



INSTRUCTION MANUAL

Iceman Portable Chiller System

Models Covered AC, AS, WC, and WS

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Portable Chiller and Full Range Systems Quick Start-Up Checklist

Please verify that the product received matches the product ordered and that the equipment is designed for the intended application. The following quick checklist is an abridged version - always refer to the Mokon Manual provided for additional data and requirements prior to the commissioning of the unit.

✓ **Electrical Inspection**

- Verify amp draws and voltage on serial tag match electrical service being supplied.
- All electrical termination points checked for tightness.
- Electrical wiring completed and disconnect sized and installed per code and compliance.
- Motor rotation verified, motor(s) and compressor(s) bumped.
- Verify any remote control wiring is complete.

✓ **Mechanical Inspection**

- Mechanical fittings tight.
- Unions tight.
- Compression fittings tight.
- Insure Supply, Drain and Process connections are connected properly and operating pressure does not exceed ratings.

✓ **Refrigeration Inspection**

- Insure all refrigeration work has been completed by a certified refrigeration technician.

✓ **Location and Good Standard Installation Practices**

- Confirm safe access to equipment for maintenance, removal and lockout- tag out.
- Insure equipment is designed for the installed environment.
- Water-cooled condenser - Confirm water supply to condenser, if City water use 1.5 GPM/Ton, if Cooling Tower water use 3 GPM/Ton.
- Air-cooled condenser - Confirm there is no short-circuiting of exhaust air into intake of condenser.
- Allow a minimum of 4 feet (1.2 meters) on all four (4) sides to allow for proper ventilation of condenser.
- Unobstructed heights above systems vary from 5 feet (1.5 meters) to 20 feet (6 meters). See user's manual for recommendations. Please use extreme caution when dealing with hot surfaces.
- If systems are to be installed side by side where one system will be exhausting hot air on the next unit, they should be spaced apart a minimum of 15 feet (4.6 meters) for proper & efficient operation.
- Proper non-automotive glycol mixture is being used for selected temperature range under 50°F (10°C).



Section 1 – Warnings and Cautions

Please read and understand this manual before operating the system!



1.1 Electrical Warning

The Mokon portable chiller system, as with all high voltage electrical equipment, should be connected according to all local and national codes. All installation, maintenance, service, repair, adjustment, and operation should be done only by qualified trained electrical personnel who have read and completely understood this instruction manual. To the upper right is a symbol for Electrical Danger. When it is seen on the following pages of this manual as well as on the system, care should be taken to avoid possible electric shock. All maintenance and service should be performed with the power isolated and locked out except where noted.

1.2 Evaporator Freeze-Up Caution



Protect the evaporator on the Mokon portable chiller system from freeze-up. Evaporator temperatures are 10°F – 15°F (-2°C to -9°C) lower than the coolant temperature shown on the thermostat or the temperature controller. Standard systems are set to operate between 50°F – 65°F (10°C – 18°C), but are engineered to operate as low as 20°F (-7°C). Unless your system was set to operate below 50°F (10°C) at the time of purchase, do not attempt to operate your Mokon portable chiller system below 50°F (10°C) without first contacting the Mokon customer service department. It will be necessary to derate the capacity of the system, change the default settings, and add glycol to the Mokon portable chiller system.

Do not use automotive antifreeze in the Mokon portable chiller system due to waxy deposits that will form on the internal components at lower temperatures, reducing efficiency. Using automotive antifreeze will void your warranty!

Only pure ethylene glycol/water mixture should be used. Mokon recommends that a food coloring die be added to signify that glycol is present in system. The glycol should have a corrosion inhibitor added to reduce the risks of metallic degradation.

Note: The automatic fill option should not be used when system operating temperatures are below 50°F. The glycol in the reservoir tank will become diluted which will lead to system freezing.



1.3 Cold Weather Caution

If the Mokon portable chiller system will be moved from your plant and will be subjected to freezing temperatures, the water in the system must be completely drained and/or sufficient antifreeze (not automotive antifreeze) added to prevent serious water damage from freezing.

1.4 Overhead Piping Warning

When overhead piping is connected to a Mokon portable chiller system equipped with an open reservoir or non-pressurized expansion tank there is risk of overflow of the system's reservoir tank upon shutdown, this is due to the back flow of fluid volume from the overhead piping system.

To prevent reservoir tank overflow an overhead piping kit should be installed. This kit is available from Mokon as an option.

1.5 Reservoir Tank Overflow Connection

A reservoir tank overflow connection is supplied on all Mokon portable chiller systems with an automatic fill option. Should the automatic fill option malfunction the overflow connection will protect the system against an overflow condition. This connection is clearly labeled on the system and must be plumbed to a non-pressurized open drain connection.

1.6 Short Circuit Current Rating Caution

Equipment supplied with a safety door disconnect or power cord is design rated for a short circuit current rating (SCCR) of 10,000 amperes RMS if protected with a class "J" fuse.

1.7 Non Potable Water

This system has been designed for use in non-potable water applications only. For applications requiring potable water use please contact Mokon directly to discuss a product offering.

1.8 Capacity Derate

Altitude Correction Factors

Altitude (ft)	1,000	2,000	3,000	4,000	5,000	6,000
Factor	0.98	0.96	0.93	0.91	0.89	0.87

High Ambient Temperatures

The chiller efficiency will be reduced by up to 5% for every 5° over 90°F ambient.

Section 2 – Installation

2.1 Unpacking

Upon arrival inspection should be done to assure there was no damage during shipping. In addition, all electrical and mechanical connections should be inspected to ensure that they are secure and tight. This includes all electrical terminations, mechanical fitting union bulbs, compression fittings, etc.

Note: Refer to Section 4.1 Preventative Maintenance.

The maximum weights of the Mokon chiller systems when drained of water are:

.5 hp	300 lbs (137kg)	10 hp	860 lbs (391kg)
1 hp	330 lbs (150kg)	15 hp	1650 lbs (749kg)
1.5 hp	425 lbs (193kg)	20 hp	1850 lbs (840kg)
2 hp	450 lbs (205kg)	25 hp	3700 lbs (1679kg)
3 hp	460 lbs (209 kg)	30 hp	3860 lbs (1751kg)
5 hp	565 lbs (257kg)	35 hp	4200 lbs (1906kg)
7.5 hp	840 lbs (382kg)	40 hp	4995 lbs (2266kg)

Properly rated equipment should be used to move this machinery.

When removing system from pallet, lift from bottom only. Care should be taken to ensure that the system will not tip. After removing from pallet, the system should only be placed on a level surface.

