CIRCULATING OIL TEMPERATURE CONTROL SYSTEMS

INSTRUCTION MANUAL

INSTALLATION, OPERATION, MAINTENANCE, PARTS

MODEL NUMBER MK, XC, HC

SERIAL NUMBER

FEATURES: General manual
OPTIONS:

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SECTION 1 – WARNINGS AND CAUTIONS

PLEASE READ AND UNDERSTAND THIS SECTION <u>BEFORE</u> OPERATING SYSTEM!

1.1 – ELECTRICAL WARNING



The Mokon system, as with all high voltage electrical equipment, should be connected according to all national and local codes. All installation, maintenance, service, repair, adjustment, and operation should be done only by appropriately 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, care should be taken to avoid possible electric shock. All maintenance and service should be performed with the power OFF except where noted.

1.2 – HOT FLUID WARNING



Exercise **EXTREME CAUTION** while working on or in the area of the Mokon Temperature Control System. The high temperature of the fluid will cause the process lines, the system components, and the metal cabinetry to become **VERY HOT** and therefore should **NOT** be touched. To the upper right is a symbol for **SURFACE MAY BE HOT, HIGH TEMPERATURE**. When it is seen on the following pages of this manual, care should be taken to avoid possible burns. All maintenance and service must be performed with the system completely cooled. It is advisable to plug the process ports of any unused zones so that if a wrong button is pressed, heat transfer fluid will not be pumped through them.

1.3 – COLD WEATHER CAUTION



If the Mokon temperature control 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 added to prevent serious water damage from freezing.

1.4 – PUMP CAVITATION WARNING

The process utilizing a Mokon Circulating Hot Oil System should be tested PRIOR to use. It is essential that all water to be removed from the process prior to charging with oil. Water concentration as low as 500 PPM in the oil will result in pump cavitations at about 220°F (104°C) operating temperature.

1.5 - OVERHEAD PIPING WARNING

When overhead piping is connected to a Mokon temperature control 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 tank overflow an overhead piping kit should be installed. This kit is available from Mokon as an option.

SECTION 2 – INSTALLATION

2.1 – UNPACKING

Upon arrival inspection should be done to assure there was no damage during shipping.

The **maximum** weights of the Mokon Oil systems when drained of fluids are:

Series	# of Zones	Heating KW Per Zone	lbs	kg
H4	1	6	378	171
		12	406	184
		18	456	207
		24	484	220
		30	628	285
		36	656	298
	2	6	674	306
		12	730	331
		18	822	373
		24	878	398
	3	6	970	440
		12	1054	478
		18	1188	539
		24	1272	577

Series	# of Zones	Heating KW Per Zone	lbs	kg
H5 H6	1	6	432	196
		12	460	209
		18	510	231
		24	538	244
		30	682	309
		36	710	322
		48	802	364
	2	6	782	355
		12	838	380
		18	930	422
		24	986	447
		30	1216	552
		36	1272	577
	3	6	1216	552
		12	1300	590
		18	1434	650
		24	1518	689

Properly rated equipment should be used to move this machinery.

When removing 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

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.

2.2 - LOCATION CONT.

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 the 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, oil, 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 85 decibels or lower. When operating the machine, 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.

Note: If your unit was purchased with a process purge option, review section 4.7 or 4.8 for operating instructions.

2.4 – ELECTRICAL CONNECTORS



WARNING: THE MOKON SYSTEM, AS WITH ALL HIGH VOLTAGE ELECTRICAL EQUIPMENT, SHOULD BE CONNECTED ACCORDING TO ALL APPICABLE NATIONAL AND LOCAL CODES. ALL INSTALLATION, MAINTENANCE, SERVICE, REPAIR, ADJUSTMENT, AND OPERATION SHOULD BE DONE ONLY BY APPROPRIATELY TRAINED ELECTRICAL PERSONNEL WHO HAVE READ AND COMPLETELY UNDERSTOOD THIS INSTRUCTION MANUAL.

