COLMAC COIL
Manufacturing Inc.

When you want Quality, specify COLMAC!

Installation, Operation, and Maintenance

ENG00005472 Rev B

Modulair Pump Skids

Contents

1. SAFETY INSTRUCTIONS

To avoid serious personal injury, accidental death, or major property damage, read and follow all safety instructions in the manual and on the equipment. Maintain all safety labels in good condition. If necessary, replace labels using the provided part numbers.

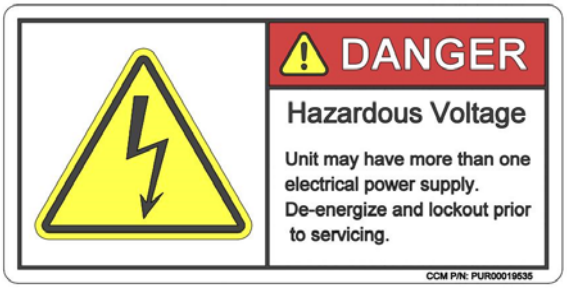
This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE NOTICE indicates instructions that pertain to safe equipment operation. Failure to follow these instructions could result in equipment damage.



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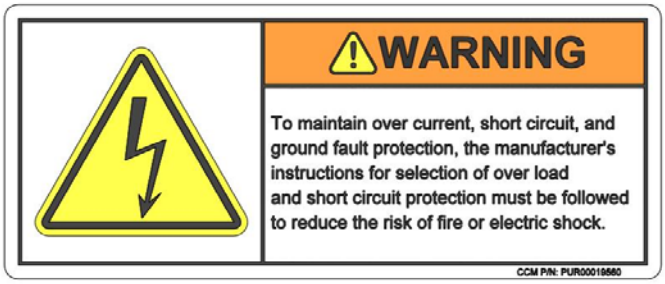

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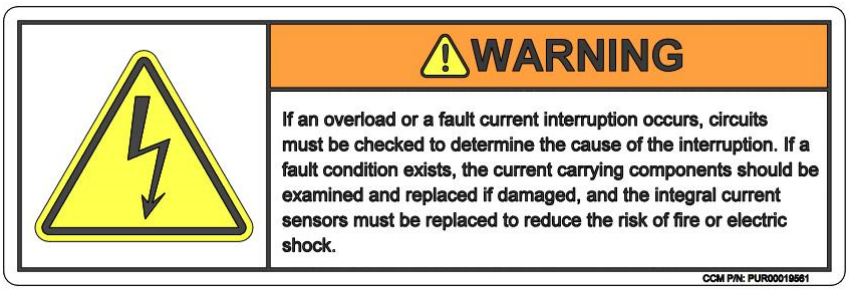

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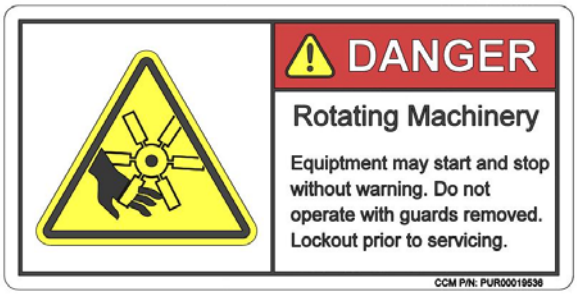

