, biogas, natural gas, de-ionized water, refrigerant air cooling, condensor.

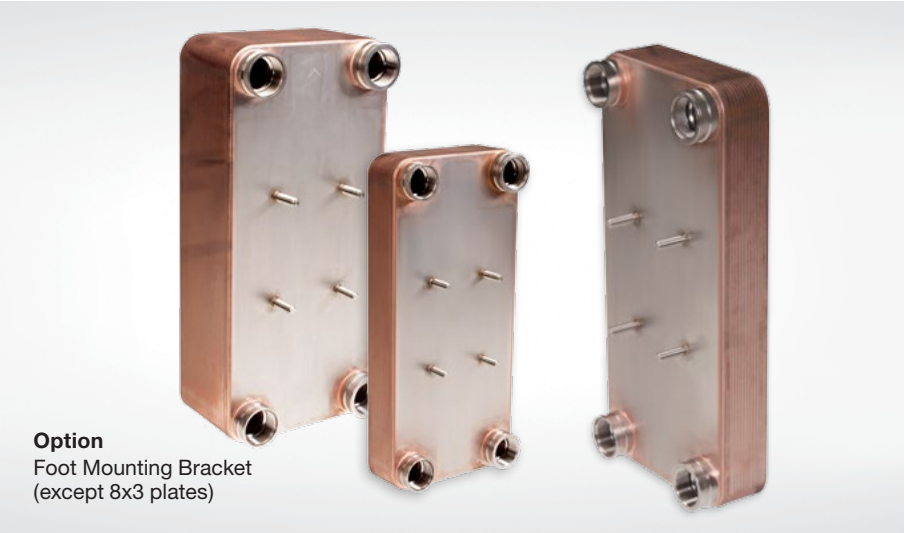
A BP Series heat exchanger is one of the most efficient ways to transfer heat today!

Fluid Cooling Brazed Plate BPSW Series

STAINLESS STEEL CONSTRUCTION

Performance Notes

- Short lead time
- Stacked plate
- Stainless steel
- Copper brazed (nickel option)
- Oil to water applications
- High performance
- Compact design
- SAE connections
- Corrosion resistant Type 316 stainless steel plates
- Mounting studs standard (except 8x3 plates)
- SAE oil connections, NPT water connections



Option
Foot Mounting Bracket
(except 8x3 plates)

Ratings

Maximum Working Pressure
450 psi (31 BAR)

Test Pressure
650 psi (44 BAR)

Minimum Working Temperature
-320ºF (-19°C)

Maximum Working Temperature
437ºF (225°C)

Materials

Plate Material - Fluid Contact
316 stainless steel

Braze Material Copper

Connectors 316 stainless steel

Stud Bolts 304 stainless steel

Foot Mounting Bracket Carbon steel

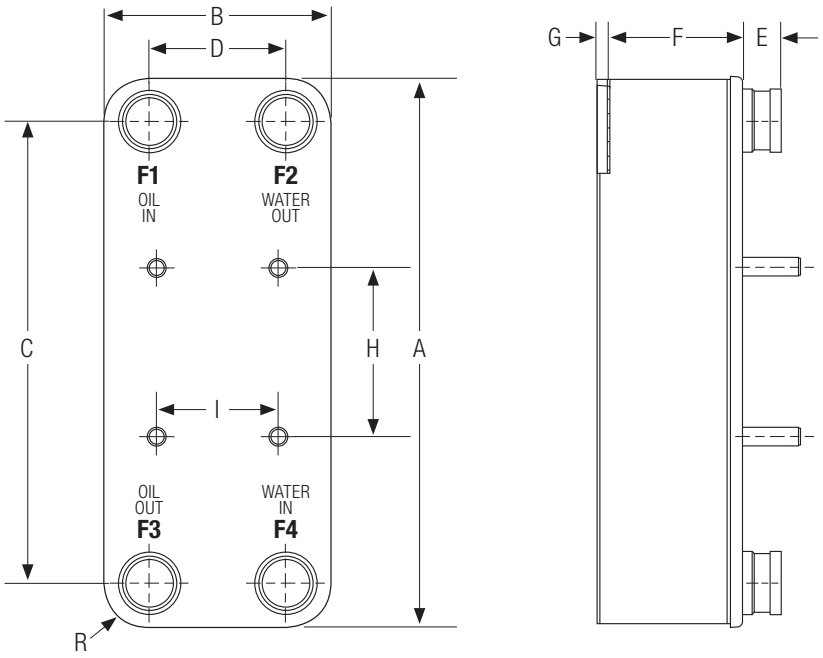
Optional Foot Mounting Brackets
(See page 155)

