



**BALTIMORE
AIRCOIL AUSTRALIA**



Puroflux Filters

OPERATION & MAINTENANCE MANUAL

Baltimore Aircoil Australia is the right choice when it comes to having a more efficient, safe, and effective system. The PF-64 series separator is designed to assist in eliminating expensive “down-time,” reducing operating costs, chemical usage, wear and tear on equipment and maintenance. With many years of combined filtration experience, BAC engineers can find a solution to a wide variety of cooling tower application filtration problems.

Following the guidelines listed in this manual will help to insure the safety of all personnel who maintain the separator unit and related equipment. If there are any questions on the procedures or performance of the PF-64 series separator contact your local BAC representative.

Do Not operate the separator until all questions about operating procedures are answered by a qualified representative. This manual covers recommended procedures for installation, anchoring, start-up, shut down, safety and maintenance.

All recommendations are minimums. The environment/ operating conditions in which the separator unit is installed will dictate the frequency of scheduled maintenance. Maintaining your PF-64 series separator will assure a long trouble free life.



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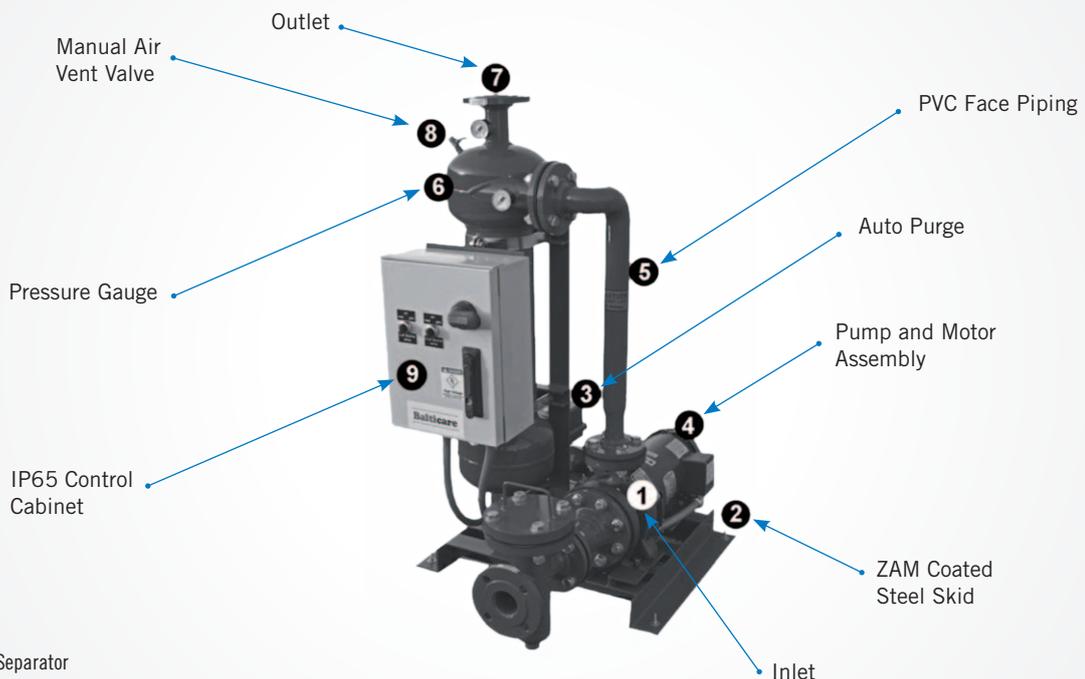


Figure 1. PF-64 Separator



PUROFLUX FILTERS

Receiving and Installation

RECEIVING EQUIPMENT

DESIGN CRITERIA

SUPPORT AND LIFTING

INSTALLATION AND ANCHORING

PIPING INTERFACE CONNECTIONS

SEPARATOR REQUIREMENTS

ELECTRICAL CONTROLS

WIRING REQUIREMENTS

Receiving Equipment



Receiving and Installation

Receiving Equipment

Design Criteria

Before accepting the separator equipment and prior to signing the bill of lading, all equipment should be checked thoroughly for any shipping damage. Make sure that all required equipment noted on the bill of lading is received. Refer to Figure 1 on page 1 and the below Table for components to be inspected upon receiving.