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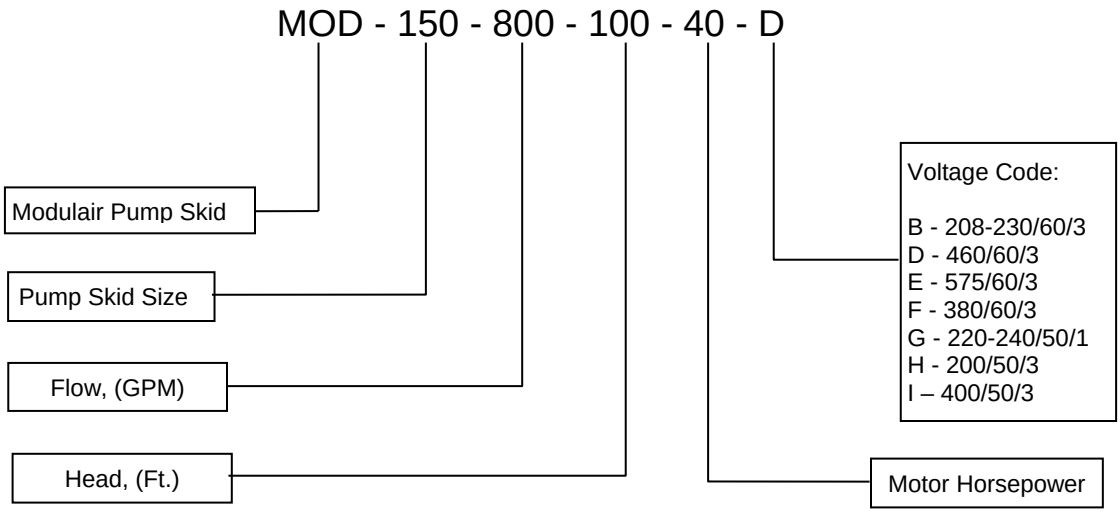
2. MODEL NOMECLATURE



3. GENERAL DESCRIPTION

3.1. Colmac Modulair Pump Skids are designed for closed loop cooling of water, ethylene glycol / water and propylene glycol / water solutions with air cooled fluid coolers for many power generation cooling applications such as gas turbines, diesel engines and fuel cells. The pump skids are available in a series of pre-engineered standard modules with a range of flows from 200 gpm to 2300 gpm with the following standard features:

- Two 100% full rated pumps and motors rated for continuous outdoor duty.
- Bladder type expansion tank prevents air contact with the glycol water.
- Design pressure 150 psig with 150# ANSI RF flanges except bladder tank is 125 psig.
- Heavy-duty TEFC motors high efficiency 1.15 SF with Class F insulation.
- Motors and switches are factory wired to a weatherproof NEMA 4 electrical enclosure to provide single point field wiring.
- Pressure switches to signal pump changeover and low liquid level alarm.
- Structural steel base with provision for lifting.

3.2. The pumps are heavy-duty ANSI standard end-suction centrifugal design flanged pumps.

- Open impeller with external adjustment and balanced to ISO standards.
- Ductile iron casing.
- Extra heavy-duty shaft and oil lubricated bearings minimum life (L_{10}) of two years.
- Industry Standard Mechanical Shaft Seal.
- Flexible type spacer shaft coupling.
- Fully enclosed OSHA compliant coupling guard.

4. INSTALLATION

4.1. Inspection

4.1.1. Damage or Shortage – Upon receipt of equipment, inspect for shortages and damage. Any shortage or damage found during initial inspection should be noted on delivery receipt. This action notifies the carrier that you intend to file a claim. Any damaged equipment is the responsibility of the carrier, and should not be returned to Colmac Coil without prior notification. If any shortage or damage is discovered after unpacking the unit, call the deliverer for a concealed damage or shortage inspection. The inspector will need related paperwork, delivery receipt, and any information indicating his liability for the damage.

4.1.2. Specified Equipment – Check unit nameplate for: Electrical specifications to ensure compatibility with electrical power supply. Check model nomenclature and other information to ensure that the equipment matches the original order.

4.2. Mounting & Rigging

4.2.1. Colmac pump skids are provided with four holes in the steel base for lifting with slings and an overhead crane. Forklift trucks may be used providing the forks extend to the far side of the steel base.

4.3. Mechanical

4.3.1. Move the skid into position to line up with the manifold inlet flange before the mechanical anchors are installed. The fluid cooler, pump skid and interconnecting manifold must be aligned and leveled.

4.3.2. Install steel shims to adjust the height if necessary and add shims to fill any gaps under the support feet to avoid distorting the steel base.

4.3.3. The cooler inlet manifold flanges are bolted to the fluid air cooler(s) first and final alignment is made at the manifold connection to the pump skid. In some cases the manifold connection flange and adjoining pipe are shipped loose for final fit up and welding in the field. Install a 1/8 inch shim between the flanges when welding to allow for the gasket thickness.