How to Order

BPSW	–		–			
Model Series BPSW		**Number of Plates**		**Plate Size**		**Option** Foot Mounting Brackets *(ordered as a separate item)*

Part No.	Plate Size
56839	12x5
56840	20x5
56841	15x5
56842	15x10
56843	20x10
56844	28x10

Dimensions

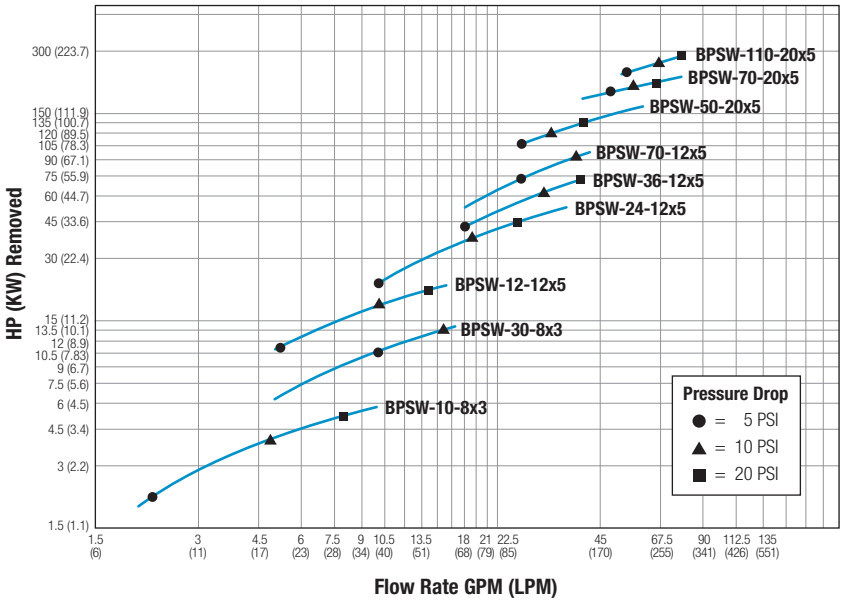


Model	A	B	C	D	E	G	F	F3, F1	F2, F4	H	I	Stud Bolt		R	Net Wt. LB (KG)
												Thread	Length		
BPSW-10-8x3	7.6 (193)	3 (76)	6.06 (154)	1.57 (40)	0.79 (20)	0.28 (7)	1.04 (26)	#10 SAE	3/4" NPT	NA	NA	NA	NA	0.70 (18)	2.1 (0.9)
BPSW-30-8x3	7.6 (193)	3 (76)	6.06 (154)	1.57 (40)	0.79 (20)	0.28 (7)	2.80 (71)	#10 SAE	3/4" NPT	NA	NA	NA	NA	0.70 (18)	4.0 (1.8)
BPSW-12-12x5	11.4 (290)	4.69 (119)	9.57 (243)	2.83 (72)	1.78 (45)	0.24 (6))	1.21 (31)	#12 SAE	3/4" NPT	5.51 (140)	2.36 (60)	M8	0.76 (19)	0.9 (23)	5.6 (2.5)
BPSW-24-12x5	11.4 (290)	4.69 (119)	9.57 (243)	2.83 (72)	1.78 (45)	0.24 (6)	2.27 (58)	#12 SAE	3/4" NPT	5.51 (140)	2.36 (60)	M8	0.76 (19)	0.9 (23)	8.1 (3.7)
BPSW-36-12x5	11.4 (290)	4.69 (119)	9.57 (243)	2.83 (72)	1.78 (45)	0.24 (6)	3.33 (84)	#20 SAE	1-1/4" NPT	5.51 (140)	2.36 (60)	M8	0.76 (19)	0.9 (23)	10.7 (4.9)
BPSW-70-12x5	11.4 (290)	4.69 (119)	9.57 (243)	2.83 (72)	1.78 (45)	0.24 (6))	6.32 (160)	#20 SAE	1-1/4" NPT	5.51 (140)	2.36 (60)	M8	0.76 (19)	0.9 (23)	17.9 (8.1)
BPSW-50-20x5	20.7 (526)	4.69 (119)	18.5 (470)	2.48 (63)	1.07 (27)	0.24 (6)	4.56 (116)	#20 SAE	1-1/4" NPT	8.86 (225)	2.36 (60)	M8	1.19 (30)	0.90 (23)	23.0 (10.5)
BPSW-70-20x5	20.7 (526)	4.69 (119)	18.5 (470)	2.48 (63)	1.07 (27)	0.24 (6)	6.32 (160)	#20 SAE	1-1/4" NPT	8.86 (225)	2.36 (60)	M8	1.19 (30)	0.90 (23)	30.3 (13.8)