Receiving / Inspection
Separator Vessel
Control Panel
Inlet/Outlet Gauges
Interconnecting Piping
Isolation Valves
Manual Air Vent Valves
Pump & Motor
Auto Purge

Table 1. Receiving/Inspection

Check the model and serial number against the packing slip. Serial and model numbers can be found on a nameplate inside the control cabinet.

Design Criteria

The BAC standard PF-64 series separator is designed for use in open process liquid applications. Standard equipment design is 350 kPa @ 38°C. The PF-64 series separator will remove suspended solids with a specific gravity of 1.2 or higher down to 45 micron/325 mesh.

The PF-64 series separator packages utilise a PF-61 series separator. Standard units are equipped with motor controls, inlet and outlet gauges, pump and motor, PVC interconnecting piping, manual air vent valve, ZAM coated steel skid and automatic purge.



NOTE: Never install the PF-64 series separator in an application where the system pressure exceeds the separator package design pressure.

Support and Lifting

The PF-64 series separator can be lifted from the bottom of the separator skid with the skid fully supported. If the unit is hoisted, lifting straps must be placed under the bottom of the filter skid and should not come in contact with the separator components.

Installation and Anchoring

The PF-64 series separator is designed for slip stream use on nonpressurised open sump applications. The PF-64 series separator should be located as close to the sump or interface piping as possible and never installed in full flow system piping. The PF-64 series separator can be rigidly anchored to the floor using 13mm anchor bolts. Refer to the certified drawing for location of anchor holes.

NOTE: The PF-64 series separator should not be installed more than 2.4 m above the process liquid operating level.



Piping Interface Connections

The filter piping should be installed as follows:

1. Installation of interconnecting piping
 - When mating interconnecting fittings to the filter unit make sure that filter components are securely held in place so no damage or leaks occur.
 - If welding or soldering mating flanges or fittings make sure not to overheat filter components. Overheating filter components can cause damage or leaks.
 - If welding DO NOT use the filter or its components as a ground.

Piping Interface Connections cont.

BAC

Receiving and Installation

- For piping connection sizes refer to below table:

Model PF-64	Inlet (Table E flanged) mm	Outlet (ANSI flanged) mm
64-012	65NB	32NB
64-015	65NB	40NB
64-020	80NB	50NB
64-025	80NB	65NB
64-030	80NB	80NB
64-040A	100NB	100NB
64-040B	100NB	100NB
64-050	125NB	125NB
64-060A	150NB	150NB
64-060B	150NB	150NB

Table 2. Size & Connection

- Run an influent line from the system sump to the pump labelled "INLET". A service valve and union should be installed in this line near the separator.
- Run an effluent line from the separator return labelled "OUTLET" back to the system sump. A service valve and union should be installed in this line near the separator.
- Run a waste line from the separator purge outlet labelled "WASTE" to the nearest sewer drain. A union should be installed in this line near the separator.

Support and Lifting

Installation and Anchoring

Piping Interface Connections



NOTE: Do not reduce the pipe sizes listed, the pipe sizes are minimums. If long runs, excess fittings, or lifts are necessary, it is recommended to enlarge the pipe diameter in order to reduce friction loss. Never reduce the waste line; this can restrict the flow of the purge cycle and reduce efficiency.



NOTE: If the separator inlet connection is located above the process liquid operating level, a foot or check valve must be installed below the water level to prevent loss of pump prime.



WARNING: Do not put any type of valve in the waste line!



NOTE: Never over tighten service unions on the separator unit. Service unions should be hand tightened only. Over tightening can cause damage, which may result in leaks.

