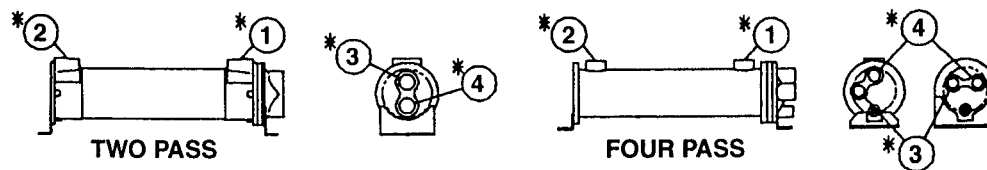
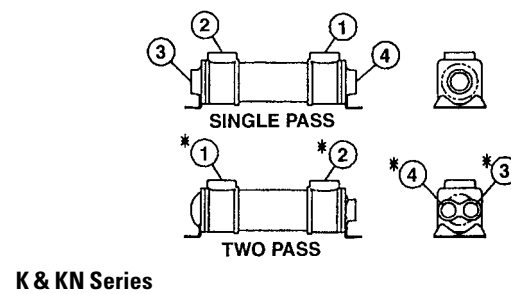
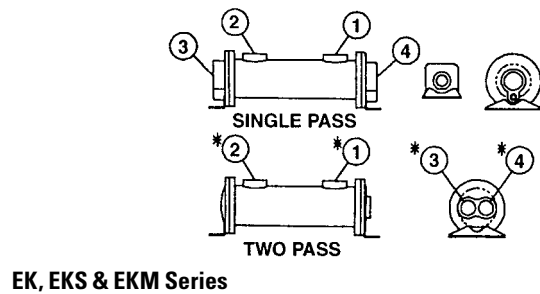
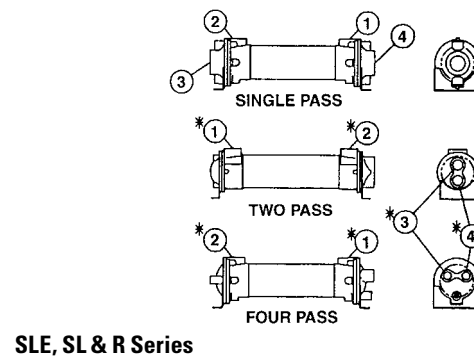
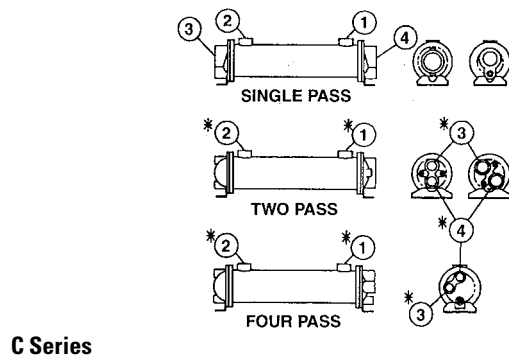
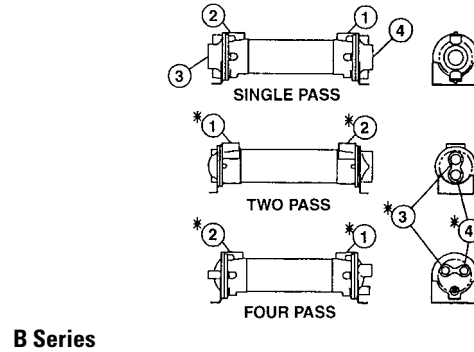
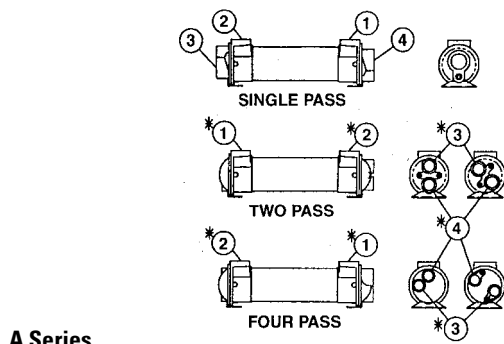


Heat Exchanger Piping Hook-up



U, UC & UR Series

Note baffle location when inserting bundle into shell assembly after cleaning.

- ① Hot Fluid In
- ② Cooled Fluid Out
- ③ Cooling Water In
- ④ Cooling Water Out

*Note: For all two pass and four pass heat exchangers: connections ① and ② may be reversed, and connections ③ and ④ may be reversed with no effect on performance.

Shell & Tube Heat Exchanger Installation & Service Recommendations

Installation The satisfactory use of this heat exchange equipment is dependent upon precautions which must be taken at the time of the installation.

1. Connect and circulate the hot fluid in the shell side (over small tubes) and the cooling water in the tube side (inside small tubes). Note piping diagrams.
2. If an automatic water regulating valve is used, place it on the INLET connection of the cooler. Arrange the water outlet piping so that the exchanger remains flooded with water, but at little or no pressure. The temperature probe is placed in the hydraulic reservoir to sense a system temperature rise. Write the factory for water regulating valve recommendations.
3. There are normally no restrictions as to how this cooler may be mounted. The only limitation regarding the mounting of this equipment is the possibility of having to drain either the water or the oil chambers after the cooler has been installed. Both fluid drain plugs should be located on the bottom of the cooler to accomplish the draining of the fluids. Drains are on most models.
4. It is possible to protect your cooler from high flow and pressure surges of hot fluid by installing a fast-acting relief valve in the inlet line to the cooler.
5. It is recommended that water strainers be installed ahead of this cooler when the source of cooling water is from other than a municipal water supply. Dirt and debris can plug the water passages very quickly, rendering the cooler ineffective. Write the factory for water strainer recommendations.
6. Fixed bundle heat exchangers are generally not recommended for steam service. For steam applications, a floating bundle exchanger is required. Note: When installing floating bundle unit, secure one end firmly and opposite end loosely to allow bundle to expand and contract. Consult factory for selection assistance.
7. Piping must be properly supported to prevent excess strain on the heat exchanger ports. If excessive vibration is present, the use of shock absorbing mounts and flexible connectors is recommended.

Service Each heat exchanger has been cleaned at the factory and should not require further treatment. It may be well to inspect the unit to be sure that dirt or foreign matter has not entered the unit during shipment. The heat exchanger should be mounted firmly in place with pipe connections tight.

Caution If sealant tape is used on pipe threads, the degree of resistance between mating parts is less, and there is a greater chance for cracking the heat exchanger castings. Do not overtighten. When storing the unit, be sure to keep the oil and water ports sealed. If storage continues into cold winter months, the water chamber must be drained to prevent damage by freezing.

Performance information should be noted and recorded on newly installed units so that any reduction in effectiveness can be detected. Any loss in efficiency can normally be traced to an accumulation of oil sludge, or water scale.

Recommendations Replace gaskets when removing end castings. It is recommended that gaskets be soaked in oil to prevent corrosion and ensure a tight seal.

Salt water should not be used in standard models. Use salt water in special models having 90/10 copper-nickel tubes, tube sheets*, bronze bonnets and zinc anodes on the tube side. Brackish water or other corrosive fluids may require special materials of construction.

When zinc anodes are used for a particular application, they should be inspected two weeks after initial startup.

At this time, by visual inspection of the anode, determination of future inspection intervals can be made, based on the actual corrosion rate of the zinc metal.

The zinc anodes must be replaced when 70% of the zinc volume has been consumed.

It may be necessary to drain the water chambers of the exchanger to protect it from damage by freezing temperatures. Drains are provided in most standard models.