BPSW-110-20x5	20.7 (526)	4.69 (119)	18.5 (470)	2.48 (63)	1.07 (27)	0.24 (6)	9.84 (250)	#20 SAE	1-1/4" NPT	8.86 (225)	2.36 (60)	M8	1.19 (30)	0.90 (23)	44.7 (20.3)
BPSW-50-15x5	14.8 (376)	4.69 (119)	12.6 (320)	2.48 (63)	1.07 (27)	0.24 (6)	4.56 (116)	#20 SAE	1-1/4" NPT	8.86 (225)	2.36 (60)	M8	0.79 (20)	0.90 (23)	17.0 (7.7)
BPSW-90-15x5	14.8 (376)	4.69 (119)	12.6 (320)	2.48 (63)	1.07 (27)	0.24 (6)	8.08 (205)	#20 SAE	1-1/4" NPT	8.86 (225)	2.36 (60)	M8	0.79 (20)	0.90 (23)	27.6 (12.5)
BPSW-130-15x10	15.5 (394)	9.57 (243)	12.76 (324)	6.85 (174)	1.07 (27)	0.12 (3)	12.28 (312)	#24 SAE	1-1/2" NPT	5.51 (140)	3.94 (100)	M12	0.75 (19)	1.38 (35)	112.9 (51.2)
BPSW-200-15x10	15.5 (394)	9.57 (243)	12.76 (324)	6.85 (174)	1.07 (27)	0.12 (3)	18.72 (475)	#24 SAE	1-1/2" NPT	5.51 (140)	3.94 (100)	M12	0.75 (19)	1.38 (35)	165.3 (75.1)
BPSW-24-20x10	20.7 (526)	9.57 (243)	17.95 (456)	6.85 (174)	1.07 (27)	0.16 (4)	2.55 (65)	#24 SAE	1-1/2" NPT	5.51 (140)	3.94 (100)	M12	1.53 (39)	1.38 (35)	44.0 (20.0)
BPSW-50-20x10	20.7 (526)	9.57 (243)	17.95 (456)	6.85 (174)	1.07 (27)	0.16 (4)	4.89 (124)	#24 SAE	1-1/2" NPT	5.51 (140)	3.94 (100)	M12	1.53 (39)	1.38 (35)	67.2 (30.5)
BPSW-80-20x10	20.7 (526)	9.57 (243)	17.95 (456)	6.85 (174)	1.07 (27)	0.16 (4)	7.59 (193)	#24 SAE	1-1/2" NPT	5.51 (140)	3.94 (100)	M12	1.53 (39)	1.38 (35)	93.9 (42.6)
BPSW-90-28x10	27.3 (693)	9.57 (243)	23.54 (598)	5.83 (148)	2.13 (54)	0.04 (1)	8.73 (222)	2-1/2" SAE FLG	2-1/2" NPT	12.13 (308)	3.94 (100)	M12	1.53 (39)	1.89 (48)	148.2 (67.3)
BPSW-130-28x10	27.3 (693)	9.57 (243)	23.54 (598)	5.83 (148)	2.13 (54)	0.04 (1)	13.11 (333)	2-1/2" SAE FLG	2-1/2" NPT	12.13 (308)	3.94 (100)	M12	1.53 (39)	1.89 (48)	198.2 (90.0)