NOTE: Always follow local, council, state or other government authorities requirements for piping hook-ups.

Separator Requirements

1. The PF-64 series separator is equipped with a pump designed to maintain proper flows through the separator system. Standard units are equipped with a pump to match the required separator system flow (l/s)@ 180 kPa of head. BAC separators are designed to operate within a specified range; 27 to 63 kPa pressure drop across the separator is recommended. Some installations may require that a throttling valve be installed in the outlet line to regulate the flow or the pump be altered (lower/higher discharge head) to maintain proper flows.
2. The separator should be installed to merge with the natural flow of the system, never against it. A straight run of 5 to 6 pipe diameters up and down stream of the separator is recommended to reduce turbulence.
3. The minimum inlet pressure should be at least equal to the pressure loss anticipated through the separator plus the systems down stream pressure requirements. Pipe sizes must be large enough to maintain proper flow (refer to below Table and individual specification sheets). It is important to understand that the selection of a separator is based on the flow rate through the separator (approx. 3 m/sec.) and not the separator pipe size (connections). Always reduce pipe sizes at the separator if necessary to maintain proper fluid velocity.

Model PF-64	Dry (kg)	Operating Weight (kg)	Volume (l)
64-012	123	131	8
64-015	126	134	8
64-020	140	167	27
64-025	156	186	30
64-030	194	224	30
64-040A	242	299	57
64-040B	255	312	57
64-050	369	460	91
64-060A	472	623	151
64-060B	515	666	151

Table 3. Weight and Volume PF-64

Electrical Controls



The PF-64 series separator can be supplied in a number of configurations and voltages. Standard voltage is 415v/3ph/ 50hz, (additional alternate voltages are available).

Primary voltage will be reduced to 120v control voltage. Control components will vary depending on separator configuration and options.

Standard separator units are equipped with a IP65 control cabinet containing a locking combination on/off disconnect switch with motor circuit protection (MCP), control transformer, HOA switch and motor contactor. An adjustable purge timer, purge HOA switch and electric valve actuator are also provided as standard.

Wiring Requirements

Install a circuit breaker between the closest branch distribution panel and the control panel (Refer to below Table for amperage draw by motor power). The control cabinet is pre-wired and includes a door disconnect switch with overload and short circuit protection.

The electric purge actuator will draw approximately 1 additional amp.

Motor (kW)	Motor Voltage	Amperage, 3 phases
2.2	415	4.7
3	415	6.3
4	415	8.1
5.5	415	10.4
7.5	415	14
11	415	20.7
15	415	27.2
18.5	415	32.5

Table 4. Electrical Requirements

Receiving and Installation

Separator Requirements

Electrical Controls

Wiring Requirements



NOTE: All incoming power supply lines must be connected to the door disconnect when provided.



WARNING: Always follow local, council, state or other government authorities' requirements for electrical hook-up.



PUROFLUX FILTERS

Maintenance Procedures

OPERATING CONDITIONS

GENERAL MAINTENANCE PROCEDURES

PURGE REQUIREMENTS

PUMP REQUIREMENTS

Operating Conditions



The BAC PF-64 series separator utilises high centrifugal forces to separate solids from liquids. The suspended particulate is simply dropped from the carrying fluid where it is collected for discard. The PF-64 separators do not require a backwashing and will not interrupt throughput when purging. Because no backwash is required large amounts of system fluids will not be wasted. The 60 series separator collects and concentrates particulate as it falls from the process fluid into the accumulation chamber. Because the separator and the accumulation chamber are at equal pressures, there is no need for any additional pressure to induce purging. Purging the accumulation chamber is done without excess waste of system fluid while the separator package remains “on-line”.

Influent is fed via the pump tangentially into the separator acceptance chamber. The influent is spun in a downward motion pushing the suspended particulate to the walls of the separator vessel by centrifugal forces. Suspended solids are forced downward into the collection chamber for purge. The clean liquid then reverses direction moving upward entering the vortex finder where it is then returned back to the process system.