The oil chamber of the exchanger may become filled with sludge accumulation and require cleaning. It is recommended that the unit be flooded with a commercial solvent and left to soak for one-half hour. Backflowing with the solvent or regular oil will remove most sludge. Repeated soaking and backflowing may be required, depending on the degree of sludge buildup.

It may be necessary to clean the inside of the cooling tubes to remove any contamination and/or scale buildup. It is recommended that a fifty-fifty percent solution of inhibited muriatic acid and water may be used. For severe problems, the use of a brush through the tubes may be of some help. Be sure to use a soft bristled brush to prevent scouring the tube surface causing accelerated corrosion. Upon completion of cleaning, be certain that all chemicals are removed from the shellside and the tubeside before the heat exchanger is placed into service.

When ordering replacement parts or making an inquiry regarding service, mention model number, serial number, and the original purchase order number.

**Available on C/CA Series models only.*

Max S & T Flow Rates

CAUTION Incorrect installation can cause this product to fail prematurely, causing the shell side and tube side fluids to intermix. Maximum allowable flow rates are as charted below.

B Series Model No. Example: B-702-A4-F

Unit Size	Shell Side (GPM)/Baffle Spacing					Tube Side (GPM)		
	A	B	C	D	E	O	T	T
400	9.6					25		
700	17	29	29			61	31	15
1000	24	48	69	69		146	73	37
1200	29	57	115	115		224	112	56
1600	37	74	149	253		363	181	91
2000			187	347*	457*	652	326	163

*281 GPM maximum for all B-2005-D **500 GPM maximum for all B-20080-E and 562 GPM maximum for all B2006-E6 or B-2006-E10
562 GPM maximum for all B-2006-E6 or B-2006-E10

A Series Model No. Example: A-1024-2-6-F

Unit Size	Baffle Spacing	Shell Side (GPM)	Tube Side (GPM)		
			O	T	F
400	.75, 2	7, 19	18	—	—
600	1, 1.5, 2, 4	14, 21, 29, 29	48	24	12
800	1.5, 2, 3, 4	29, 38, 57, 69	87	43	21
1000		32, 42, 60, 69	146	73	37
1200	2, 3, 4, 6	51, 77, 103, 115	224	112	56
1600		66, 100, 133, 200	280	203	101

K & EK Series Model No. Example: EK or K-712-F

Unit Size	Shell Side (GPM)	Tube Side (GPM)	
		O	T
500	20	13	
700	70	24	12
1000	100	56	28

C Series Model No. Example: C-1024-2-6-F

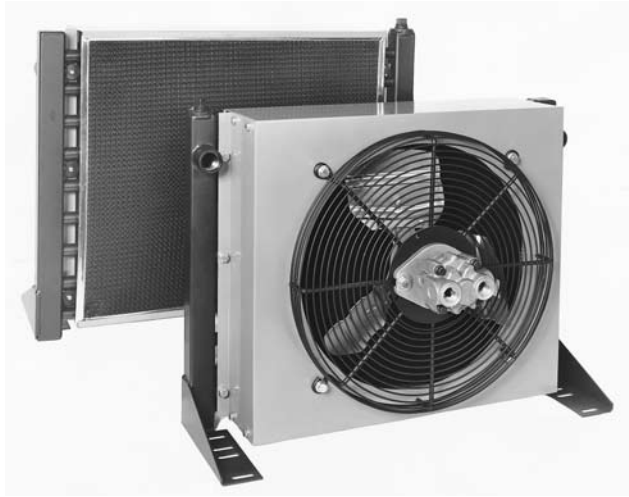
Unit Size	Baffle Size	Shell Side (GPM)	Tube Side (GPM)		
			O	T	F
600	1.38, 2, 3	19, 29, 29	48	24	12
800	1.38, 1.7, 2, 3, 4	26, 32, 38, 57, 69	84	42	21
1000	1.38, 2, 3, 5	24, 41, 64, 69	146	23	37
1200	2.5, 3, 3.62, 5, 6	60, 77, 93, 115, 115	224	112	56
1700	3.5, 4, 4.5, 5, 6, 7, 8.4	125, 143, 161, 179, 215, 251, 253	465	232	116

SLE Series Model No. Example: SLE-1236-6-F

Unit Size	Baffle Size	Shell Side (GPM)	Tube Side (GPM)		
			O	T	F
1000	4, 6, 8	55, 70, 70	66	33	15
1200	4, 6, 8, 12	65, 100, 115, 115	120	60	28
1700	4, 6, 8, 12	90, 140, 190, 255	220	110	52

AOC Series

Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.



Description AOC series forced air oil coolers are used for high-efficiency oil cooling in hydraulic systems. Units utilize the latest in heat transfer technology to reduce the physical size and provide the ultimate in cooling capacity. By maintaining a lower oil temperature, hydraulic components and fluids work better and have a longer life expectancy.

General Safety Information

1. Do not exceed the pressure rating of the oil cooler, nor any other component in the hydraulic system.
2. Do not exceed the published maximum flow rates as the potential can result in damage to the hydraulic system.
3. Release all oil pressure from the system before installing or servicing the oil cooler.
4. These oil coolers are not suitable for use in hydraulic systems operating with water-glycol or high water base fluids without a corrosion inhibitor suitable for aluminum and copper component protection.

Unpacking After unpacking the unit, inspect for any loose, missing or damaged parts. Any minor damage to the cooling fins can generally be corrected by gently straightening them.

WARNING Do not exceed the maximum pressure of 300 PSI, or the maximum temperature of 350°F as oil cooler failure can occur.

1. These hydraulic oil coolers should be installed on either the low pressure return line, or a dedicated recirculation cooling loop.
2. Turn off the hydraulic system and drain any oil from the return lines before installing these coolers.
3. A strainer located ahead of the cooler inlet should be installed to trap scale, dirt, or sludge that may be present in piping and equipment, or that may accumulate with use. A thermostatic or spring loaded bypass/relief valve installed ahead of the cooler may be helpful to speed warm-up and relieve the system of excessive pressures.

CAUTION Use of a back-up wrench is recommended to prevent twisting of the manifolds when installing the oil piping. If pipe sealant is used on threads, the degree of resistance between mating parts is less, and there is an increased chance for cracking the heat exchanger fittings. Do not over tighten.

4. Piping must be properly supported to prevent excess strain on the heat exchanger ports.

Operation Once unit is installed, turn the fan by hand to eliminate possible part interference because of damage in shipment or installation. Observe the fan operation upon initial startup. The system may then be operated.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surfaces Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with compressed air. Should the surface be greasy, the cooler should be brushed or sprayed with a mild alkaline solution, or a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam cleaner may also be used effectively. Do not use caustic cleaners.

Casing Fan and Motor Dirt and grease should be removed. Rusty or corroded surfaces should be sanded clean and repainted.

Internal Cleaning At least once a year piping should be disconnected and degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full thermal capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pumps and accessories. The strainer or any filtering devices should be removed and serviced following this cleaning operation.

Trouble Shooting Chart

Symptom	Possible Cause	Corrective Action
Not cooling adequately	1. Not enough air flow 2. Unit is fouled 3. Unit is undersized	1. Consult specifications and adjust if required 2. Clean exchanger (see maintenance) 3. Check specifications and change size if necessary
Leaking at connections	1. Not tight 2. No thread sealant	1. Tighten carefully 2. Remove pipe, apply thread sealant and reinstall

Heat Exchangers – AO, AOVH, AOHM, AOF, & AOVHM Series

General Information

1. Air cooled oil coolers are built for operation with maximum oil pressures of 300 psi and temperatures of 400°F.
2. The motors furnished are specially built for fan duty. They are guaranteed by the manufacturer for operation in a maximum ambient temperature of 104°F. Consideration should be given to installation location so motors are not subjected to temperatures above this level.
3. Air/oil coolers that are to be installed for utilization of waste heat for the space heating should be mounted 7 to 14 feet above the floor depending on the structure, for proper heat distribution.