2.2 Location

Mokon systems should be located in an area that provides adequate space for pedestrian and vehicle traffic. If this is not feasible, owner should provide additional safeguards including safety signs.

For optimum system performance, allow adequate space and ventilation around entire system, as well as a means to direct vapors away from work area.

There should be a minimum of four (4) feet of clearance around the entire Mokon system (all sides) for adequate ventilation and operation of the system.

Recommended unobstructed heights above the system as follows:

- Up to 3 Ton Systems – 5'
- 5-10 Ton Systems – 10'
- 15 Ton and greater Systems – 20'

If multiple systems (air-cooled) are installed side by side a minimum of fifteen (15) feet of clearance is required between systems for proper operation.

If braking casters are included, they must be in the locked position when system is in the operating position. Prior to moving, unlock the casters.

Customer supplied and installed air vents (mechanical or electrical) should be placed at the highest point in the process for application where the process height is greater than eight (8) feet above Mokon system.

2.3 Warnings

Owner should ensure by adequate supervision that correct safety, installation, maintenance and operating procedures described in this manual, as well as recognized industry practice, are followed by all personnel.

All panels must be in place during normal operation.

The top of the machinery should not be used for storage.

Power sources or energy types referred to in this manual are water, glycol and electricity.

This machinery is not for use in hazardous or explosion proof environments.

Under normal operating conditions, the decibel level of the machinery is 80 db or lower from 5' away from the system. When operating the system, hearing protection is recommended.

Any alteration, additions or modifications to any part of the system must receive prior written approval from Mokon's Engineering or Customer Service Departments.

Refer to serial tag for motor and heater electrical information and schematic drawing number.

2.4 Electrical Connections



Warning: The Mokon portable chiller system, as with all high voltage electrical equipment, should be connected according to all applicable state and local codes. All installation, maintenance, service, repair, adjustment, and operation should be done only by qualified trained electrical personnel who have read and completely understood this instruction manual.

Before operating the Mokon portable chiller system, the grounding wire must be connected. The grounding wire is the green or green and yellow wire connected to the frame of the system.

Connect ground wire to the ground screw (labeled PE) located in the electrical box. Connect power lines L1, L2, L3, to disconnect switch or terminal blocks marked L1, L2, and L3 respectively, inside the electrical box. Overcurrent protection of the supply conductors should be sized according to The National Electrical Code (NEC) and any other applicable state and local codes.

For Three Phase Systems: Connect the power cord leads inside the electrical box L1, L2, and L3 to terminals 2, 4, and 6 respectively on the safety disconnect switch located inside the electrical box. The customer supplied main electrical disconnect should be fused for the proper amp draw (see specifications on the serial tag).

For Single Phase Systems: Connect the power cord leads inside the electrical box L1 and L3 to terminals 2 and 6 respectively on the safety disconnect switch located inside the electrical box. The customer supplied main electrical disconnect should be fused for the proper amp draw (see specifications on the serial tag).

Note: For systems without an optional power cord, there is an entry hole in the electrical box for the customer-supplied power cord. Depending on the size of your power cord it may be necessary to enlarge this hole.

2.5 Fluid Connections



Following are the fluid connections for the Mokon portable chiller system, both the water-cooled and the air-cooled version. *Connect each port with full size, unrestricted, insulated hose or pipe.* The hose or pipe should be equivalent in diameter to the port and rated for 100 PSI (689 kPa) and 100°F (38°C).

Fluid Connection/Port Sizes

Water Cooled Tonnage	Connection Size	
	Process	Condenser
2	1"	0.5"
3	1"	0.5"
5	1.5"	0.75"
7.5	1.5"	1.5"
10	1.5"	1.5"
15	1.5"	1.5"
20	1.5"	1.5"
25	2"	2"
30	2"	2"
40	3"	2"

Air Cooled Tonnage	Process Connection size
0.5	0.5"
1	1"
2	1"
3	1"
5	1.5"
7.5	1.5"
10	1.5"
15	1.5"
20	1.5"
25	2"
30	2"
40	3"

Process Fluid Connections (All Systems)

Note: If the Mokon portable chiller system will feed a pulsating system such as a temperature control system, a bypass valve must be installed to ensure flow.

There are two process fluid connections, "To Process" and "From Process" located on the back of the system.

To Process: Connect this port to the process inlet, through which chilled fluid will enter the process.

From Process: Connect this port to the process outlet, through which fluid will leave the process and return to the chiller. *The fluid returning from the process must have a temperature of lower than 80°F (27°C).*

Note: Mokon recommends that you install a strainer on the "from process" line to prevent contamination from the process to enter the chiller. These strainers are available from the Mokon factory.

Reservoir Tank Overflow Connection

A reservoir tank overflow connection is supplied on all systems with an automatic fill option. Should the automatic fill option malfunction the overflow connection will protect the system against an overflow condition. This connection clearly labeled on the system and must be plumbed to a non-pressurized open drain connection.

Condenser Cooling Water Connections

(WC, WS Systems Only)

Condenser cooling water may be obtained from city or tower water supplies. The water usage is dependent on the tonnage of the system and temperature of the water. Variation in the cooling water temperature will lead to variation in water usage. If city water is being used, it will need approximately 1.5 gpm (5.7 lpm) per ton of refrigeration. If tower water is being used, it will need approximately 3 gpm (11.3 lpm) per ton of refrigeration. Mokon recommends that you install a strainer on the condenser water supply line to eliminate any unnecessary fouling. The connections for the condenser cooling water are located in the back of the system, labeled "Supply Water" and "Drain Water".

Supply Water: Connect this port to an adequate source of cold, clean supply water. Do not restrict incoming water to the condenser.

Drain Water: Connect this port to drain. Do not restrict outgoing water from the condenser.

2.6 Filling Reservoir Tank

- Isolate and lock out all power sources.
- Remove the top panel of the Mokon portable chiller system.
- Remove the lid to the reservoir tank.
- Fill the reservoir tank to a minimum of 3/4 full of water or water/glycol mixture. Use of glycol *IS REQUIRED FOR OPERATION BELOW 45°F*. The table on following page lists the correct glycol/water mixtures for operating at temperatures below 45°F.

Warning: The use of "ultra" pure fluids (de-ionized, de-mineralized, etc.) in the standard Mokon systems is prohibited and will void the systems warranty.

Please contact the Mokon factory for further recommendations.

Warning: Use a pure ethylene glycol/water mixture with a corrosion inhibitor in the Mokon portable chiller system. Do not use automotive antifreeze! Automotive antifreeze will cause damage to the system, voiding your warranty and result in reduced efficiency.