General Maintenance Procedures

Always follow the start-up and shut down procedures before and after any service or maintenance is done on the filter unit. PF- 64 series separators are designed for low maintenance and minimal service. With proper care the PF-64 series separator will provide trouble free service. The following is a list of maintenance check points and schedules.

1. Visually inspect separator every 48 hours (minimum) for proper operation (check for unusual noise and/or vibration).
2. Read pressure gauge (gauge reading should not exceed design pressure).
3. Purge separator as required (refer to Purge Cycle on page 11). Check for a build up of debris in accumulation chamber.

Run a manual purge cycle by switching the HOA switch to “Hand” position. Leave the purge valve open for a minimum of 5 seconds or until purge liquid becomes clear. Reposition the HOA switch to the “Auto” position.



NOTE: All recommendations are minimums. The environment/ operating conditions in which the separator unit is installed will dictate the frequency of scheduled maintenance. Maintaining your PF-64 series separator will assure a long trouble free life.

General Maintenance Procedures cont.

4. Check voltage and amperage draw on motor lead.
5. The PF64 series separators are designed to operate within a specific flow range. Keeping the separator within the design flow range will produce optimal pressure drops and increase the separator efficiency. Running below the design flow rates will reduce efficiency while running above the design flow will increase wear.

Purge Requirements

Setting Purge Timer

The purge time is set as follows:

- A - purge duration (purge valve open).
- B - purge off interval (purge valve closed).

Once the HOA switch is placed into the "AUTO" position the timer initiates the purge off Interval (valve closed). Upon completion of the off interval time, the relay is energised and the purge duration begins. Once the purge open duration (valve open) is completed the purge valve will close. The cycle repeats until the HOA switch is turned "OFF" or "MANUAL" position. The top two circles are for setting the purge valve open duration. Upper circle is the time setting range selector. The duration can be turned for various times if needed. Lower circle is the % of this setting.

The lower two circles are for setting the interval between purge valve openings. The time setting range can be turned for various times if needed. Lower circle is the % of this setting.

Examples with factory setting:

- *Purge duration is set at 30 seconds and % at 60%:* the purge valve will open for 18 seconds ($60\% \times 30$ seconds)
- *Purge off interval is set at 3 hours and % at 100%:* the purge valve will open once every 3 hours ($100\% \times 3$ hours)