Installation

1. "AO" and "AOF" coolers are designed for suspension by eye bolts or threaded hanger rods screwed into the upper and lower covers in 1/2" to 13 threaded holes; "AOVH" coolers have 6 to 12 holes (0.56" diameter) in the base for mounting. Refer to product page for location and quantity.
2. Units should not be located in corrosive atmospheres as rapid deterioration of casing, cooling coil, fan and motor may take place resulting in reduced life.
3. For proper air flow, a minimum of 12" should be allowed between the oil cooler fan and any walls or obstructions.
4. Piping should be sized based on oil flow and pressure drop requirements and not on the oil coolers supply and return connection size. Piping should also be properly supported to prevent excessive strain to connection, manifolds, etc.
5. Filter located ahead of the cooler should be installed to trap scale, dirt or sludge that may be present in piping and equipment, or that may accumulate with use. A thermostatic or spring loaded by-pass relief valve installed ahead of the cooler may be helpful to speed warm-up and relieve the system of excessive pressure. All accessories should be considered in the original heat rejection and piping calculations.
6. Electric Motors: CAUTION To prevent possible electrical shock, it is important to make sure this unit is grounded properly. Connect motor only to a power supply of the same characteristics as shown on the motor nameplate. Voltage may vary 10% of nameplate voltage. Be sure to provide proper fusing to prevent possible motor burnout. Follow wiring diagram printed on motor nameplate or in terminal box. Before starting motor, follow motor manufacturer recommendations. Turn fan manually to eliminate possible motor burn out in the event the fan has become damaged in shipment. Observe operation carefully after motor is started for the first time.
7. Hydraulic Motors: Connect motor, port B, to inlet oil line and return line to port A for correct rotation. A filter is highly recommended upstream of the motor rated at 25 micron nominal. Controlling oil flow rate as specified on motor data sheet with cooler is very important. Maximum oil pressure to motor is 2000 psi, minimum pressure is shown on motor data sheet. Do not allow dirty oil to enter the motor. Excessive flows will cause fan blade failure. Insufficient flows to motor will reduce cooling capacity.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surface Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with an air hose. Should the surface be greasy, the motor should be removed and the fins and tubes brushed or sprayed with a mild alkaline solution, or a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam hose may also be used effectively.

Casing, Fan and Motor: Dirt and grease should be removed from these parts. Rusty or corroded surfaces should be sanded clean and repainted.

Internal Cleaning: At least once a year piping should be disconnected and a degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer of any filtering devices should be removed and serviced following this cleaning operation.

Electric Motor Keep outside surface free of dirt and grease so motor will cool properly. Make sure cooling air over motor is not obstructed. Prelubricated ball bearing motors are normally furnished and require no grease for about 5 to 10 years. Sleeve bearing motors require oil after three years.

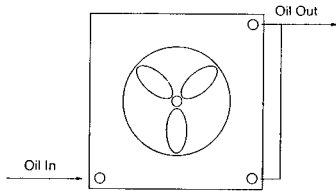
Hydraulic Motor Change any oil filter(s) in the motor circuit as frequently as necessary to assure that good, clean oil is maintained.

Units with Replaceable Air Filters Examine filters for dirt and grease accumulation twice yearly, or more if operating conditions dictate. If disposable filters are used, replace as required. If the washable aluminum filters are used, wash with a warm water and soap solution that will remove dirt and cut grease build-up. Make sure that the aluminum filter is completely dry before replacing the unit. This filter can be made more effective if treated with a lightweight oil before placing in service. It is recommended that a spare aluminum filter be kept in stock to minimize downtime during the filter cleaning operation.

Repair or Replacement of Parts When ordering replacement parts or making inquiry regarding service, mention model number, serial number and the original purchase order number. Any reference to the motor must carry full nameplate data.

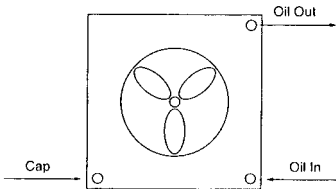
Air/Oil Heat Exchangers

One Oil Pass



AO, AOF & AOHM Models	One Pass Flow in GPM	AOVH & AOVHM Models	One Pass Flow in GPM
5	2-80	5	4-160
10	3-80	10	6-160
15	4-80	15	8-160
20	5-80	20	10-160
25	6-100	25	12-200
30	7-100	30	14-200
35	8-112	35	16-220
40	9-118	40	18-230

Two Oil Passes



AO, AOF & AOHM Models	Two Pass Flow in GPM	AOVH & AOVHM Models	Two Pass Flow in GPM
5	2-25	5	4-50
10	2-30	10	4-60
15		15	
20	2-40	20	4-80
25		25	
30		30	
35	3-40	35	6-80
40	4-40	40	8-80

GRESEN HYDRAULIC MOTOR SPECIFICATIONS

Models	Maximum Fan Speed (rpm)	Oil Flow Required (gpm)	Displacement (cu. in./rev)	Minimum Operating Pressure (psi)
AOHM-5	1725	1.6	.22	300
AOHM-10				
AOHM-15				
AOHM-20				
AOHM-25	1140	1.1		400
AOHM-30				900
AOHM-35				
AOHM-40				
AOVHM-5	3450	3.3		300
AOVHM-10				
AOVHM-15				
AOVHM-20				
AOVHM-25	1725	3.4	.45	500
AOVHM-30		5.2	.70	1000
AOVHM-35				
AOVHM-40				

Maximum operating pressure 2000 psi. Stated minimum operating pressure is at inlet port of motor. 1000 psi allowable downstream back pressure.

Air Cooled Oil Coolers — AOL Models

General Information

1. Air cooled oil coolers are built for operation with maximum oil pressure of 250 psi (17.2 BAR) and temperatures of 350°F (176°C).
2. The motors furnished are built for fan duty. Consideration should be given to the installation location so motors are not subjected to extreme temperatures.
3. The AOL oil coolers are not to be operated in ambient temperatures below 35°F (1°C).
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.

Installation

1. Air cooled oil coolers should not be located in corrosive atmospheres as rapid deterioration of fan shroud, cooling coil, fan and motor may take place.
2. Piping should be sized based on oil flow and pressure drop requirements, not on the oil cooler's supply and return connection sizes.
3. A filter located ahead of the oil cooler should be installed to trap dirt or sludge that may be present in piping and equipment, or that may accumulate with use.
4. Flexible connectors should be installed to prevent the stressing of manifolds. (Must be properly installed to validate warranty.)
5. For proper air flow, a minimum of 12" should be allowed between the oil cooler fan and any walls or obstructions.

Electrical

1. CAUTION To prevent possible electrical shock, it is important to make sure this unit is properly grounded.
2. Connect motor only to a power supply of the same characteristics as shown on the motor nameplate. Be sure to provide proper fusing to prevent possible motor burnout. Before starting motor, follow manufacturer's recommendations. Turn fan manually to eliminate possible motor burnout in the event the fan has been damaged in shipment. Observe operation after motor is started for the first time.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surface Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with an air hose. Should the surface be greasy, the motor should be removed and the fins and tubes brushed or sprayed with a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam hose may also be used effectively. **Do not clean with caustic cleaners.**

Fan Shroud, Fan and Motor Dirt and grease should be removed from these parts. Rusty or corroded surfaces should be sanded clean and repainted.

Internal Cleaning Once a year piping should be disconnected and a degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer of any filtering devices should be removed and serviced following this cleaning operation.