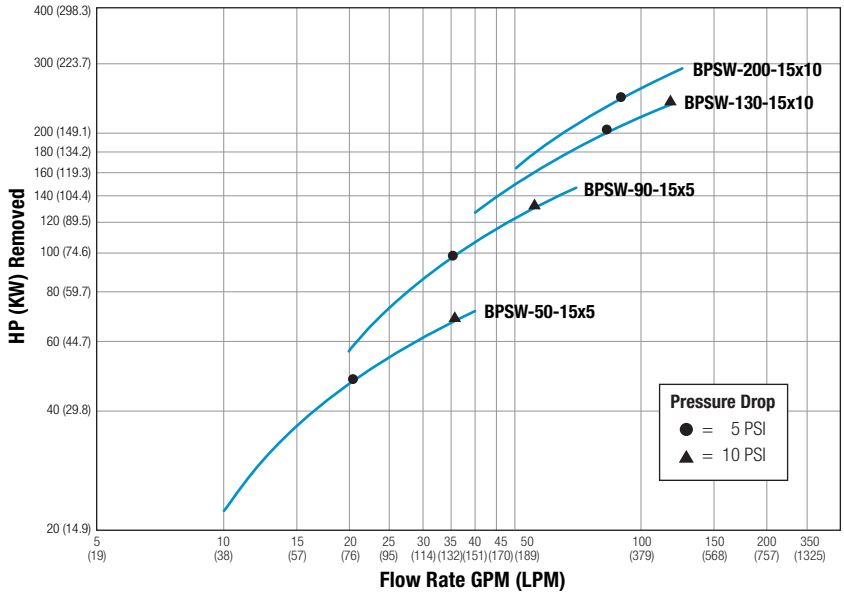
All dimensions are inches (millimeters), unless noted otherwise.
Note: We reserve the right to make reasonable design changes without notice.