General Maintenance Procedures

Purge Requirements

Setting Purge Timer

Purge Cycle

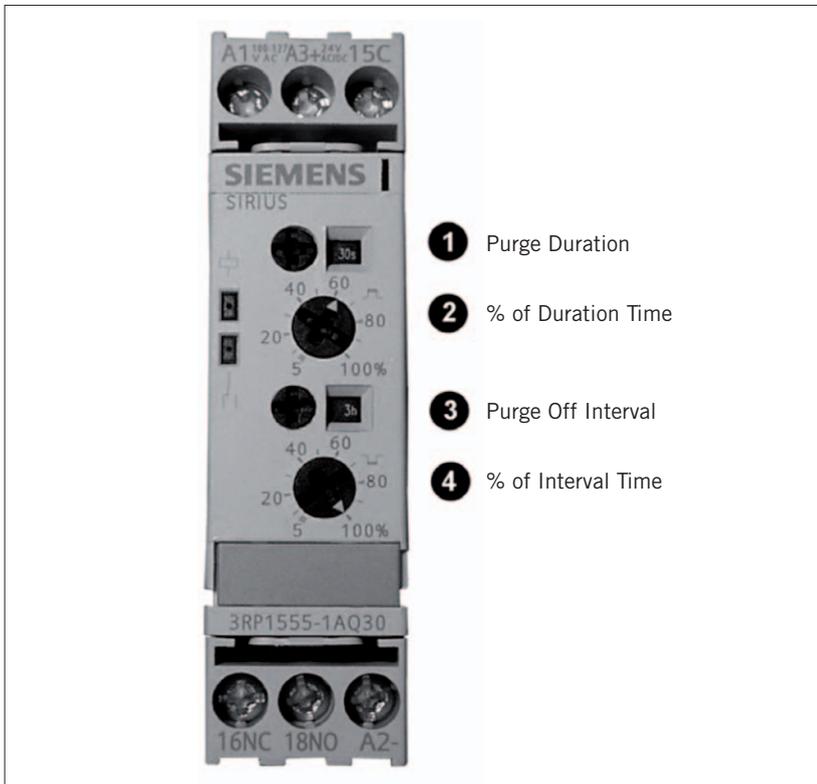


Figure 2. Purge Timer

Purge Cycle

The PF-64 series separator must be purged regularly as debris accumulates in the unit's collection chamber. If the purge chamber becomes full and is not purged the separator will no longer perform efficiently.

During start-up the amount of purged solids generated by the separator may be high. It is recommended that the separator be purged frequently (every 1 to 2 hours) until it is visually obvious that the frequency can be cut down. If the purge concentration is still high, adjust the purge frequency until 4 to 6 seconds is required to clear solids from the purge chamber. For most applications after the initial start-up the purge frequency can be reduced.

Purge Requirements cont.

NOTE: The factory auto purge pre-set is 18 seconds every 3 hours.



It is imperative that the purge cycle lasts long enough to purge all solids from the collection chamber in order to extend the life of the purge valve. If the purge cycle does not last long enough, particulate can become wedged or pinched in the valve causing leaks or permanent damage to the valve.

Auto Purge Cycle

The purge cycle can be initiated either manually or by the purge cycle timer. The separator control cabinet is equipped with an Hand-Off-Auto (HOA) switch. The HOA switch allows for the automatic or manual purging of the separator. In the “HAND” position the purge valve will energise to an open (purge) position. In the “AUTO” position the cycle timer is energised and controls the purge time and frequency (refer to Setting Purge Timer on page 10). The “OFF” position will disable the purge function in a closed position.

Pump Requirements



Maintenance Procedures

PF-64

Pump and Motor

The pump flows for the PF-64 series separator are listed in the below table “Pump Motor kW” at 18 m of head (TDH). This correlates to approximately 180 kPa discharge pressure at design flow.

Flow Rate at 180 kPa			
Model PF-64	Motor (kW)	System (l / sec)	Purge (l / sec)
64-012	2.2	3.2	1.26
64-015	2.2	5	1.26
64-020	3	6.9	1.26
64-025	4	10.1	1.26
64-030	5.5	13.9	1.26
64-040A	5.5	20.8	3.47
64-040B	7.5	25.2	3.47
64-050	11	37.9	3.47
64-060A	15	56.8	3.47
64-060B	18.5	75.7	3.47

Table 5. Pump Motor kW PF-64

Cleaning and Adjusting Pump

Always follow the shut down procedure before attempting any repairs or adjustments. The impeller should spin freely. If not, check for an obstruction or debris that may be lodged between the impeller and volute or impeller and adapter bracket. If no debris can be found and the impeller remains obstructed, remove the bolts holding the volute to the motor bracket and the two bolts holding the motor to the base (see above Figure). Slide the motor and motor bracket away from the pump volute. Inspect the volute for foreign material. Reverse the above procedures to reassemble replace any gaskets that are not in good condition). Rotate the pump shaft manually after assembly to check clearance. Always follow the start-up procedures whenever the filter unit has been turned off.

Purge Requirements

- Purge Cycle
- Auto Purge Cycle

Pump Requirements

- PF-64
- Pump and Motor
- Cleaning and Adjusting Pump



WARNING: Disconnect and lock out all electrical power to the filter prior to performing pump maintenance.