Motor Keep outside surface free of dirt and grease so motor will cool properly. Ball bearing equipped motors are sealed, and do not require greasing. Motors with Alemite fittings require lubrication every 6 months. Clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes in NEMA 404 frame or larger. CAUTION Keep grease clean. Lubricate motors at standstill. **Do not mix petroleum grease and silicone grease in motor bearings.**

Repair or Replacement of Parts When ordering replacement parts or making inquiry regarding service, mention model number, serial number and the original purchase order number. Any reference to the motor must carry full nameplate data.

RM Series

Unpacking Instructions

Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.



Description RM series forced air oil coolers are used for high-efficiency oil cooling in hydraulic systems. Units utilize the latest in heat transfer technology to reduce the physical size and provide the ultimate in cooling capacity. By maintaining a lower oil temperature, hydraulic components and fluids work better and have a longer life expectancy.

General Safety Information

1. Do not exceed the pressure rating of the oil cooler, nor any other component in the hydraulic system.
2. Do not exceed the published maximum flow rates as the potential can result in damage to the hydraulic system.
3. Release all oil pressure from the system before installing or servicing the oil cooler.
4. These oil coolers are not suitable for use in hydraulic systems operating with water-glycol or high water base fluids without a corrosion inhibitor suitable for aluminum and copper component protection.

Unpacking After unpacking the unit, inspect for any loose, missing or damaged parts. Any minor damage to the cooling fins can generally be corrected by gently straightening them.

WARNING Do not exceed the maximum pressure of 300 PSI, or the maximum temperature of 350°F as oil cooler failure can occur.

1. These hydraulic oil coolers should be installed on either the low pressure return line, or a dedicated recirculation cooling loop.
2. Turn off the hydraulic system and drain any oil from the return lines before installing these coolers.
3. A strainer located ahead of the cooler inlet should be installed to trap scale, dirt, or sludge that may be present in piping and equipment, or that may accumulate with use. A thermostatic or spring loaded bypass/relief valve installed ahead of the cooler may be helpful to speed warm-up and relieve the system of excessive pressures.

CAUTION

Use of a back-up wrench is recommended to prevent twisting of the manifolds when installing the oil piping.

If pipe sealant is used on threads, the degree of resistance between mating parts is less, and there is an increased chance for cracking the heat exchanger fittings. Do not over tighten.

4. Piping must be properly supported to prevent excess strain on the heat exchanger ports.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surfaces Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with compressed air. Should the surface be greasy, the cooler should be brushed or sprayed with a mild alkaline solution, or a non-flammable degreasing fluid. Follow with hot water rinse and dry thoroughly. A steam cleaner may also be used effectively. **Do not use caustic cleaners.**

Casing Dirt and grease should be removed. Rusty or corroded surfaces should be sanded clean and repainted.

Internal Cleaning At least once a year piping should be disconnected and decreasing agent or flushing oil circulated through the unit to remove sludge form turbulators and internal tube surfaces to return the unit to full thermal capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pumps and accessories. The strained or any filtering devices should be removed and serviced following this cleaning operation.

Trouble Shooting Chart

Symptom	Possible Cause	Corrective Action
Not cooling adequately	1. Not enough air flow 2. Unit is fouled 3. Unit is undersized	1. Consult specifications and adjust if required 2. Clean exchanger (see maintenance) 3. Check specifications and change size if necessary
Leaking at connections	1. Not tight 2. No thread sealant	1. Tighten carefully 2. Remove pipe, apply thread sealant and reinstall

M Series & MR Series

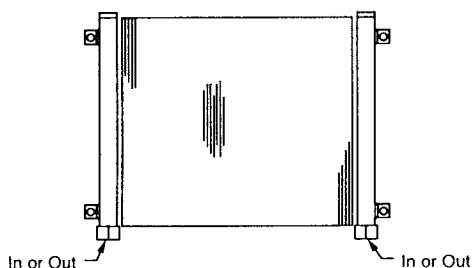
General Information

1. Air Cooled Mobile Series coolers are built for operation with maximum oil pressures to 300 psi and temperatures to 400°F.
2. Care must be taken to reduce or eliminate dirt and debris from blocking the cooling surface as overheating could result.

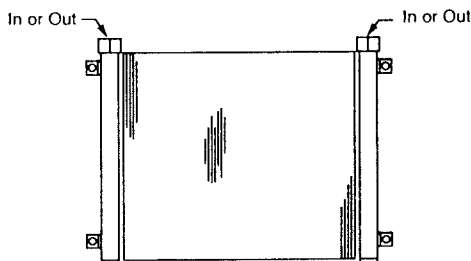
Heat Exchanger Piping Hook-up

M Series

Oil Connections Down—High Flow Rates Only.

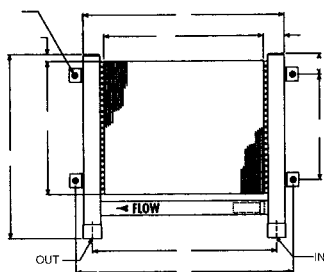


Oil Connections Up—High, Low and Medium Flow Rates

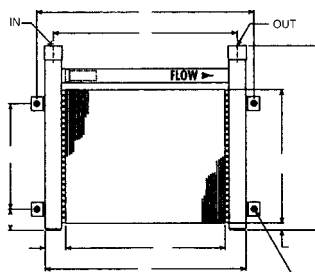


MR Series

Oil Connections Down—High Flow Rates Only.



Oil Connections Up—Low to Medium Flow Rates



Installation

1. Mobile Series coolers are designed for mounting by "L" shaped brackets attached to the sides of the manifolds.
2. It is recommended that these units be installed with the oil ports positioned, based on oil flow rates.
3. Units **should not be located** in corrosive atmospheres as rapid deterioration of cooling coil, and/or manifolds may take place resulting in reduced service life (corrosion resistant coatings available—consult factory).
4. Piping should be sized based on oil flow and pressure drop requirements, not on the oil coolers port sizes. It should also be properly supported to prevent excessive strain to connections, manifolds, etc.

NOTE: Oil port position is at customer option, however, the cooler must be flooded with oil to take full advantage of cooling potential.

Maintenance

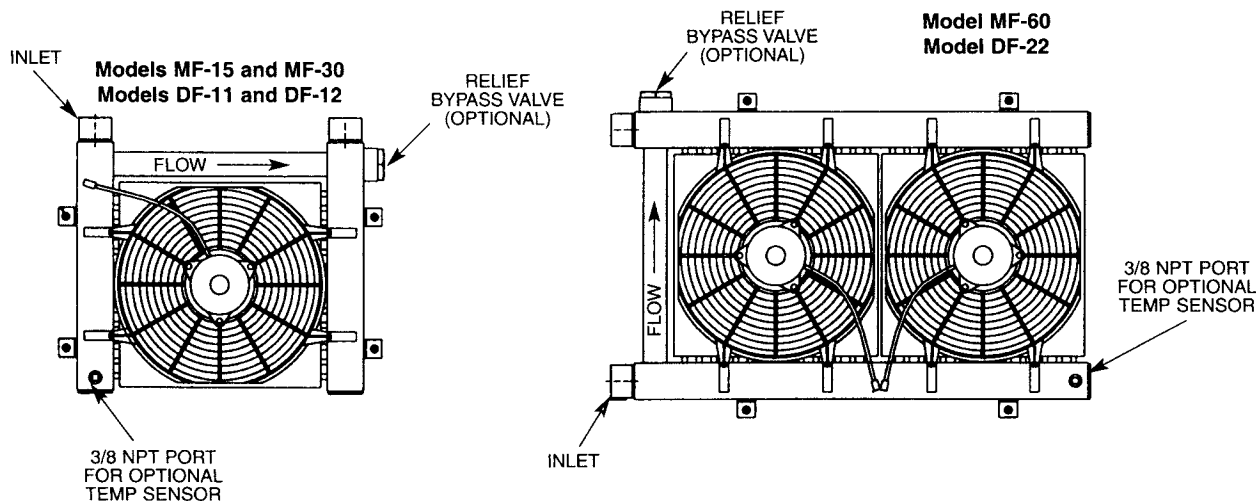
1. The unit should be inspected regularly for corrosion and dirty or clogged heat transfer surface. Dirt and dust can be removed by washing, brushing or blowing out with compressed air. Should the surface be greasy, the fins and tubes can be brushed or sprayed with a non-flammable degreasing fluid which is safe on copper, steel and aluminum. Follow with a hot water rinse and dry thoroughly. A steam cleaner can also be used effectively.
2. Once a year, or as required by the application, piping should be disconnected and a degreasing agent circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer or any filtering devices should also be serviced following this operation.
3. When ordering replacement parts or inquiring on service, mention the model number, serial number and the original purchase order number.
4. Check valve cartridge (MR Series) is not serviceable. Install oil filter ahead of unit to keep foreign particles from rendering the cartridge ineffective.