After the Mokon portable chiller system is operating and all lines to the process and within the chiller are full, maintain a minimum 3/4 full tank level. This will require the addition of more water or water/glycol to the tank after start up. The table below is for reference only.

Water/Glycol Mixture

Fluid Temperature from System	% Glycol	% Water
44°F to 32°F (7°C to 0°C)	10	90
31°F to 25°F (-6°C to -4°C)	15	85
24°F to 20°F (-4°C to -7°C)	20	80
20°F to 0°F (-7°C to -18°C)	40	60
0°F to -20°F (-18°C to -29°C)	50	50

Note: Evaporator temperatures are 10°F – 12°F (-12°C to -11°C) lower than process fluid temperatures.

NOTE: Standard systems are set to operate between 50°F – 65°F (10°C – 18°C), but are engineered to operate as low as 20°F (-7°C). Unless your system was set to operate below 50°F (10°C) at the time of purchase, do not attempt to operate your Mokon portable chiller system below 50°F (10°C) without first contacting the Mokon customer service department as a low temperature seal assembly will need to be installed to the supply pumpak & various items re-set for low temperature operation. It will be necessary to derate the capacity of the system, change the default settings, and add glycol to the Mokon portable chiller system.

Note: Do not operate your chiller below 50°F (10°C) if system is equipped with an automatic fill option. The glycol will become diluted and your system will freeze.

Section 3 – Operation

The Mokon portable chiller system is a circulating fluid temperature control system, which is capable of providing chilled water or a water/glycol mixture to a process at lower temperatures than available from conventional water supplies. The system is designed for normal operating temperatures of 20°F to 65°F (-7°C to 18°C) unless otherwise noted. The Mokon portable chiller system is a system consisting of a refrigeration loop and water or water/glycol loop.

The refrigerant loop circulates refrigerant through a variety of components, which causes the refrigerant to change phase from a gas to a liquid and then back to a gas. This produces a chilling action on the chilled water loop. The compressor takes the refrigerant from a low pressure, low temperature gas and compresses it to a high pressure, high temperature gas which flows to the condenser. The condenser changes the refrigerant from a gas to a liquid under high pressure. This flows through a filter dryer (to remove any dirt, debris, and moisture) then to a moisture indicator (to indicate any moisture problem) and then to a thermal expansion valve. The thermal expansion valve regulates the flow of high pressure liquid refrigerant into the evaporator, where the refrigerant changes from a high-pressure liquid to a low-pressure gas. The refrigerant absorbs heat from the water or water/glycol mixture in chilled fluid loop on the other side of the evaporator causing a phase change of the refrigerant, from a liquid to a gas. The refrigerant, as a low-pressure gas, returns to the compressor and the evaporator to dissipate it.

The circulating fluid is pumped through the evaporator via a supply pump. As mentioned above, the refrigerant on the refrigerant loop absorbs heat from the water or water/glycol mixture and chills it. The water then flows to the process where it again picks up heat and returns to the evaporator to dissipate it.

Due to the use of high-pressure refrigerant and to ensure proper operation of the system, several safety devices are standard on the Mokon portable chiller system. Only a qualified refrigeration technician should be allowed to service the system.

3.1 Initial Starting Procedure

After all connections are made and the reservoir tank is filled as described in Section 2.6, the Mokon portable chiller system is ready to be started.

Note: Regardless what type of heat-generating process your Mokon portable chiller system is used on, it is important that the Mokon portable chiller system is the first piece of equipment started. If you do not start the Mokon portable chiller system first, too much heat can accumulate and the system will not be able to catch up, appearing to be undersized for the application.

- For “initial start-up” it is recommended to turn on the main electrical disconnect for at least 12 hours before starting the Mokon portable chiller system. This will preheat the compressor oil and liquid refrigerant helping to protect the compressor.

If the power has been disconnected more than 2 hours and less than 3 where the Mokon disconnect switch is in the “off” position, power to main electrical disconnect is recommended for at least 4 hours before starting the Mokon portable chiller system. This applies if the ambient air temperature is above 60°F (15.5°C), and the system is located indoors. If the system is not located indoors or the ambient air temperature is lower than 60°F (15.5°C), refer to the initial start-up instructions.

If power disconnection to the compressor is longer than 3 hours refer back to initial start-up instructions above.

Ideally, it is recommended that power be applied to the system continuously except for service purposes.

It is recommended that the crankcase heater should be checked for proper operation on a regular basis.

Warning: During normal operation the compressor can get very hot which can cause burns. Do not touch the compressor or any of the refrigeration system piping during operation or if the system has been in operation.

- Remove both side panels for access to, and observation of, the system.
- For water-cooled condensing systems, turn on the water flow to "supply water" connections. (See Section 2.5 for Fluid Connections)
- Check the pump rotation using the following procedure (for 3 phase systems):
 - Turning on the supply pump momentarily; press the "start" button (the green light will illuminate) then the "stop" button (the green light will go off).
 - Check the rotation of the supply pump by viewing the motor armature through the louvers on the back of the motor as it slows down. The armature should be turning clockwise from the lead (rear) end.
 - If the rotation is incorrect, deactivate the power supply to the Mokon portable chiller system and switch any two power cord wires (L1, L2, L3) on the inlet of the disconnect switch.
- Restart the supply pump by pressing the "start" button (the green light will illuminate). The supply pump should provide positive pressure to the process. Allow the fluid to circulate for a few minutes to eliminate air pockets from the lines. This will decrease the possibility of cavitations.
- Turn on the compressor by pressing the "start" button (the green light will illuminate).
 - For Systems Equipped with a Scroll Compressor: Check the rotation of the compressor using the following procedure.
 - Observe the high/low refrigeration gauges.
 - Turn on the compressor by pressing the "start" button (the green light will illuminate).
 - The high/low refrigeration gauges should rise/fall to proper levels (refer to the last step)

Note: Phasing of the compressor is verified at the Mokon factory and should not be tampered with in anyway. If compressor phase verification is required contact the Mokon customer service department for instructions. Failure to do so will void your system's warranty.

Warning: Do not run the scroll compressor in reverse direction.

- Check the refrigerant pressure for the proper reading. The high-pressure reading is 200 - 300 PSI (1379 - 2068 k Pa) for R-22/R-407C or 110 - 230 PSI (758 - 1586 k Pa) for R-134A dependent on load. The normal low-pressure readings are listed below in the table. If the pressures are other than these, CONSULT THE MOKON FACTORY.