PUROFLUX FILTERS

Cold Weather Operations

ABOUT COLD WEATHER OPERATION

START-UP

SHUTDOWN

About Cold Weather Operation



Cold Weather Operations

About Cold Weather Operation

Start-up

When the PF-64 series separator is exposed to below-freezing temperatures, it will require protection to prevent freezing. An indoor installation in a heated room is the best way to preventing freezing of any liquid in the separator unit. If an indoor installation is not practical, supplemental heat must be supplied. Heat tape and insulation around the liquid filled filter components must be used to prevent freezing. The separator unit should be drained when not in use for long periods of time. Refer to shutdown procedures below.

Start-up

Before initial start-up or after a long shutdown period, the separator unit should be thoroughly inspected.

1. Close all isolation valves in interconnecting piping and relieve all pressure from the separator by opening the manual air relief valve.
2. Turn the pump and motor shaft by hand to insure free rotation.
3. Remove the hand hole cover (100mm units and larger) by removing the hex nut on the crab clamp by pushing the hand hole/manhole into the vessel. Remove and inspect the gasket (replace if necessary).
4. Inspect the internals for any debris build-up.
5. Inspect the hand hole, gasket, ring, and cover for foreign matter, and clean all surfaces. Place the hand hole cover into the vessel. Slip the gasket over the hand hole and reinstall the crab clamp and hex nut. Align the gasket and crab clamp properly with the hand hole and ring, before tightening the hex nut. Do not over tighten the hex nut. Over tightening hex nut can damage gasket.
6. Prime the pump by filling the piping with water. Check the pump rotation by bumping the motor. Verify rotation with the arrow on the pump volute. Do not run the pump for an extended period of time in reverse direction or dry. Have a qualified electrician change leads to correct rotation.



INFORMATION: Perform the first five recommendations with the electrical power off and locked out. Refer to the section under “Safety” regarding the safeguarding of maintenance personnel from biological contaminants prior to start-up.

Start-up cont.

NOTE: An excessive amount of air released from the vent valve can indicate an air leak. All leaks must be repaired before running the filter unit.



7. Open the service valves in the separator inlet, outlet, and purge lines. Before starting the pump, verify all valves are open. Open the manual air relief valve on top of the separator vessel. Start the pump and fill the separator. Once a steady stream of water is coming out of the manual air relief valve, and all air has been evacuated, the manual air relief valve can be closed.
8. Check the voltage and current of all leads on the pump motor. The correct amperage draw can be found on the motor nameplate (refer to Table Wiring Requirements on page 7).
9. Check the separator unit for any unusual noise or vibration. Shut separator unit off and contact your local BAC representative or the factory direct if there are any questions about the performance of the separator unit.
10. Check the separator unit and all integral piping to the unit for any air or fluid leaks. All air leaks must be found and repaired. Failure to do so could result in poor performance and/or personal injury.
11. Purge the separator (refer to Purge Cycle on page 11). After purging the separator, check the pressure gauges and record the start up differential pressure. Use the starting differential pressure as a bench mark whenever routine maintenance is performed.
12. After several hours of run time from start up, perform steps 7 through 11 again.

Shutdown



Cold Weather Operations

Start-up

Shutdown

The following services should be performed when the unit is to be shutdown for a prolonged time period.

1. Run the separator unit through a complete purge cycle.
2. Close the service valves in the separator inlet and outlet lines.
3. Relieve all pressure from the separator vessel and piping. Open the manual relief valve, located on top of the vessel and leave the valve open.
4. Open the purge valve. Allow the vessel to drain fully. Once the separator is empty close the purge valve and manual air relief valve.
5. Shut off and lock out all electrical power.
6. Drain all external piping to and from the separator.
7. Remove the hand hole cover (100mm units and larger) by removing the hex nut on the crab clamp by pushing the hand hole into the vessel. Remove and inspect the gasket (replace if necessary).
8. Re-install the hand hole cover.