MF Series & DF Series

General Information

1. Air Cooled "MF and "DF" Mobile Series coolers are built for operation with maximum oil pressures to 300 psi and temperatures to 350°F.
2. Care must be taken to reduce or eliminate dirt and debris from blocking the cooling surface as overheating could result.

Heat Exchanger Piping Hook-up



Installation

1. These coolers are designed for mounting by "L" shaped brackets attached to the sides of the manifolds.
2. It is recommended that these units be installed with the oil ports positioned as shown below.
3. **Units should not be located** in corrosive atmospheres as rapid deterioration of cooling coil, and/or manifolds may take place resulting in reduced service life.
4. Piping should be sized based on oil flow and pressure drop requirements, not on the oil coolers port sizes.
5. Turn fan blade manually to assure proper clearance before motor start-up in case it has been damaged in shipment.

NOTE: Oil port position is at customer option, however, the cooler must be flooded with oil to take full advantage of cooling potential.

Maintenance

1. The cooler should be inspected regularly for corrosion and dirty or clogged heat transfer surface. Dirt and dust can be removed by washing, brushing or blowing out with compressed air. Should the surface be greasy, the fins and tubes can be brushed or sprayed with a non-flammable degreasing fluid which is safe on copper, steel and aluminum. Follow with a hot wash rinse and dry thoroughly. A steam cleaner can also be used effectively.
2. Once a year, or as required by the application, piping should be disconnected and a degreasing agent circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer or any filtering devices should also be serviced following this operation.
3. **Twelve volt DC motors are not serviceable** and must be replaced if problems occur..
4. When ordering replacement parts or inquiring on service, mention the model number, serial number, and the original purchase order number.

Brazed Plate — BP Series & BPS Series

Liquid To Liquid Service

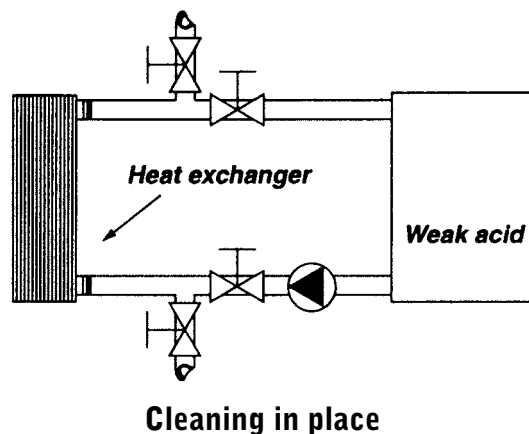
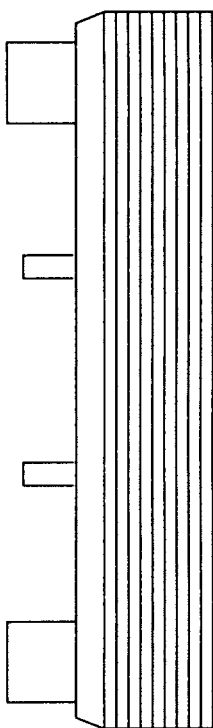
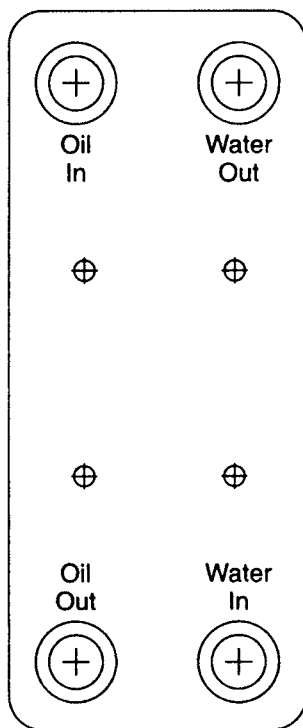
Installation Units may be mounted in any orientation. The only limitation regarding the mounting of this equipment is the possibility of having to drain the unit after installation. It may be necessary to drain the fluids to protect the unit from damage by freezing temperatures.

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. Type 304 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.

BP Series & BPS Series



Air Cooled Compressed Air Aftercoolers — AA-35 – AA-300 & UPA-20 – UPA-100

General Information

1. Air cooled aftercoolers are built for operation with maximum air pressure of 250 psi and temperature of 350°F.
2. The motors furnished are built for fan duty. Consideration should be given to the installation location so motors **are not subjected to extreme temperatures**.
3. Air cooled aftercoolers are generally installed at floor level. If the unit is to be used to reclaim waste heat for space heating, it is recommended that the unit be mounted 7 to 14 feet above the floor, depending on the structure, for proper heat distribution.

Installation

1. Air cooled aftercoolers are designed for mounting either by mounting legs, or by suspension from brackets attached to the cabinet. (Hanger rod not included.)
2. Aftercoolers **should not be located** in corrosive atmospheres as rapid deterioration of casing, cooling coil, fan and motor may take place resulting in reduced life.
3. Piping should be sized based on air flow and pressure drop requirements and not on the aftercooler's supply and return connection size. The piping must also be properly supported to prevent manifold stress.
4. A strainer located ahead of the aftercooler should be installed to trap scale, dirt or sludge that may be present in piping and equipment, or that may accumulate with use.
5. A separator/trap/drain should be installed in the outlet piping of the aftercooler to remove condensate.
6. Flexible connectors should be installed to prevent the stressing of manifolds. (Must be properly installed to validate warranty.)
7. Arrange the outlet pipe so that the moisture that condenses within the aftercooler can drain freely by gravity.
8. For proper air flow, a minimum of 12" clearance should be allowed between the aftercooler fan and any wall or obstructions.

Electrical

1. **CAUTION To prevent possible electrical shock, it is important to properly ground this unit using grounding screw provided. Be sure not to disconnect the motor grounding wire when making this connection.**
2. Connect motor only to a power supply of the same characteristics as shown on the motor nameplate. Be sure to provide proper fusing to prevent possible motor burnout. Before starting motor, follow manufacturer's recommendations. Turn fan manually to eliminate possible motor burnout in the event the fan has been damaged in shipment. Observe operation after motor is started for the first time.
3. In a typical compressor aftercooler installation, the aftercooler is interlocked to the compressor so it runs whenever the compressor is turned on.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surface Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with an air hose. Should the surface be greasy, the motor should be removed and the fins and tubes brushed or sprayed with a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam hose may also be used effectively.

Casing, Fan and Motor Dirt and grease should be removed from these parts. Rusty or corroded surfaces should be sanded clean and repainted.