Normal Low Pressure Gauge Readings

Chilled Fluid Temperature	Nominal Low Pressure Gauge Reading	
	R-22/R-407C	R-134A
60°F (16°C)	80 PSIG (552kPa)	45 PSIG (310kPa)
50°F (10°C)	65 PSIG (448kPa)	35 PSIG (241kPa)
45°F (7°C)	60 PSIG (414kPa)	30 PSIG (207kPa)
40°F (4°C)	55 PSIG (379kPa)	25 PSIG (172kPa)
30°F (-1°C)	30 PSIG (207kPa)	18 PSIG (124kPa)
20°F (-7°C)	30 PSIG (207kPa)	11 PSIG (76kPa)

- Set the controller or thermostat to the desired temperature. See Section 5 for complete controller directions for systems, which have a controller.

Note: Automatic air purge, during start-up removes air from lines (add an air-bleed and/or air separator at highest process loop point if needed to help expel air from process).

3.2 Shut Down Procedure

Note: The Mokon portable chiller system should be the last piece of equipment shut off to protect the system from overheating.

- Turn off the compressor by pressing the "stop" button (the green light will go off).
- Turn off the supply pump by pressing the "stop" button (the green light will go off).
- The main electrical power to the Mokon portable chiller system should remain connected.

Note: When the power is turned off to the system, the compressor crank case heater is also turned off which will hamper the system's ability to burn off liquid in the compressor which will result in damage to the compressor.

- The main electrical power and the supply water (for water-cooled systems) to the Mokon portable chiller system may be turned off if the system is being relocated or for prolonged shut down.

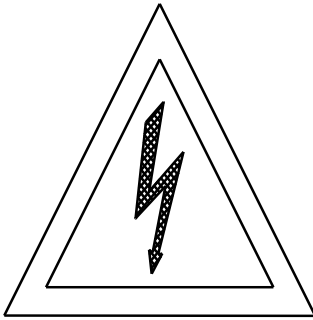
3.3 Restarting Procedure

- If the water lines and main electrical power have not been disconnected, refer to Section 3.1.
- If the water lines and/or the main electrical power have been disconnected, refer to Section 2.4 for Electrical Connections, Section 2.5 for Fluid Connections, and Section 3.1 for Initial Start-Up Procedure.

Section 4 – Maintenance and Service

Warning: The maintenance and service procedures included in Sections 4.1 – 4.2 require that all power sources to the Mokon portable chiller system be shut off, isolated and locked out (exceptions noted). Follow all local and national codes and procedures for working on electrical equipment. Failure to do so could result in injury or death. Only qualified electrical personnel should install, maintain, repair, adjust, and operate Mokon portable chiller systems. The instruction manual furnished with the system should be completely read and understood before system maintenance.

The following hazard warning symbols will be used to denote a specific hazard associated with a procedure.



Electrical Danger



High Temperature
Surface May Be Hot



High Voltage &
Hot Surface

4.1 Preventative Maintenance

Mokon portable chiller systems are designed for a long, trouble free service life under a variety of conditions, with a minimum of maintenance. Performing the following preventative procedures will extend the life of your system. Refer to Section 4.1 - 4.2 in the instruction manual for specific adjustment or service procedures. Refer to the condensed parts list included in Section 8 of the instruction manual for proper replacement parts if required.

The preventative maintenance section is broken into weekly, monthly, and every three months checks. Associated with each check is a series of corrective procedures that may solve a problem detected in the check. If the corrective procedures do not resolve a problem detected in the check, see the trouble shooting guide in Section 7 for a complete list of corrective measures.


Electrical Preventative Maintenance

Weekly Checks	Corrective Procedures
	Correct component wiring
	Verify voltage and frequency stamped on system matches customer supply voltage and frequency
	Correct excessive system load (current draw)
	Verify customer supply voltage is balanced and fluctuations are within 15% of nominal
	Verify wire gauge for main power hookup is properly sized
	Replace components if needed
Slightly tug on each conductor to make sure it makes a solid contact to its attached component. Pay close attention to the green grounding wires.	Tighten with proper tooling
Every 3 Months Checks	Corrective Procedures
Check that the interior electrical and mechanical components are securely fastened to the back panel, and/or to the sides of the electrical box	Tighten with proper tooling
	Inspect/replace fuses
	Inspect/replace motor starter overloads

Pump/Motor and Mechanical Connections Preventative Maintenance

Weekly Checks	Corrective Procedures
Check for foreign materials obstructing airflow in the motor and pump area	Remove all dust, lint, grease or oil with a cloth and/or brush
Monthly Checks	Corrective Procedures
Check that all bolts and screws are securely tightened	Tighten with proper tooling
	Repair solder joints
	Replace necessary parts if leaks persist
	Correct motor wiring
	Verify supply voltage is balanced and fluctuations are within 15% of nominal
	Tighten with proper tooling
	Contact Mokon customer service or a qualified refrigeration technician
	Replace necessary parts if leaks persist
Semi Annual Check	Corrective Procedures
The system's internal and external hoses and clamps should be inspected	Tighten with proper tooling
	Tighten with proper tooling
	Contact Mokon customer service or a qualified refrigeration technician
	Replace necessary parts if leaks persist

Miscellaneous Preventative Maintenance

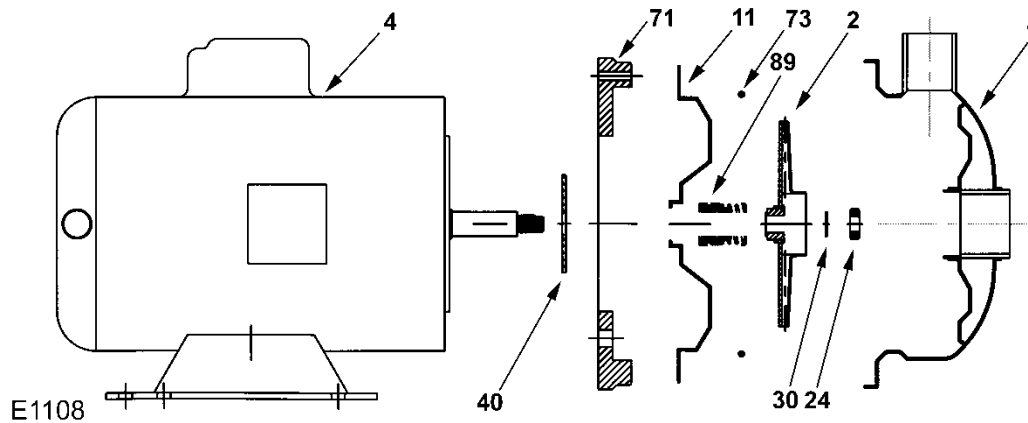
Monthly Checks	Corrective Procedures
 <p>Check that all applicable lights, gauges, and indicators are functioning properly (Power On)</p>	Replace necessary parts
Check that the "Warning," "High Voltage," "Caution," and lamicoid labeling are adhering to the correct locations	Replace torn, damaged or missing labels
Check the condenser coil (air-cooled systems) is free of dirt and debris	Vacuum, blow clean, or chemically clean