PUROFLUX FILTERS

Fluid Treatment

ABOUT FLUID TREATMENT

BIOLOGICAL CONTROL

CHEMICAL TREATMENT

About Fluid Treatment



Filtration is an effective way of reducing the level of suspended solids in a system. However, it is only one portion of a complete treatment program. Dissolved solids will not be removed from the system by media filtration. It is important to realise that the dissolved solids will concentrate, and can cause damage to a system. Furthermore, airborne impurities and biological contaminants may be introduced into the system through the equipment being filtered.

Biological Control

The growth of algae, slimes and other micro-organisms, if uncontrolled, will reduce system efficiency and may contribute to the growth of potentially harmful micro-organisms, such as Legionella, in the recirculating water system.

Accordingly a treatment programme specifically designed to address biological control should be initiated when the system is first filled with water and administered on a regular basis thereafter in accordance with any regulations (national, regional) that may exist or in accordance with accepted codes of good practice.

It is strongly recommended to monitor the bacteriological contamination of the recirculating water on a regular basis (for example, TAB test with dip slides on a weekly basis) and record all results.

If a chemical water treatment is used, it must meet the following requirements:

Chemical Treatment

1. The chemicals must be compatible with the materials of construction used in the cooling system.
2. Chemicals should be fed into the re-circulated water to avoid localised high concentrations, which may cause corrosion. Chemicals are normally fed into the pump discharge line. Batch feeding of chemicals does not afford adequate control of water quality and is not recommended.

To control all potential contaminants, a chemical treatment program must be employed by a competent professional. Such treatment should be initiated before the system start-up and continued regularly thereafter.

Fluid Treatment

About Fluid Treatment

Biological Control

Chemical Treatment



PUROFLUX FILTERS

Notes





PUROFLUX FILTERS

General Information

SAFETY PRECAUTIONS

Safety Precautions



General Information

Safety Precautions

- Authorised Personnel
- Electrical Safety
- Local Regulations

All electrical, mechanical and rotating machinery constitute a potential hazard, particularly for those not familiar with its design, construction and operation. Accordingly adequate safeguards (including use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public (including minors) from injury and to prevent damage to the equipment, its associated system and the premises.

If there is doubt about safe and proper rigging, installation, operation or maintenance procedures, contact the equipment manufacturer or his representative for advise.

Authorised Personnel

The operation, maintenance and repair of this equipment should be undertaken only by personnel authorised and qualified to do so. All such personnel should be thoroughly familiar with the equipment, the associated systems and controls and the procedures set forth in this and other relevant manuals. Proper care, procedures and tools must be used in handling, lifting, installing, operating and repairing this equipment to prevent personal injury and/or property damage.

Electrical Safety

Each pump motor associated with this equipment should be installed with a lockable disconnect switch located within the sight of the equipment. No service work should be performed on or near the motors, drives or inside the equipment unless pump motors are electrically isolated.

Local Regulations

Installation and operation of cooling equipment may be subject of local regulations, such as establishment of risk analysis. Ensure regulatory requirements are consistently met.



Recommended Spare Parts

BAC parts are the “Perfect Fit” for your cooling tower. These parts are specifically designed, engineered and manufactured to work in a cooling tower environment. They are the right parts, at competitive pricing levels, and BAC offers the best deliveries in the industry.

BAC Australia stocks most common repair and retrofit parts and can ship other parts, often overnight, from our manufacturing facility located in Somersby NSW. In addition, most BAC Representatives maintain a local inventory of commonly used parts.

Even with this fast delivery capability, it is still recommended that certain essential, emergency repair parts be maintained in your local inventory, to minimise any potential downtime.

Basic recommended spare parts

- Bearing set
- Float valve or repair kit
- Float ball
- Solenoid valve (if unit is equipped with electric water level control)
- Set of belts
- Spray nozzle kit with grommets
- Door gasket
- Strainer
- Fan and sheave bushings
- Pump seal and gasket kit for coil products

Parts to Consider if Extended Downtime is a Concern

- Spray pump for coil products
- Fan or fan wheel
- Fan shaft
- Sheave set
- Fan motor

COOLING TOWERS

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