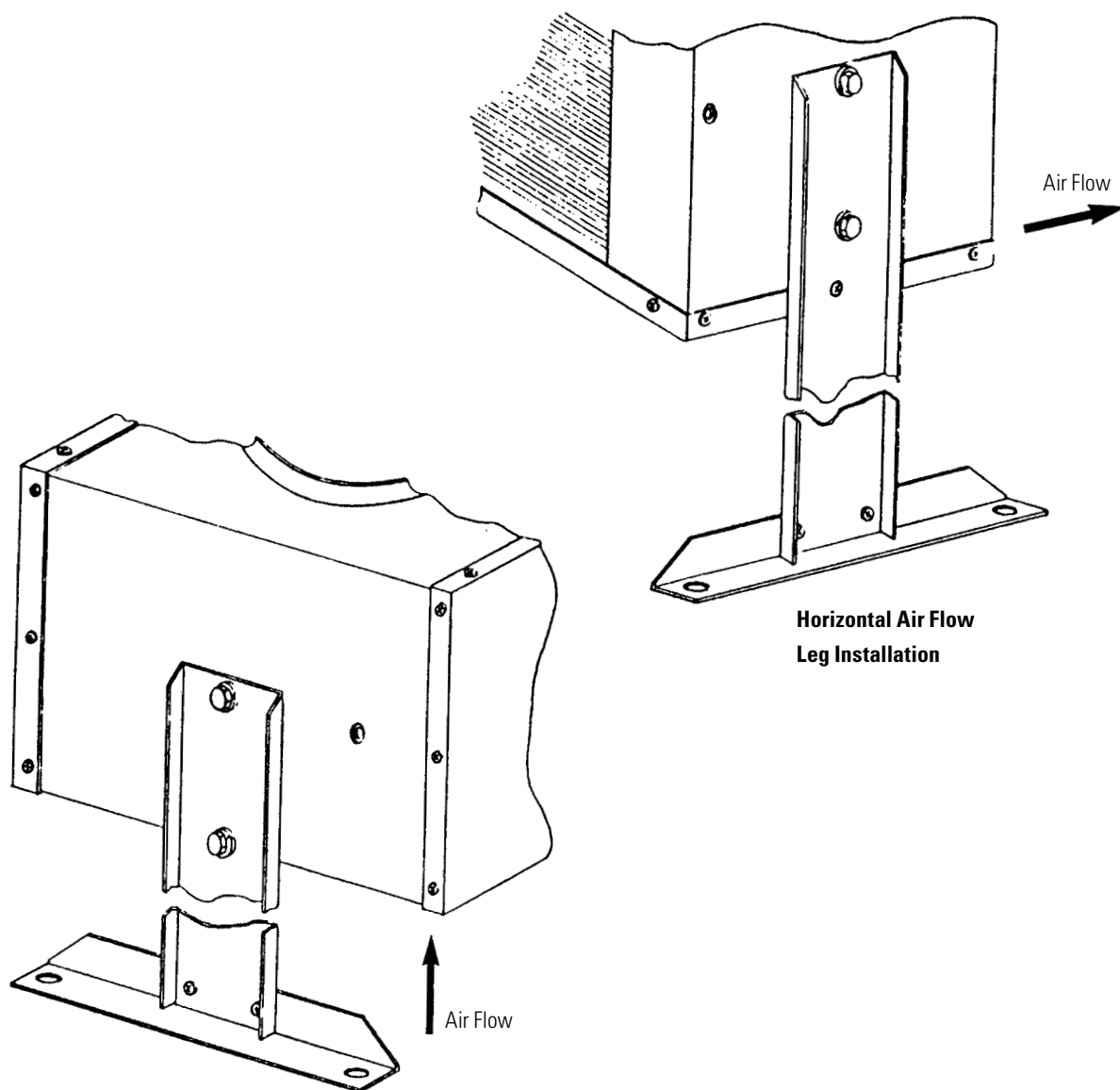
Internal Cleaning Once a year piping should be disconnected and a degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer of any filtering devices should be removed and serviced following this cleaning operation. **Caustic cleaners should not be used to clean these heat exchangers.**

Motor Keep outside surface free of dirt and grease so motor will cool properly. Make sure cooling air over motor is not obstructed. Sleeve bearing motors are normally furnished and require lubrication every 6 months. Add a few drops of SAE 20 oil to each bearing. When TEFC Motors are furnished, they are normally prelubricated ball bearing motors and require no grease for about 5 to 10 years.

Repair or Replacement of Parts When ordering replacement parts or making inquiry regarding service, mention model number, serial number and the original purchase order number. Any reference to the motor must carry full nameplate data.

Models UPA 50 & UPA 100

Leg Installation



**Vertical Air Flow
Leg Installation**

**Horizontal Air Flow
Leg Installation**

Air Cooled Compressed Air Aftercoolers — AHP Models

General Information

1. Air cooled aftercoolers are built for operation with maximum air pressure of 250 psi (17.2 BAR) and temperature of 350°F (176°C).
2. The motors furnished are built for fan duty. Consideration should be given to the installation location so motors **are not subjected to extreme temperatures**.
3. AHP Coolers are **not to be operated** in ambient temperatures below 35°F (1°C).
4. The fan **cannot** be cycled.
5. AHP coolers operated outdoors **must be protected** from weather. Consult factory for recommendations.

Installation

1. Aftercoolers **should not be located** in corrosive atmospheres as rapid deterioration of fan shroud, cooling coil, fan and motor may take place resulting in reduced life.
2. Piping should be sized based on air flow and pressure drop requirements, and not on the aftercooler's supply and return connection size.
3. A strainer located ahead of the aftercooler should be installed to trap scale, dirt or sludge that may be present in piping and equipment, or that may accumulate with use.
4. A separator/trap/drain should be installed in the outlet piping of the aftercooler to remove condensate.
5. Flexible connectors should be installed to prevent the stressing of manifolds. (Must be properly installed to validate warranty.)
6. Arrange the outlet pipe so that the moisture that condenses within the aftercooler can drain freely by gravity.
7. For proper air flow, a minimum of 12" clearance should be allowed between the aftercooler fan and any wall or obstructions.

Electrical

1. **CAUTION** To prevent possible electrical shock, it is important to **make sure this unit is grounded properly**.
2. Connect motor only to a power supply of the same characteristics as shown on the motor nameplate. Be sure to provide proper fusing to prevent possible motor burnout. Before starting motor, follow manufacturer's recommendations. Turn fan manually to eliminate possible motor burn out in the event the fan has been damaged in shipment. Observe operation after motor is started for the first time.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surface Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with an air hose. Should the surface be greasy, the motor should be removed and the fins and tubes brushed or sprayed with a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam hose may also be used effectively. Do not clean with caustic cleaners

Fan Shroud, Fan and Motor: Dirt and grease should be removed from these parts. Rusty or corroded surfaces should be sanded clean and repainted.

Internal Cleaning Once a year piping should be disconnected and a degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer of any filtering devices should be removed and serviced following this cleaning operation.

Motor Keep outside surface free of dirt and grease so motor will cool properly. Ball bearing equipped motors are sealed, and do not require greasing. Motors with Alemite fittings require lubrication every 6 months. Clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes in NEMA 404 frame or larger.

CAUTION Keep grease clean. Lubricate motors at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

Repair or Replacement of Parts When ordering replacement parts or making inquiry regarding service, mention model number, serial number and the original purchase order number. Any reference to the motor must carry full nameplate data.

Combination Oil Cooler/Aftercooler Side By Side Air Cooled — “ACOC” Models

General Information

1. Side by side units are built for operation with maximum air and oil pressure of 250 psi and temperature of 350°F (176°C).
2. The motors furnished are built for fan duty. Consideration should be given to the installation location so motors are not subjected to extreme temperatures.
3. The “ACOC” coolers **are not to be operated** in ambient temperatures below 35°F (1°C).
4. The fan **cannot be cycled**.
5. “ACOC” coolers operated outdoors **must be protected** from weather. Consult factory for recommendations.