4.2 Pump Maintenance

Exploded View Drawing

REF NO.	QTY	3 HP	1 HP	1.5 HP	5 HP	3/4 HP	DESCRIPTION	PART #
	1	✓	✓	✓		✓	CASE 1.25 x 1 NPT	018266
	1						CASE 1.25 X 1 NPT	018268
	1				✓		CASE 1.5 x 1.25 NPT	018267
	1					✓	IMPELLER 4.88", STAINLESS	018275
	1		✓	✓			IMPELLER 5.25", STAINLESS	018276
	1	✓					IMPELLER 6.3", STAINLESS	018277
	1				✓		IMPELLER 6.3", STAINLESS	018342
4	1	✓	✓	✓	✓	✓	MOTOR 56J	CONSULT FACTORY
11	1	✓	✓	✓	✓	✓	COVER, STAINLESS	018269
24*	1	✓	✓	✓	✓	✓	NUT	018270
30*	1	✓	✓	✓	✓	✓	D-WASHER	018271
40*	1	✓	✓	✓	✓	✓	FLINGER	018272
71	1	✓	✓	✓	✓	✓	DISC IRON	018273
73*	1	✓	✓	✓	✓	✓	GASKET, CASE	018274
89*	1	✓	✓	✓	✓	✓	SEAL, 5/8"	IN REPAIR KIT

* - DENOTES COMPONENTS INCLUDED IN REPAIR KIT 018246.



Seal Replacement/Maintenance

Warning: Make certain that the system is disconnected from the power source in compliance with all local and national codes before attempting to service or remove any components. Never run the pump when dry.

Maintenance:

Inspection: Pump should be periodically checked for proper operation. If the system has changed or if the pump is operating noisily or erratically, then the pump should be removed and examined. It should be repaired and parts replaced as necessary.

Cleaning: Remove oil, dust, dirt, water, chemicals from exterior of pump and motor. Blow out interior of open motors with clean compressed air at low pressure. Regularly drain moisture from TEFC motors.

Draining: If the pump is located in an area subject to freezing temperatures, the pump must be drained when not in operation or add sufficient antifreeze.

Seal Replacement:

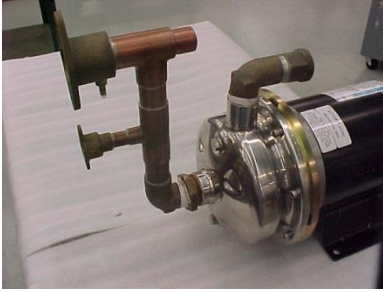
Disassembly:

- Turn off power.
- Drain the Mokon portable chiller system. Flush if necessary.

Necessary Tools:

- 3/8" drive ratchet
- Pry bars (2)
- Flat blade screwdriver
- 6" socket extension 3/8"
- Gloves
- 1/4" Hex Allen wrench/socket
- 1/2" Socket





- Remove pump/motor from cabinet.

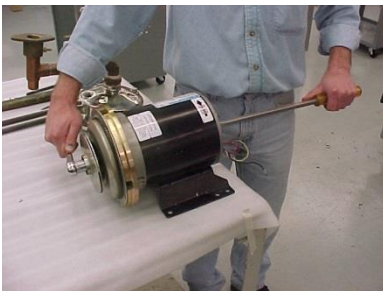


- Remove casing screws and remove case. Inspect o-ring for wear or damage.



- Remove the cap at the lead end of the motor. A screwdriver slot will be exposed. Use a screwdriver to stop the shaft from turning.

Caution: Do not insert screwdriver between impeller vanes to prevent rotation. This can damage the impeller.



- Remove the impeller lock nut and washers by turning counter clockwise when looking at the front of the pump.



- Remove the impeller by turning counter clockwise. Protect the hand by wearing a glove.

Caution: Failure to remove the impeller in a counterclockwise direction may damage the threading on the impeller, the shaft or both.



- Remove the spring to the mechanical seal assembly.



- With two pry bars 180° apart and inserted between the seal housing and the motor plate adapter and carefully separate the two parts. The mechanical seal assembly will come off of the shaft inside the seal housing. It is not necessary to remove the cast iron disc from the motor.



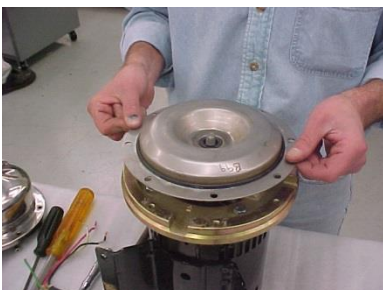
- Using a dowel, push the mechanical seal assembly out of the seal housing from the motor side.

Reassembly:

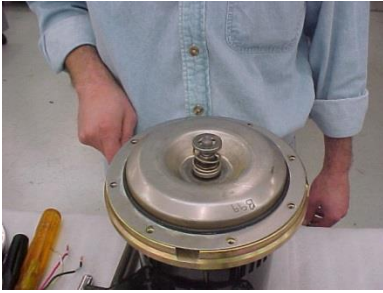
Caution: The mechanical seal is a precision product and should be handled accordingly. Use care when handling lapped running surfaces of the mechanical seal to ensure they remain clean and are free of chips or scratches. Clean gasket and flange faces, seal seat cavity and shaft, in particular, shaft shoulder fitting against impeller.



- Lubricate the seal seat cavity of the cover and the rubber cup or O-ring of stationary seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity in the cover squarely and evenly using an arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.



- Place the seal assembly housing (with the seal assembly inserted) onto the shaft and replace the spring. Lubricating fluid can be applied to the motor shaft and the rubber bellows of the seal used to facilitate assembly. **Do not contaminate the mechanical face seals with lubricant. Do not use petroleum based lubricants.**



- Thread the impeller onto the shaft by turning clockwise. Protect the hand with a glove. Prevent shaft rotation by using a screwdriver on the shaft end screwdriver slot.



- Replace the impeller lock nut and washer by turning clockwise. Prevent shaft rotation by using a screwdriver on the shaft end screwdriver slot.





- Replace the casing and casing screws and tighten finger tight. Finish tightening the cap screws alternately and evenly to approximately 6 ft. lbs. torque.

Note: It is imperative that screws be tightened alternately and evenly, as this action centers the cover in the casing, assuring proper alignment. Binding of the impeller in the case and adaptor may occur if the cap screws are not tightened as listed above.