BEFORE OPERATING SYSTEM THE GROUNDING WIRE MUST BE CONNECTED. THE GROUNDING WIRE IS THE GREEN WIRE CONNECTED TO THE FRAME OF THE SYSTEM.

Connect green wire to the ground screw (labeled GND or PE) located in the electrical box. Connect power lines L1, L2, L3, to the disconnect switch inside the electrical box. Overcurrent protection of the supply conductors should be sized according to Article 670 of The National Electrical Code (NEC), 1996 or the appropriate national code.

2.5 – FILLING RESERVOIR

Fill the reservoir with heat transfer fluid (see section 4.12 for recommended fluids) through the fill port. The fill port is located on the side of the system on 500 and 600 series systems and located on the front of the system for all other models. Fill to the highest level on the sight glass. See chart below for the total fluid capacity of your system.

RESERVOIR TANK FLUID CAPACITY

# OF ZONES	HEATING CAPACITY KW PER ZONE	RESERVOIR TANK VOLUME (GALLONS)	RESERVOIR TANK VOLUME (LITERS)
1	6	18	70
	12	18	70
	18	18	70
	24	18	70
	30	38	144
	36	38	144
	48	38	144
2	6	38	144
	12	38	144
	18	38	144
	24	38	144
	30	58	220
	36	58	220
3	6	58	220
	12	58	220
	18	58	220
	24	58	220

Note: On initial start up, while purging the air from the system, it may be necessary to add additional heat transfer fluid to the reservoir to compensate for the volume of fluid consumed by this process.

WARNING: ON A STANDARD SYSTEM, A MINIMUM OPERATING FLUID LEVEL OF ½ FULL IS RECOMMENDED (OPTIMUM FLUID LEVEL IS ¾ FULL). IT MUST BE MAINTAINED AT ALL TIMES. IF THE PROPER FLUID LEVEL IS NOT MAINTAINED, SERIOUS DAMAGE MAY OCCUR TO THE MOKON SYSTEM. IT IS MANDATORY TO PERIODICALLY INSPECT THE FLUID LEVEL SIGHT GLASS AND ADD HEAT TRANFER FLUID IF REQUIRED.

2.6 - FLUID CONNECTIONS



EXERCISE EXTREME CAUTION WHILE WORKING ON OR IN THE AREA OF THE MOKON TEMPERATURE CONTROL SYSTEM. THE HIGH TEMPERATURE OF THE FLUID WILL CAUSE THE PROCESS LINES, THE SYSTEM COMPONENTS AND THE METAL CABINETRY TO BECOME VERY HOT AND THEREFORE, THEY SHOULD NOT BE TOUCHED.

There are four (4) convenient and clearly marked connections, "To Process" (one for each zone), "From Process" (one for each zone), "Supply Water" and "Drain Water." They are located on the rear of the HF. (Note: Quick disconnects should not be used on any of the connections, they will restrict the flow.)

USE FULL SIZE UNRESTRICTED HIGH TEMPERATURE, INSULATED HOSE OR PIPE FOR EACH CONNECTION.

1. To Process: Connect the port(s) to the process inlet(s), through which heat transfer fluid will enter the process.

2. From Process: Connect the port(s) to the process outlet(s), from which heat transfer fluid will leave the process.*****

3. Supply Water: Connect the port to an adequate source of cold, clean supply water.

4. Drain Water: Connect the port to drain (or return line in an in plant closed recirculation system).

CAUTION:

Do not use brass, bronze or copper (yellow) metals in process plumbing that will come in contact with the heat transfer oil. Yellow metal promotes oxidation of the oil, drastically shortening its' life.

***** A "Y" type strainer is provided to be installed in the "From Process" line. Make sure the direction indicating arrow, on the body of the strainer, corresponds to the flow direction of the fluid. It is recommended that the strainer be installed in the horizontal position, with the "Y" pointed downward.

If the strainer must be mounted in the vertical position, below the process connection on the Mokon unit, a drip leg should be installed to trap debris that will dislodge from the screen upon shutdown. Consult the factory if the strainer must be installed in this fashion.