4.3.4. After the flange gaskets and bolts are installed, tighten snug but do not torque. Next install the mechanical anchors at all the support legs and tighten down. Finally, tighten the flange bolts.

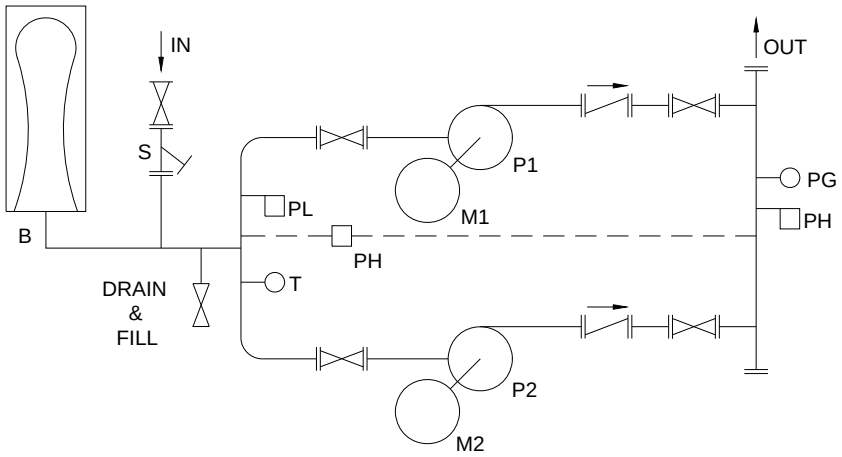
4.3.5. Do not force flanges to come together. If flanges are not parallel they may need to be removed and rewelded. Contact Colmac for instructions.

4.3.6. When the bladder tank is shipped separately install it after the skid is in position. Fit the connecting pipe and bolt the tank securely to the skid base. The residual pressure in the tank is 12 psig. Check the tank air pressure with a tire pressure gauge and add more air if required.

4.4. **Filling**

4.4.1. The pump skid schematic shown in Figure 1 illustrates the pipe connections and locations of valves.

Figure 1.
Piping Schematic



T	DIAL THERMOMETER
PL	LOW PRESSURE SWITCH
PH	HIGH PRESSURE SWITCH
PG	HIGH PRESSURE GAGE
P1	PUMP 1
P2	PUMP 2
M1	MOTOR 1
M2	MOTOR 2
S	FLANGED Y STRAINER
B	BLADDER TYPE EXPANSION TANK

4.4.2. The pump skid is filled at the same time as the fluid air cooler and manifold using the 1 ¼" inch valve on the inlet header to the pumps.

4.4.3. Open the vents during filling located on the pump outlet elbows, the outlet header and at the top of the bladder tank piping (for bladder tanks with a top connection).

4.4.4. Clean water is suitable for flushing and testing in warm weather but when the temperature is below freezing a glycol /water solution is required. The external piping must be flushed before connecting to the fluid cooler and pump skid.

4.4.5. When all the air is vented, shut off the valve to the expansion tank, pressurize the system and check all the flange joints for leaks. Retighten flange bolts where necessary.

4.4.6. Drain the flushing fluid and replace with clean demineralized water and glycol solution of the specified ratio repeating the filling and venting procedure. When all of the air is vented, open the valve to the expansion tank and continue to pump more fluid into the system to bring it to the pressure that corresponds with the fluid temperature as shown in the table below.

System Pressure (psig)	17	24	32	38	43
Fluid Temperature (°F)	-30	+20	70	100	140

4.4.7. The expansion tank capacity determines the system operating pressure change. The pressure chart above is based on an expansion tank capacity equal to 5% of the total system volume using 50/50 glycol water. If the tank capacity is greater than 5% of the system volume the pressure change will be smaller.

4.4.8. As the system is filled, the extra fluid will enter the expansion tank bladder, compressing the tank air and causing the tank pressure to rise.

4.4.9. In operation the pressure will increase as the fluid becomes warmer and decrease as the fluid temperature falls.

4.4.10. A loss of coolant will cause the pressure to fall eventually triggering the low-pressure alarm switch. This switch should be set about 5 psig below the minimum expected operating pressure.