- Check for free rotation then replace the cap at the rear of motor. Reinstall pump/motor into system.

4.3 Glossary of Indicators, Gauges, and Buttons

Supply Pumps Start/Stop Buttons:	Pilot light illuminates green to supply pump (chilled water circuit) to process is activated.
Compressor Start/Stop Buttons:	Pilot light illuminates green to indicate refrigeration loop and compressor pump is activated.
No Flow Indicating Light:	When illuminated indicates inadequate fluid flow returning to the Iceman system to ensure safe operation.
Freezestat Indicating Light:	When illuminated, indicates compressor has shut down due to coolant temperatures below safe operation.
Low Refrigerant Pressure Indicating Light:	When illuminated, indicates compressor has shut down due to low refrigerant pressure.
High Refrigerant Pressure Indicating Light:	When illuminated, indicates compressor has shut down due to high refrigerant pressure.
Supply Pump Pressure Gauge:	Indicates fluid pressure for the "chilled water loop" going to the process.
Return Temperature Gauge:	Indicates the temperature of "chilled water loop" returning from the process.
High Refrigerant Pressure Gauge:	Indicates the pressure of the refrigerant, as it is being condensed in the condenser. This pressure is critical to the performance of the chiller and is generated by the compressor. The normal pressure is between 200-300 PSIG/ 1379-2068 kPa (R-22/R-407C) or 110-230 PSIG/ 758-1586 kPa (R-134A) (depending on load).
Low Refrigerant Pressure Gauge:	Indicates compressor suction pressure and is related to temperature setting and the adequacy of refrigerant charge.

Section 5 – Eurotherm Controller (3000 Series)

5.1 Operation

This section of the manual contains all essential information needed to operate the controller. Contact Mokon Customer Service with controller problems as well as warranty and repair issues.

The controller is configured by model number. Inputs, outputs and alarm types are preset. Final setup and configuration are done from the keypad. The controller has four basic modes: Operator 1, Operator 2, Operator 3 and the configuration mode.

The controller's default level is Operator 1, and is used for day to day operation.

Note: Operator 2, 3 and configuration are password protected.

Home List Navigation

To step through list levels press and hold the Page button until level 1 is obtained. Press the up button or the down button to change levels.

To step through parameters within a particular list, press the Scroll button until the required parameter is obtained.

To change the value (or state) of a parameter, press the Up button or the Down button.

***Refer to Section 5.1 Keys for button locations and descriptions.**





Levels	Operator 1	Scroll	Function
	Parameter Mnemonic		
	WRK.OP	WORKING OUPUT The active output value	Output %
	SP1	SETPOINT 1	-----
	SP2	SETPOINT 2	-----
	A1.High	ALARM 1 SETPOINT	
	A2.Low	ALARM 2 SETPOINT	
*	A3.xxx	ALARM 3 SETPOINT	
	ID	Customer ID	Controller Revision #

*Optional

Keys

Note: Pictured is the 3216 Eurotherm controller - this also applies to 3204 and 3208 series controllers.



Button or Indicator	Name	Explanation
OP1	Output 1	When lit, it indicates that alarm output is on. "FREEZE PROTECTION" will scroll.
OP2	Output 2	When lit, it indicates that alarm output is on. "HIGH FLUID TEMPERATURE" will scroll.
	Page button	Press to select a new list of parameters.
	Scroll button	Press to select a new parameter in a list.
	Down button	Press to decrease a value in the setpoint.
	Up button	Press to increase a value in the setpoint.
ALM	Alarm	Flashes when in alarm condition. "ALARM MESSAGE" will scroll.
OP4	Output 4	When lit indicates that the cooling output is on. "COOLING" will scroll.

5.2 Troubleshooting

Diagnostic Alarms:

Display Shows	What it means	What to do about it
E.ConF	A change made to a parameter takes a finite time to be entered. If the power to the controller is turned off before the change has been entered then this alarm will occur. Do not turn the power off to the controller while ConF is flashing.	Enter configuration mode then return to the required operating mode. It may be necessary to re-enter the parameter change since it will not have been entered in the previous configuration.
E.CAL	Calibration error	Re-instate Factory calibration
E2.Er	EEPROM error	Return to factory for repair
EEEr	Non-vol memory error	Note the error and contact your supplier
E.Lin	Invalid input type. This refers to custom linearization which may not have been applied corrector or may have been corrupted.	Go to the INPUT list in configuration level and set a valid thermocouple or input type.

Note: Some error messages may not appear, depending on the controller options.

5.3 Alarm Indicators

- ALM beacon flashing red = a new alarm (unacknowledged).
- This is accompanied by a scrolling alarm message. A typical default message will show the source of the alarm followed by the type of alarm. For example, "FREEZE PROTECTION" and "HIGH FLUID TEMPERATURE".
- If more than one alarm is present further messages are flashed in turn in the main display. The alarm indication will continue while the alarm condition is present and is not acknowledged.
- ALM beacon on continuously = alarm has been acknowledged.

To Acknowledge an Alarm

Press  and  together.

Non-Latched Alarms

Alarm condition present when the alarm is acknowledged.

- ALM beacon on continuously.
- The alarm message(s) will continue to scroll.

This state will continue for as long as the alarm condition remains. When the alarm condition disappears all indication also disappears.

If the alarm condition disappears before it is acknowledged the alarm reset immediately.

5.4 Remote Setpoint and Retransmission “Scaling”

Scaling of the 4-20mA and 0-10V signals for this option are as follows:

- 4mA or 0V = minimum system operating temperature.
- 20mA or 5V, 10V = maximum system operating temperature.

Note: Maximum system operating temperature value is reflective of the series system purchased, (refer to serial tag for maximum operating temperature located on Mokon system).

Consult customer service at Mokon factory (716) 876-9951, regarding system’s minimum and maximum temperatures if there are any questions.

Section 6 – Options

6.1 Air Duct Flange (Top)

This option allows the user to run duct work with a blower fan to the top of the air-cooled unit to draw the heat generated by the cooling process out of the room (area) where the chiller is located. The flange, placed by Mokon, will be sized per the unit. The customer will need to provide and install the accompanying duct work as well as the blower fan. The blower fan must be sized so that it delivers 1,000 cfm (minimum) per chiller ton of air flow for the proper ventilation (heat removal) of the chiller. Anything less will result in the chiller overheating and will shut down the unit.