Performance Curves

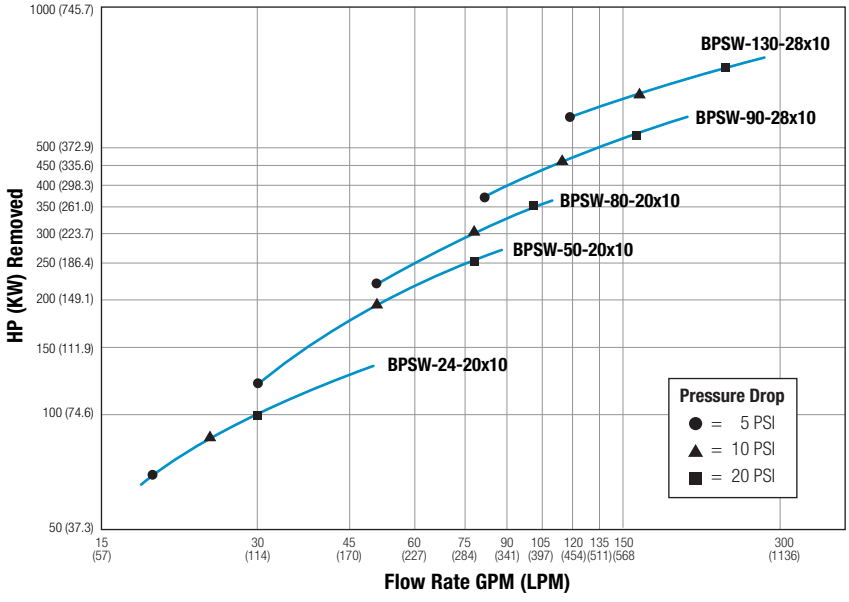
Low Flow



Medium Flow



High Flow



Selection Procedure

Performance Curves are based on 100SSU (21.7 cSt) oil at 40°F (22°C) approach temperature (125°F (52°C) oil leaving cooler, 85°F (29°C) water entering cooler), 2:1 oil: water ratio.

Step 1 **Determine Curve Horsepower Heat to be Removed.**

$$\text{HP (KW) heat load} \times \frac{40\ (22)}{\text{Oil leaving cooler °F (°C) minus water entering cooler °F (°C)}} \times \text{Performance correction multiplier} = \text{Curve HP (KW) heat to be removed}$$

Step 2 **Determine Actual Oil Pressure Drop.** Pressure drop shown on curve x Pressure drop correction multiplier = Actual pressure drop.

Oil Temperature

Oil coolers can be selected by using entering or leaving oil temperatures.

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°F - 130°F (43°C - 54°C)
Hydrostatic Drive Oil	130°F - 180°F (54°C - 82°C)
Lube Oil Circuits	110°F - 130°F (43°C - 54°C)
Automatic Transmission Fluid	200°F - 300°F (93°C - 149°C)

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

Off-Line Recirculation Cooling Loop: Desired temperature is the temperature entering the cooler. In this case, the oil temperature change must be determined so that the actual oil leaving temperature can be found. Calculate the oil temperature change (Oil △T) with this formula:

Oil △T=(BTUs/HR)/GPM Oil Flow x 210). (Oil △C=KW/LPM Oil Flow x .029)

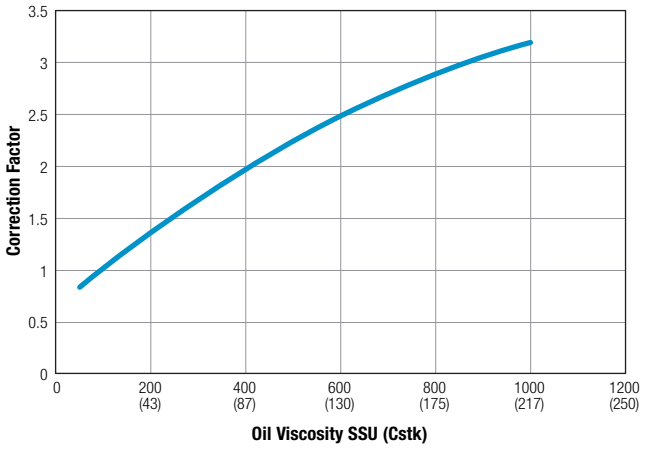
To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil △T.

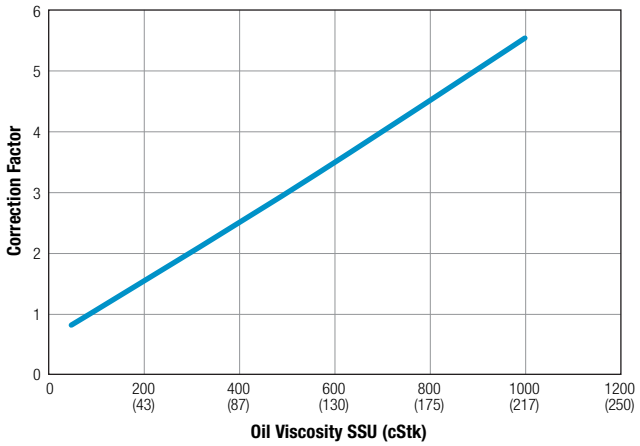
This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Correction