SECTION 3 – OPERATION

NOTE: Prior to starting the Mokon system it may be necessary to tighten the mechanical fittings on the piping. Vibration cause during transport can loosen the fittings. Before proceeding, check and tighten all of the mechanical fittings.

3.1 – INITIAL STARTING PROCEDURES

1. Fill the Mokon system with heat transfer fluid (See section 2.5)

2. Turn on the water supply connected to the Mokon system. (See section 2.6)

3. Turn on the electrical main disconnect switch. (See section 2.4)

4. If your unit is supplied with the process purge option via drum reverse, make sure the three position, "Forward / Reverse" selector switch is in the forward position.

   NOTE: The cover of the system must be removed for the procedures in steps 5 & 6. The side cover for HTF series 500 and 600 or the front cover for all other model oil systems.

5. For each zone, check the pump alignment. (See section 4.2.1)

6. For each zone, check the motor rotation by turning on the system momentarily (press the "Start" button then the "Stop" button). As the pump slows down, check the motor rotation. If the motor is not rotating in the direction of the arrow label located on the motor housing (clockwise from the lead end), reverse any two power cord leads (see section 2.1) to change the direction of the motor rotation.

7. Restart the system and set the controller to the minimum temperature. (See section 5 for the specific controller operation instructions)

   NOTE: The start button may have to be held in for up to 30 seconds in order to build adequate pressure to start the system.

8. Allow the system to run for approximately 5 to 10 minutes at the minimum temperature to purge the air from the system. The air is purged from the system when the pressure gauge reading is steady (typically between 40 to 80 psi / 276 to 552 kPa depending on restrictions in your process) and when the pump runs smooth and steady.

   If the above procedure does not eliminate air in the system, turn the unit off then on, a once or twice to break up the air pockets.

   NOTE: The air purge button may be pressed to eliminate air in the system at any time during operation.

9. Set the controller to the desired temperature. The unit will reach the Setpoint temperature. See section 5 for specific controller instructions

3.2 - CHANGING TEMPERATURE SETTING

If a new temperature setting is required while the unit is in operation, adjust the controller to the new desired setpoint temperature. See section 5 for specific controller instructions.

3.3 - SHUT DOWN PROCEDURE

COOL THE UNIT BY REDUCING THE SETPOINT TEMPERATURE TO 150EF (66ºC) OR LOWER. DO NOT SHUT UNIT OFF AT ELEVATED TEMPERATURES. THIS COULD BE DETRIMENTAL TO FLUID AND UNIT LIFE. When the unit has reached 150EF (66ºC) or lower, push the stop button. See section 5 for specific controller instructions.

3.4 - RESTARTING PROCEDURE

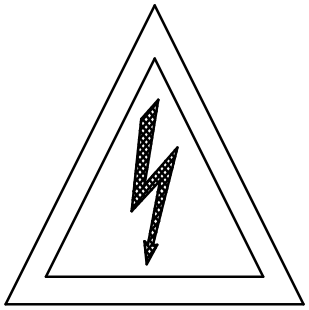
1. If the water lines and main electrical power have not been disconnected, refer to section 3.1.7 to restart the unit.

2. If the water lines and/or the main electrical power has been disconnected, refer to section 2.4 for electrical connections, section 2.6 for water connections and section 3.1 for initial starting procedure.

SECTION 4 – MAINTENANCE & SERVICE

WARNING: THE MAINTENANCE AND SERVICE PROCEDURES INCLUDED IN SECTIONS 4.1 – 4.10 REQUIRE THAT ALL POWER SOURCES BE ISOLATED AND LOCKED OUT FOLLOWING ALL NATIONAL AND LOCAL CODES (EXCEPTIONS NOTED) AND THAT THE SYSTEM BE COMPLETELY COOLED. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH. ONLY QUALIFIED ELECTRICAL PERSONNEL SHOULD INSTALL, MAINTAIN, REPAIR, ADJUST, AND OPERATE MOKON TEMPERATURE CONTROL SYSTEMS. THE INSTRUCTION MANUAL FURNISHED WITH THE SYSTEM SHOULD BE COMPLETELY READ AND UNDERSTOOD BEFORE ANY 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 temperature control 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 4.2 – 4.10 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 are a series or corrective procedures that may solve a problem detected in the check. If the corrective procedures do not resolve the problem, see the Trouble Shooting Guide in section 7 to find a complete list of corrective measures.