6.2 Automatic Fill with Low Water Level Indication

As stated in Section 2.6, the reservoir tank must maintain a minimum of $\frac{3}{4}$ total fluid capacity. This option provides for automatic monitoring and filling of the reservoir. Connect a constant supply water source to the $\frac{1}{2}$ " NPT tank connection at the back of the unit and leave on. When the level gets below the $\frac{3}{4}$ minimum, the Low Level light on the front of the electrical panel will come on and the unit, via a float switch, will fill to the required level. The light will then turn off. Keep in mind, use of glycol IS REQUIRED FOR OPERATION BELOW 45°F AND MUST BE MANUALLY ADDED TO THE TANK. The table in Section 2.6 lists the correct glycol/water mixtures for operating at temperatures below 45°F.

6.3 Crankcase Pressure Relief (CPR) Valve

The chiller generally operates with a set point anywhere between 50° F (10° C) and 65° F (18.3° C) allowing for a return fluid temperature of up to 75° F (23.9° C). If it is desired to run the chiller temperature set point above 65° F (18.3° C) then a CPR valve is required. This regulating valve helps to maintain the proper suction pressure of the crankcase of the compressor so as not to overload the compressor motor. Even with the CPR valve, the maximum allowable temperature set point on a chiller is 85° F (29.4° C) with an assumed return fluid temperature of 95° F (35° C). At no time should the return fluid temperature to the chiller ever exceed 95° F (35° C)! This CPR valve is factory set and must never be adjusted by the customer!!

6.4 Digital Flow Meter

This optional feature provides for a Blancett 1100 Series Turbine Flow Meter with flow indication on the "TO" Process line of each zone. See the CD for the flow meter Data Sheet and Manual.

6.5 Emergency Stop

The emergency stop device will shut the machine down regardless of the operating mode. Once the emergency stop device has been activated, it must be disengaged by turning the button clockwise. Disengaging the emergency stop will not restart the machinery but only permit restarting.

- Per the risk assessment of the machine, the emergency stop is not wired to a safety rated relay.
- Do not wire additional safety components to the Mokon stop relay **or** modification of the emergency stop circuit is prohibited.

6.6 Overhead Piping Kit

This option is required when the process and/or process piping is above the level of the unit and the volume is such that the total amount of fluid (water/water & glycol) used exceeds the capacity of the unit reservoir. Upon unit shut-down, the swing check valve(s) and the spring check valve(s) within the unit will prevent backflow of fluid from the process loop into the unit reservoir thereby avoiding an overflow condition.

6.7 Process Purge Option (Air Connections)

To facilitate mold changes with a minimum amount of oil loss from the hoses and the process, a process purge system via air is provided as an option.

Note: If additional fluid has been added to the Mokon system after initial start up, it will be necessary to drain the excess fluid prior to using the process purge as to avoid overflowing the reservoir tank.

The following is the procedure to utilize this process purge option:

- Turn the controller to the minimum setting and wait until the process temperature is below 130°F. (See Section 5 for Controller Instructions)
- Shut off the zone by pressing the "Stop" button.
- Connect the Air Supply to the Air Inlet on the system.

Warning: Air supply pressure should not exceed 15 PSIG (103 kpa).

- Depress the "Process Purge" button on the control panel.
The fluid in the process loop will be returned to the reservoir.
- Repeat steps 1 – 4 for each system.
- Refer to Section 3.1 to Restart the System.

Note: The time required to purge the system is based on the holdup volume of the process and the air supply to the system.

6.8 Valved Process Bypass

This option is simply a direct fluid path between the "TO" process line and the "FROM" process line that will allow you to bypass your process partially or completely via a metered globe valve on the outside back of the unit. This provides a means of controlling the amount of flow out to the process should you wish to reduce it from the normally full flow condition.

6.9 "Z" Purge Instructions for Mokon Portable Chiller Systems

- A 3 inch diameter threaded pipe connection is provided to receive an air or nitrogen supply, a 90 cfm blower is recommended. This blower shall not be installed or placed in the hazardous environment where hazardous fumes will be drawn from for supply air to the electrical enclosure or internal cabinetry of the Mokon system. The optimum nitrogen or air supply range to the Mokon system should be .15 to .5 inches of water column.

As an alternative to nitrogen, non-hazardous "clean" dry air can be supplied which can also include clean dry compressed shop air.

The discharge pressure of the fan or blower needs to be, at least, 3.0 inches of water column for every 100 equivalent feet of 3" duct. For 4" duct, 1.0 inch of water column per 100 feet is adequate. A 3" exhaust connection is also provided.

Note: Due to temperature considerations, the purge gas must flow (sweep) through the unit to insure adequate ventilation.

- Once the purge gas is introduced, the Dwyer model 1950-0-2F pressure switch will close, energizing a time delay relay. The relay prevents startup of the Mokon system until an adequate sweep inside the unit has taken place. The switch is set at its minimum setting of 0.15 inches of water. A green pilot light will illuminate once the relay has "timed out", indicating it is safe to operate the unit.
- The magnehelic gauge has a scale of 0 to .5 inches of water, and is clearly visible to allow the operator to monitor the unit.
- If the purge is lost, for any reason, the pressure switch will open, thus activating a customer supplied alarm through a set of auxiliary contacts. The Mokon system will also shut off.
- For systems that are classified and applied properly the applicable Class, Group and Division is listed on the bottom of the systems serial tag.
- Methods: There are typically two methods for the supply of purge gas to systems for "Z" purge applications, they are as follows:

Method # 1 (recommended): Due to temperature considerations, the purge gas must flow (sweep) through the unit to insure adequate ventilation. This method would apply to water, oil, chiller, and full range heater/chiller systems.

Method # 2: (not recommended): Pressurization of the cabinetry when temperature build up is not as much of a concern can be applied. Here the exhaust coupling on the cabinet would be plugged. This method would apply to water-cooled chiller systems or very low heating capacity systems.

Note: If the "Z" purge mechanism or any other system safety devices are modified or disabled in any way Mokon considers them to be non-operational and the systems warranty could be void.

Section 7 – Troubleshooting Guide

7.1 Process Loop

Problem	Possible Cause	Corrective Measure
	System unplugged / power off	Plug system in / turn power on
	Improper power source wiring	Check wiring (electrical schematics) and correct
	Blown fuse at power supply	Isolate open fuse and replace
	Blown control circuit fuse	Replace and check for ground condition
	Low voltage	Measure incoming voltage, if too low correct
	Overload on pump/motor starter	Consult factory
	Inadequate flow of process fluid	Inspect process and process lines for blockage; if blocked correct
	Flow switch	Inspect/replace component
	Overload on pump/motor starter	Consult factory
	Blown fuse at power supply	Isolate open fuse and replace
	Blown control circuit fuse	Replace and check for ground condition
	Faulty seal	
	Improperly aligned seal	
	Over-pressured seal	
	Float switch	Inspect; if stuck, replace
	Solenoid diaphragm will not seat	Inspect/replace

7.2 Refrigeration Loop

Only a qualified refrigeration technician should attempt repairs in the refrigeration loop.