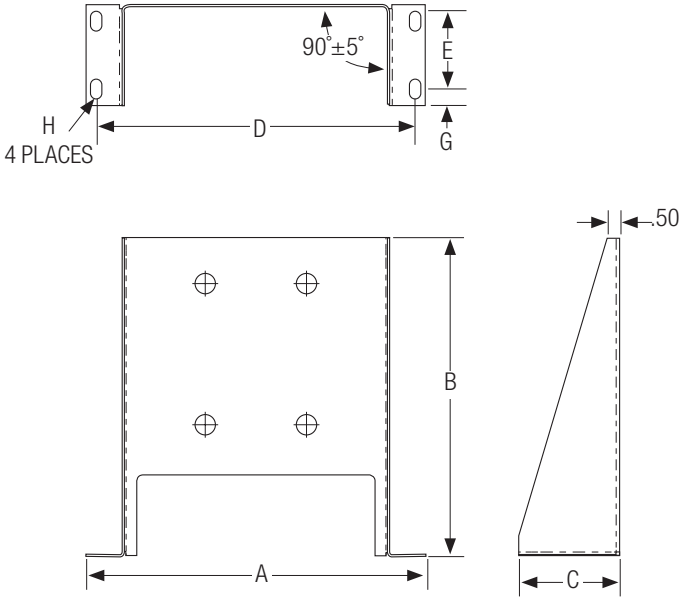
Pressure Drop Correction



	Model	Oil Conn (Female)	Water Conn (Female)
SMALL FLOW	BPSW-10-8x3	#10 SAE	¾" NPT
	BPSW-30-8x3	#10 SAE	¾" NPT
	BPSW-12-12x5	# 12 SAE	¾" NPT
	BPSW-24-12x5	# 12 SAE	¾" NPT
	BPSW-36-12x5	#20 SAE	1¼" NPT
	BPSW-70-12x5	#20 SAE	1¼" NPT
	BPSW-50-20x5	#20 SAE	1¼" NPT
	BPSW-70-20x5	#20 SAE	1¼" NPT
	BPSW-110-20x5	#20 SAE	1¼" NPT
MEDIUM FLOW	BPSW-50-15x5	#20 SAE	1¼" NPT
	BPSW-90-15x5	#20 SAE	1¼" NPT
	BPSW-130-15x10	#24 SAE	1½" NPT
	BPSW-200-15x10	#24 SAE	1½" NPT
LARGE FLOW	BPSW-24-20x10	#24 SAE	1½" NPT
	BPSW-50-20x10	#24 SAE	1½" NPT
	BPSW-80-20x10	#24 SAE	1½" NPT
	BPSW-90-28x10	2½" SAE FLG	2½" NPT
	BPSW-130-28x10	2½" SAE FLG	2½" NPT

Foot Mounting Bracket

Optional Foot Mounting Bracket for BPSW and BPW Series (except 8x3 plates).
Constructed of carbon steel.



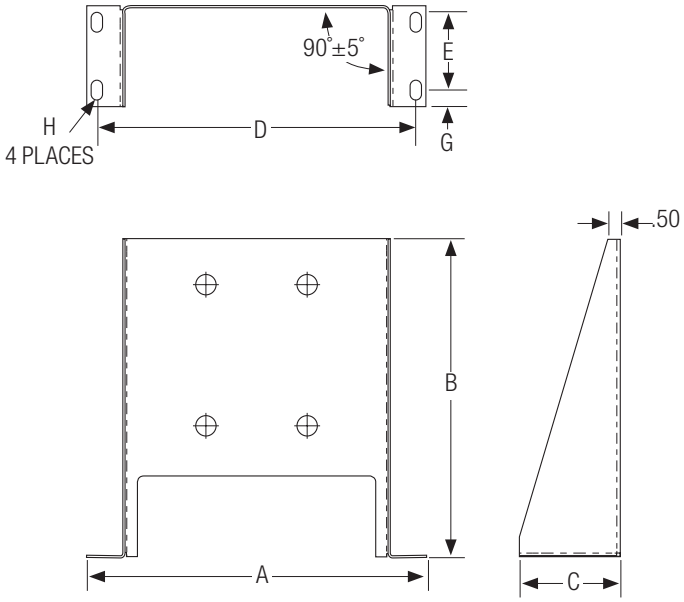
Mounting bracket for location purposes only. Bracket is not designed to support entire weight of the cooler. Customer to add extra support if necessary.