Installation

1. Units should not be located in corrosive atmospheres as rapid deterioration of fan shroud, cooling coil, fan and motor may take place resulting in reduced life.
2. Piping should be sized based on air flow and pressure drop requirements, and not on the aftercooler’s supply and return connection size.
3. A strainer located ahead of the aftercooler should be installed to trap scale, dirt or sludge that may be present in piping and equipment, or that may accumulate with use.
4. A separator/trap/drain should be installed in the outlet piping of the aftercooler to remove condensate.
5. Flexible connectors should be installed to prevent the stressing of manifolds. (Must be properly installed to validate warranty.)
6. Arrange the outlet pipe so that the moisture that condenses within the aftercooler can drain freely by gravity.
7. For proper air flow, a minimum of 12” clearance should be allowed between the aftercooler fan and any wall or obstructions.

Electrical

1. CAUTION To prevent possible electrical shock, it is important to make sure this unit is properly grounded.
2. Connect motor only to a power supply of the same characteristics as shown on the motor nameplate. Be sure to provide proper fusing to prevent possible motor burnout. Before starting motor, follow manufacturer’s recommendations. Turn fan manually to eliminate possible motor burn out in the event the fan has been damaged in shipment. Observe operation after motor is started for the first time.

Maintenance Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surface Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with an air hose. Should the surface be greasy, the motor should be removed and the fins and tubes brushed or sprayed with a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam hose may also be used effectively. Do not clean with caustic cleaners

Fan Shroud, Fan and Motor Dirt and grease should be removed from these parts. Rusty or corroded surfaces should be sanded clean and repainted.

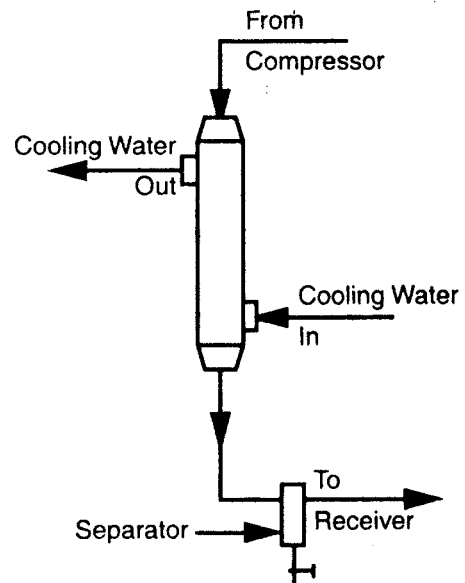
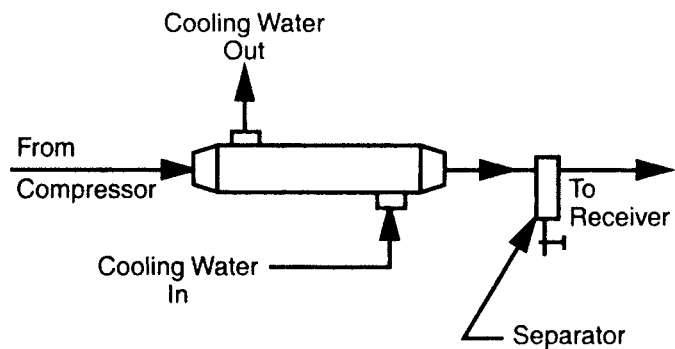
Internal Cleaning Once a year piping should be disconnected and a degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer of any filtering devices should be removed and serviced following this cleaning operation.

Motor Keep outside surface free of dirt and grease so motor will cool properly. Make sure cooling air over motor is not obstructed. Ball bearing motors are normally furnished and require lubrication every 6 months. If the motor is equipped with Alemite fitting, clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes of NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes on NEMA 404 frames and larger. On motors having drain plugs, remove grease drain plug and operate motor for 20 minutes before replacing drain plug. On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 2 to 3 inch length of grease string into each hole on motors in NEMA 215 frame and smaller. Insert 3 to 5 inch length on larger motors. On motors having grease drain plugs, remove plug and operate motor for 20 minutes before replacing drain plug. CAUTION Keep grease clean. Lubricate motors at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

Repair or Replacement of Parts When ordering replacement parts or making inquiry regarding service, mention model number, serial number and the original purchase order number. Any reference to the motor must carry full nameplate data.

Water Cooled Compressed Air Aftercooler — AB Models

Installation The satisfactory use of this heat exchange equipment is dependent upon certain precautions which must be taken at the time of the installation.



1. Aftercoolers can be mounted in either of the positions shown. Separators should be used as shown above.
2. If an automatic water regulating valve is used, place it on the INLET end of the cooler. Arrange the water outlet piping so that the exchanger remains flooded with water, but at little or no pressure. The temperature probe is placed in the air line from the aftercooler to sense a system temperature rise. Please contact factory for water regulating valve recommendations.

It is recommended that a water strainer be installed ahead of this aftercooler when the source of cooling water is from other than a municipal water supply. Dirt and debris can plug the water passages very quickly, rendering the aftercooler ineffective. Please contact factory for water strainer recommendations.
3. A separator/trap/drain should be installed in the outlet piping of the aftercooler to remove the condensate.
4. All piping to the aftercooler should be properly aligned and supported to avoid stress to the unit. A flexible metal hose should also be installed between the aftercooler and compressor to isolate damaging vibration.
5. CAUTION If sealant tape is used on pipe threads, the degree of resistance between mating parts is less, and there is a greater chance for cracking the aftercooler castings. **Do not over tighten.**
6. Never exceed maximum flow rates or ratings.

Service Each aftercooler has been cleaned at the factory and **should not require** further treatment. It may be well to inspect the unit to be sure that dirt or foreign matter has not entered the unit during shipment. The aftercooler should be mounted rigidly in place with pipe connections tight.

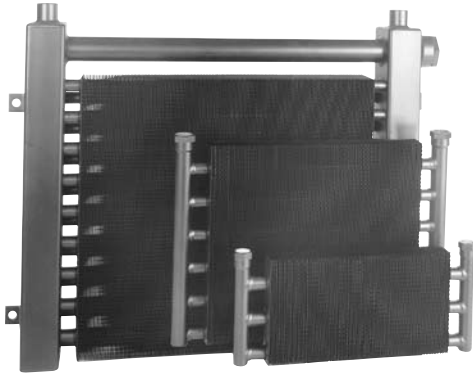
Performance information should be noted and recorded on newly installed units so that any reduction in effectiveness can be detected. Any loss in efficiency can normally be traced to an accumulation of water scale or deposits.

When storing the unit, be sure to keep the air and water ports sealed. If storage continues into the cold winter months, the water chamber must be drained to prevent damage by freezing.

Replace gaskets when removing end castings.

DH Series

Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.



Description DH series mobile oil coolers are used for high-efficiency oil cooling in hydraulic systems. Units utilize the latest in heat transfer technology to reduce the physical size and provide the ultimate in cooling capacity. By maintaining a lower oil temperature, hydraulic components and fluids work better and have a longer life expectancy.

General Safety Information

1. **Do not exceed** the pressure rating of the oil cooler, nor any other component in the hydraulic system.
2. **Do not exceed** the published maximum flow rates as the potential can result in damage to the hydraulic system.
3. Release all oil pressure from the system before installing or servicing the oil cooler.
4. These oil coolers are **not suitable** for use in hydraulic systems operating with water-glycol or high water base fluids without a corrosion inhibitor suitable for aluminum and copper component protection.