Problem	Possible Cause	Corrective Measure	
	Process fluid temperature below set point	Change set point	
	Scroll compressor rotating in the wrong direction	Consult Mokon factory	
	Low or high refrigerant pressure	Consult a Qualified Refrigeration Technician	
	Compressor shut down due to thermal protection	Let cool, restart, and verify amp draw	
	Inadequate flow of process fluid	Inspect process and lines for blockage, clear blockage if necessary	
	Controller or thermostat (controller optional on 1/2 and 1 ton systems)	Consult factory (<i><u>DO NOT attempt repairs, this will VOID your warranty!</u></i>)	
	Freezestat	Inspect/replace	
	Blown control circuit fuse	Replace and check for ground condition	
	Low water flow through the condenser	Verify condenser supply water flow rate is as stated in Section 2.5	
	Water regulating valve	Inspect/clean or replace	
	Condenser supply water lines too small	Replace lines with insulated hose or pipe of equal diameter as the port	
	Insufficient water pressure drop across condenser due to plugged or fouled condenser tubes	Inspect/clean or replace	
	Condenser supply water temperature too high (above 85°F / 29°C)	Find colder source of water	
	Dirty condenser coils	Inspect/clean	
	Fan rotation	Verify fan is rotating (counterclockwise)	
		Blown control fuse	
		Fan limit switch – Consult Qualified Refrigeration Technician	
	High ambient air temperature	Find a cooler source or force more air	
	Refrigeration loop overcharged	Consult a Qualified Refrigeration Technician	

Problem	Possible Cause	Corrective Measure
	Low refrigerant charge	
	Low head pressure	
	Restriction to refrigerant flow in refrigerant loop	
	Ambient air temperature too cold (air-cooled)	Find warmer source of air
	Condenser cooling water temperature too low (water-cooled)	Find warmer source of water
	Air in process loop	Purge – See Start Up Procedure in Section 3.1
	Water/glycol solution foaming	Replace water/glycol mixture
	Attempting to operate below setting (45°F/7°C)	Consult Mokon factory
	Freezestat	Inspect/replace
	Low water flow causing icing in condenser (water cooled)	
	Hot gas bypass valve stuck open	
	Condenser tubes limed over/blocked (water cooled)	
	Poor condensing	
	Over condensing	
	Bad valves in compressor	
	Chiller not started correctly (before heat generating process)	See Section 3.1 for Correct Starting Procedure
	Scroll compressor rotating in the wrong direction	Consult Mokon factory
	Chiller undersized for load	Consult Mokon engineering
	Lack of refrigerant	
	Dryer clogged	
	Too large process load	
	Evaporator freezing	
	Restrictive process or process connections	Remove restrictions
	Thermocouple or RTD	Inspect/replace component
	Controller calibration	See Controller Section 5

Section 8 – Condensed Parts List

½ - 10 Ton Systems:

Part No	Description
006256	Motor starter/24 amp heater contactor 110V coil (pump/motor)
006257	40 amp heater contactor 110V coil (compressor)
006366	1.0 – 5.0 amp overload
006367	3.2 – 16 amp overload
008021	0 – 160 PSI pressure gauge, suction, and discharge
018246	Seal kit for pump/motor assembly
022038	Start/stop button
023089	Thermometer
040002	Thermocouple

15 and 20 Ton Systems:

Part No	Description
006256	Motor starter/24 amp heater contactor 110V coil (pump/motor)
006257	40 amp contactor 110V coil (compressor)
006298	50 amp contactor 110V coil (compressor)
006366	1.0 – 5.0 amp overload
008021	0 – 160 PSI pressure gauge, suction, and discharge
018246	Seal kit for pump/motor assembly
022038	Start/stop button
023089	Thermometer
040002	Thermocouple

25, 30 and 40 Ton Systems:

Part No	Description
006256	Motor starter/24 amp heater contactor 110V coil (pump/motor)
006306	65 amp contactor (40 Ton x 2)
006308	120 amp contactor (25 & 30 Ton)
006367	3.2 – 16 amp overload (25 & 30 Ton)
006368	5.4 – 27 amp overload (40 Ton)
008021	0 – 160 PSI pressure gauge, suction, and discharge
018246	Seal kit for pump/motor assembly (25 Ton)
018406	Seal kit for pump/motor assembly (30 & 40 Ton)
022038	Start/stop button
040026	Thermocouple

For additional part numbers refer to the specific section in the instruction manual or consult the Mokon factory (716) 876-9951.

Section 9 – Warranty

ICEMAN PORTABLE CHILLER WARRANTY

All new ICEMAN CHILLER systems manufactured by MOKON are guaranteed to be free from defective material or workmanship for one (1) year from the date of purchase. All Standard Microprocessor controllers carry a five (5) year warranty, Microprocessors with special features carry a three (3) year warranty and Solid State controllers carry a one (1) year warranty. MOKON'S obligation under the WARRANTY SHALL BE LIMITED, TO THE ORIGINAL CUSTOMER, TO REPAIR OR REPLACE DEFECTIVE PART(S) OF THE TEMPERATURE CONTROL SYSTEM, and UPON CUSTOMER COMPLIANCE WITH THE INSTRUCTIONS CONTAINED HEREIN. Upon discovery of any alleged defect, it is the responsibility of the customer to contact the MOKON Service Department with the complete model number, serial number and the date of purchase. MOKON'S obligation under this warranty is limited to make good, from or at its factory, any parts that are returned to the company (prepaid) and deemed to defective, within the time frame of the warranty. The customer also has the option of forwarding the system to MOKON (Buffalo, NY), prepaid by the customer and with a return authorization from MOKON for inspection and component replacement or repair. Repair or replacement in any manner provided above shall constitute a fulfillment of all liabilities of MOKON concerning the quality of the temperature control system. Freeze-ups of any kind are not covered under this warranty.

No allowances, credits or reimbursements will be made for any replacement or repair made or provided for by the customer unless authorized in advance, in writing, by MOKON.

Note: The use of automotive anti-freeze in a chiller system will void the above warranty!

The warranty set forth above is in lieu of any and all other warranties expressed or implied including warranties of merchantability and fitness for a particular purpose. Mokon shall in no event be liable for any consequential damages or for any breach of warranty in an amount exceeding the original price of the unit.

Mokon's products are not guaranteed against damage caused by corrosion.



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