Part No.	Plate Size	A	B	C	D	E	G	H
56839	12x5 (305x127)	7.99 (203)	9.35 (237)	3.15 (80)	7.17 (182)	1.77 (45)	0.69 (18)	.40 x .59 (10 x 15)
56840	20x5 (508x127)	7.99 (203)	15.65 (398)	3.15 (80)	7.17 (182)	1.77 (45)	0.69 (18)	.40 x .59 (10 x 15)
56841	15x5 (381x127)	7.99 (203)	12.74 (324)	3.15 (80)	7.17 (182)	1.77 (45)	0.69 (18)	.40 x .59 (10 x 15)
56842	15x10 (381x254)	13.20 (335)	12.40 (315)	3.94 (100)	12.40 (315)	2.64 (67)	0.65 (17)	.40 x .75 (10 x 15)
56843	20x10 (508x254)	13.51 (343)	14.37 (365)	3.94 (100)	12.72 (323)	2.64 (67)	0.65 (17)	.40 x .75 (10 x 15)
56844	28x10 (711x254)	13.20 (335)	21.30 (541)	3.94 (100)	12.40 (315)	2.64 (67)	0.65 (17)	.40 x .75 (10 x 15)

All dimensions are in inches (millimeters), unless noted otherwise.

Foot Mounting Bracket

Optional Foot Mounting Bracket for **BPSW** and **BPW** Series (except 8x3 plates).
Constructed of Carbon Steel.



Mounting bracket for location purposes only. Bracket is not designed to support entire weight of the cooler. Customer to add extra support if necessary.

Dimensions

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All dimensions are in inches (millimeters), unless noted otherwise.

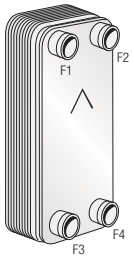
BPSW / BPW Series

General Information

Depending on material combinations, pressure ratings and functions, there are several different types of compact Brazed Plate Heat Exchangers (BPHEs). The standard materials are stainless steel, vacuum-brazed with a pure copper or nickel-based filler.

The basic materials of construction indicate the type of fluids that TTP's BPHEs can be used with. Typical examples are: synthetic or mineral oil, organic solvents, water (not seawater), glycol mixtures (ethylene and propylene glycol).

The front plate of TTP's BPHE is marked with an arrow. The purpose of this marker is to indicate the front side of the BPHE and the location of the inner and outer circuits/channels. With the arrow pointing up, the left side (Port F1, F3) is the inner circuit and the right side (Port F2, F4) is the outer circuit. For TTP asymmetric products one circuit is narrow while the other is wide, which makes it additionally important to correctly combine flow and circuit to reach design performance.



Ports F1/F2/F3/F4 are situated on the front of the heat exchanger.

Design Conditions

The standard pressure rating used for TTP BPHEs, i.e. for standard operating pressure, is maximum 450 PSI (3.1 MPa). TTP offers a wide range of pressure ratings based on applications, from low pressures (116 PSI) up to high pressures (2030 PSI). TTP's standard maximum operating temperature is 437°F for copper-brazed BPHEs, and 660°F for Nickel brazed BPHEs. However, as temperature and pressure are closely coupled, there is a possibility to increase the pressure if the temperature is reduced. For details, please check the label and other technical documentation.