Unpacking After unpacking the unit, inspect for any loose, missing or damaged parts. Any minor damage to the cooling fins can generally be corrected by gently straightening them.

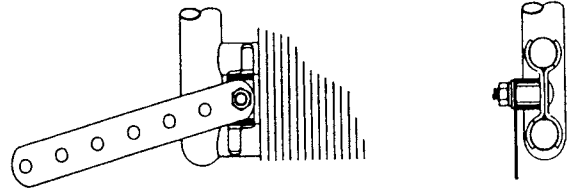
Installation

WARNING Do not exceed the maximum pressure of 300 PSI, or the maximum temperature of 350°F as oil cooler failure can occur.

1. These hydraulic oil coolers should be installed on either the low pressure return line, or a dedicated recirculation cooling loop.
2. Turn off the hydraulic system and drain any oil from the return lines before installing these coolers.

3. Installation of a fast acting relief/bypass valve is recommended to protect the oil cooler from excessive pressure and/or oil flow rates.
4. These coolers are normally installed in front of the engine radiator to obtain the coolest possible air flow.
5. There are no restrictions as to how the unit may be mounted; however, the unit must be flooded with oil to obtain the full cooling potential.
6. Mount the unit with the brackets* by installing them between any two adjacent exchanger tubes. Use the most convenient tubes for your specific location. See figure 1 below for details.

Figure 1



* brackets optional

CAUTION If pipe sealant is used on threads, the degree of resistance between mating parts is less, and there is an increased chance for cracking the heat exchanger fittings. Do not overtighten.

Operation Once unit is installed, the system may be operated normally. If the source of cooling air is other than the main engine fan, be sure that the fan is running.

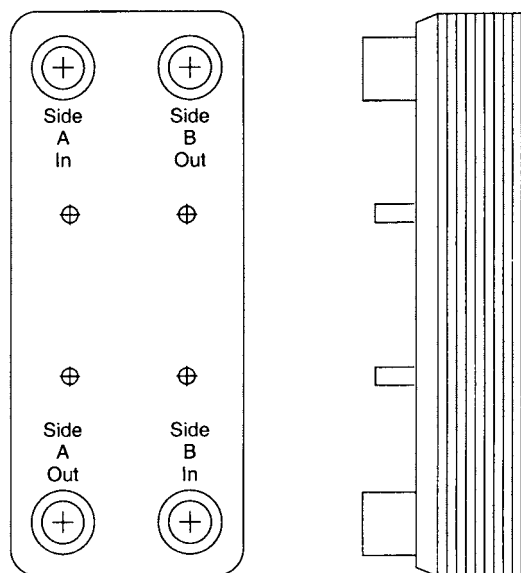
Maintenance

1. Performance information should be noted on newly installed units so that any reduction in effectiveness can be detected.
2. Inspect the unit regularly for corrosion and dirty or clogged heat transfer surfaces. Dirt and dust can be removed by washing, brushing, or blowing out with compressed air. A steam cleaner is also effective in cleaning dirty or greasy surfaces. **Do not use caustic cleaners.**
3. The oil chamber may become filled with sludge accumulation and require cleaning. It is recommended that the unit be flooded with a commercial solvent, and left to soak for one-half hour. Repeated soakings and back flowing may be required, depending on the amount of sludge accumulated.

Trouble Shooting Chart

Symptom	Possible Cause	Corrective Action
Not cooling adequately	1. Not enough air flow 2. Unit is fouled 3. Unit is undersized	1. Consult specifications and adjust if required 2. Clean exchanger (see maintenance) 3. Check specifications and change size if necessary

Condensing and Evaporative Service — Brazen Plate BPCH Series



Installation Unit **MUST be installed** in a vertical position, Dx (Freon Distribution Tube) inlet on lower position.

Water Strainer water strainer **SHOULD be installed** in the water inlet to protect the unit from particulate matter. 16 to 20 mesh minimum (20 to 40 mesh best choice).

Flow Switch A pressure differential switch or flow switch **MUST be** installed to prevent possible freeze up. Leaving temperature sensors and low pressure cut outs are not adequate to keep up with the fast reaction time of plate type heat exchangers.

Internal Distributor An optional built-in Dx distributor tube with orifices is offered to improve unit performance. This tube assures equal refrigerant distribution to all plates. It is typically used on BP plate sizes 12 x 5 and 20x 5 with more than 40 plates. It is also suggested for use on BP models 20 x 10 with more than 24 plates. When used, there is a 25 psi pressure drop at the Dx gas entrance area. The expansion valve for models with this feature should be oversized to compensate for the distributor pressure drop.

-10°F to 50°F Suction Dx inlet at bottom connections, no oil return problems. **<-10°F Suction** Dx inlet at bottom connections, possible oil return problems below -20°F depending upon gas velocities, or, Dx inlet at top connection; no oil return problem; use suction accumulator.

Piping Dx inlet piping sized to 500 fpm (liquid) (2.54 m/s).

Sealing Plate All models have a Sealing Plate as a standard feature to prevent moisture and frost freezing (unlike other brands). Frost buildup will not damage the unit. Recommend 1/2" to 3/4" insulation.

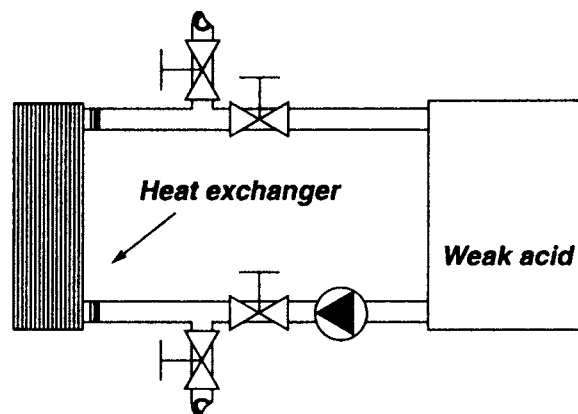
Sweat Connections Use 45% Silver Solder. Use cold rag around base of connection. **Do not overheat.** Purge with nitrogen optional.

Soldering Instructions

1. Use wet rags to protect lower fitting area.
2. Use 45% Silver solder.
3. Do not apply excessive heat.

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.

Cleaning in place



AHP, AOL, ACOC, CL and AL Series

1. The cooler storage area should be dry and maintained at a constant room temperature.
2. In order to minimize and/or eliminate condensation (on both the inside and outside surfaces of the cooler), coolers **should not be moved** from warm areas to cold areas without prior adjustment of the room temperature in order to minimize the temperature changes which result in condensation. If this criteria cannot be met, the cooler shall be sealed in plastic bags with desiccant added.
3. For coolers which will be stored up to a maximum of 6 months: No specific internal corrosion protection procedures are required. All cooler openings shall be sealed with plastic plugs.
4. For coolers which will be stored from 6 months to 24 months: These coolers should be internally flushed with oil and all cooler openings sealed with plastic plugs.
5. For coolers which will be stored for more than 24 months: These coolers should be completely filled with oil and sealed. These coolers should then be flushed, inspected, refilled with oil, and sealed every 24 months.
6. For compressor aftercoolers after installation:
 - 6.1 Any condensation should be thoroughly removed from the aftercooler after the initial trial run of the compressor.
 - 6.2 In the event a compressor is to be stored, or not used for a period of 6 months to 24 months, the aftercooler should be internally flushed with oil, and all cooler openings sealed.
 - 6.3 In the event a compressor is to be stored, or not used for a period of more than 24 months, the aftercooler **should be completely filled** with oil and sealed. the aftercooler should then be flushed, inspected, refilled with oil, and sealed every 24 months.
 - 6.4 Prior to compressor start-up, any corrosion protection oil **should be removed** from the aftercooler.