4.5. **Electrical**

4.5.1. Each Colmac Modulair pump skid is factory wired for single-point connections in the field to the weatherproof terminal box on the skid. Standard construction does not include contactors, overload protection and fused disconnects which may be ordered as an option or must be supplied by others

4.5.2. All field wiring must comply with National Electrical Code and all other state and local regulations. This includes providing proper and safe motor protection, fusing, disconnects, and other basic equipment.

4.5.3. Check that the supply voltage matches the motor rated voltage. After the motors are connected rotate the pumps by hand to make certain they are not jammed.

4.5.4. Jog the pumps to check that rotation is correct as shown by the arrow on the pump casing. Change two of the electrical connections to reverse the rotation if necessary.

4.5.5. The pump motor heaters should be connected and energized as soon as possible to keep the motors dry during commissioning.

4.5.6. See the I.O. & M. instructions from the pump manufacturer for detailed instructions for checking the pump alignment and impeller end clearance.

4.5.7. Notice: Do not operate the pumps until the alignment has been checked and the system has been verified as full of fluid. Improper alignment can led to premature failure of the pumps.

4.6. **Storage**

4.6.1. The pump skid may be stored outdoors but the pump motor heaters must be energized at all times. If the pump skid is to be stored or not operated for an extended period the pump motor heaters must be energized with a temporary power supply.

4.6.2. The pump should be rotated at regular intervals to re-oil the bearings.

5. OPERATION

5.1. General

5.1.1. Successful operation of Colmac Modulair pump skid requires proper maintenance and operating conditions that do not exceed the design temperatures and flows.

5.1.2. After all the venting is complete and the system is at operating pressure shut off the pump outlet valve and start the pump. Gradually open the valve for a few minutes then stop the pump and vent the system again.

5.1.3. Repeat this start up procedure for the second pump

5.1.4. Next operate one of the pumps for two hours then remove and clean the strainer.

5.1.5. To remove the strainer, close the valve at the strainer inlet, both pump inlet valves and the valve to the expansion tank. Open the drain valve to release the pressure and then remove the strainer cover. Clean the basket and replace it.

5.1.6. Operate the system for another two hours and repeat the cleaning procedure. Continue to repeat the flush cycle for longer intervals until the basket remains clean then remove it and store for future use.

5.1.7. Check the pump performance by reading the pressure difference between the high and low pressure gauges and comparing the pump head to the pump curve.

5.1.8. The motor current can also be used to check the actual B.H.P. compared to the pump performance curve.

5.1.9. To set the pump pressure changeover switch, throttle the pump flow with the outlet valve until the pressure difference is about 70% of normal pressure then adjust the switch setting to trip at that point.

6. MAINTENANCE

6.1. Glycol/Water Mixture

6.1.1. The glycol/water solution must be maintained at the specified mix ratio to protect the fluid from freezing in cold weather.

6.1.2. Maintain the concentration of corrosion inhibitors as supplied with the original fill. Glycol/water solutions can become corrosive after a few years if not maintained which can lead to corrosion of the system components and fouling of the inside of the cooler tubes.

6.2. Pumps

6.2.1. The pump bearings are oil lubricated and the oil level must be maintained. The oil level should be checked every 6 months or when there is any evidence of leaking oil.

6.2.2. Details on pump maintenance are contained in the O.I. & M. manual provided by the pump manufacturer.

6.3. Expansion Tank

6.3.1. If the airside of the expansion tank loses air pressure recharge and test for leaks.

6.3.2. Release the air pressure before attempting any repairs to the tank.

6.3.3. If the rubber bladder develops a leak it can be replaced through the flanged opening.

6.3.4. Refer to the instructions available from the bladder tank manufacturer.

6.4. Paint

6.4.1. Examine the steel painted components each year such as the skid base, expansion tank and piping. Repair any rusted areas by sanding to bare metal and repainting.

6.5. These instructions are intended for general use. If any difficulties are encountered please contact Colmac Coil Manufacturing Inc. for specific instructions.

6.6. Always provide the pump skid serial number or drawing when requesting information or parts.

Colmac reserves the right to change product design and specifications without notice.

For more information on Colmac products call us at 1-800-845-6778 or visit us online at:

WWW.COLMACCOIL.COM