Mounting

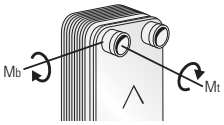
Never expose the unit to pulsations or excessive cyclic pressure or temperature changes. It is also important that no vibrations are transferred to the heat exchanger. If there is a risk of this, install vibration absorbers. For large connection diameters, we advise you to use an expanding device in the pipeline. It is also suggested that e.g. a rubber mounting strip should be used as a buffer between the BPHE and the mounting clamp.

In single-phase applications, e.g. water-to-water or water-to-oil, the mounting direction has little or no effect on the performance of the heat exchanger.

Connections

Allowable Connection Loads for Pipe Assembly Conditions

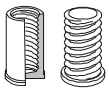
The maximum allowable connection loads given below are valid for low cycle fatigue. If high cycle fatigue is involved special analysis should be made.



Allowable connection loads for different pipe assembly conditions:

Pipe Size	Shear Force, F_s (lbf)	Tension Force, F_t (lbf)	Bending Moment, Mb (lbf* in)	Torque, Mt (lbf* in)
½"	787	562	177	310
¾"	2698	562	177	1018
1"	2518	899	398	1372
1¼"	3260	1461	774	2345
1½"	3709	2136	1372	3098
2"	4833	3035	2257	5310
2½"	10004	4047	3452	12834
3"	12447	4136	5089	21773

Allowable Loads for Stud Bolt Assembly Conditions



Mounting stud bolts, in different versions and locations, are available on the BPHEs as an option. These stud bolts are welded to the unit. The maximum allowable load on the stud bolts during assembly are stated below.

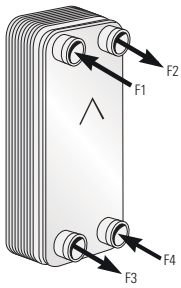
Allowable loads for different stud bolt assembly conditions:

Stud Bolt	Stress Area A_s (in²)	Tension Force F_t (lbf)	Torque M_t (lbfin)
M6	0.032	315	27
M8	0.053	585	71
M12	0.144	1349	239

Installation of BPHEs in Different Applications

Single-Phase Applications

Normally, the circuit with the highest temperature and/or pressure should be connected on the left side of the heat exchanger when the arrow is pointing upwards. For example, in a typical water-to-water application, the two fluids are connected in a counter-current flow, i.e. the hot water inlet in connection F1, outlet F3, cold water inlet F4, outlet F2. This is because the right-hand side of the heat exchanger contains one channel more than the left-hand side, and the hot medium is thus surrounded by the cold medium to prevent heat loss.



Water Strainer

A water strainer should be installed in the water inlet to protect the unit from particulate matter. 16-20 mesh minimum (20-40 mesh best choice).

Piping

Piping must be properly supported to prevent excess strain on the heat exchanger ports. Stainless steel is typically not satisfactory for salt water service.

Cleaning

In some applications, the fouling tendency could be very high; for example when using extremely hard water. It is always possible to clean the exchanger by circulating a cleaning liquid. Use a tank with a weak acid. 5% phosphoric acid, or if the exchanger is frequently cleaned, 5% oxalic acid. Pump the cleaning liquid through the exchanger. For optimum cleaning, the cleaning solution flow rate should be a minimum of 1.5 times normal flow rate, preferably in a backflush mode. Afterwards rinse with large amounts of fresh water in order to get rid of all the acid before starting up the system again. Clean at regular intervals.

Storage

BPHEs are to be stored dry. The temperature should not be below 34°F and not over 122°F for long term storage (more than 2 weeks).

Disclaimer

TTP's BPHE performance is based on installation, maintenance and operating conditions done in conformance with these instructions. TTP cannot assume any liability for BPHEs that do not meet these criteria.

The heat exchanger is not type-approved for fatigue loading.