4.1.1 – ELECTRICAL PREVENTATIVE MAINTENANCE

WEEKLY CHECKS	CORRECTIVE PROCEDURES
Check electrical box interior components for any discoloration, or any burn marks,	• Correct component wiring
	• Verify voltage and frequency on serial tag 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 solid contact to its attached component. Pay close attention to the ground wires.	• Tighten with proper tooling. (Torque to component specs)
MONTHLY CHECKS	**CORRECTIVE PROCEDURES**
Check that a N.C. contact exists across the temperature switch.	• Replace the switch if necessary.
Check that a set of N.O. and N.C. contacts exists on the low pressure switch (PS)	• Correct wiring if necessary.
	• Replace the switch if necessary.
Tighten all high voltage terminal connections.	• Tighten with proper tooling. (Torque to component specs)
EVERY 3 MONTH CHECKS	**CORRECTIVE PROCEDURES**
Check that the interior electrical and mechanical components are securely fastened to the panel.	• Tighten with proper tooling.
Check that the ratings of the overload protection (fuses circuit breakers and overloads) are adequately sized to protect the lines maximum current carrying capacity.	• Replace fuses.
	• Replace components.

4.1.2 – PUMP/MOTOR 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.
Check the pump for lubrication.	• Apply external lubrication slowly with a hand grease gun to all lubrication fittings located on the outside of the cabinet. Use a multi-purpose high temperature grease.
MONTHLY CHECKS	**CORRECTIVE PROCEDURES**
Check that all bolts and screws are securely tightened.	• Tighten with proper tooling.
Check that the packing gland is dripping approx. 1 drop per minute at 150°F (66°C). 	• See section 4.2.3 for packing gland lubrication.
Check for pump alignment.	• See section 4.2.1 to correct alignment.
Check that compression fittings are securely tightened. Pay close attention to the pumps suction side, since any air drawn in may cause a noisy pump, or reduction in capacity.	• Tighten with proper tooling. • Replace parts if leak(s) persist.
Check the electrical conduit fittings are securely tightened, and there is no evidence of cracked, burned, or discolored conduits.	• Tighten with proper tooling. • Replace cracked or burned conduit.
Check that the motor current draw matches the serial tag rating.	• Correct motor wiring. •Verify supply voltage is balanced and fluctuations are within 15% of normal.
Check gauge readings on the suction and discharge side of the pump, and/or on the cabinet. (Power On) 	• Verify suction or discharged not partially clogged. • Verify no restrictions in process or supply line. • Replace gauge(s) if needed.

4.1.3 – MISCELLANEOUS PREVENTATIVE MAINTENANCE

MONTHLY CHECKS	CORRECTIVE PROCEDURES
Check that all applicable lights, gauges, and optional indicators are functioning properly. (Power On) 	• Inspect /replace components.
Check the cooling solenoid operation by elevating setpoint temperature manually. While in the heating mode, push the manual air purge button. Listen for the cooling solenoid's audible energizing and de-energizing "clicking sound." Observe process temperature decreasing. (Power On) 	• Using a Voltmeter, determine if solenoid coil is energizing. • Replace solenoid valve, if needed.
Check the controller calibration by setting the controller for three random setpoints within the operating range of the system. Observe that the process temperature output is within the accuracy of the controller. (Power On) 	• Calibrate controller using section 5 in the instruction manual. (Power On) • Verify the thermocouple wires at the controller are secure. • If controller does not respond to any of the above steps, consult the Mokon factory. **Do not attempt repairs as the warranty could become void.**

4.1.3 – MISCELLANEOUS PREVENTATIVE MAINTENANCE

MONTHLY CHECKS	CORRECTIVE PROCEDURES
Check the system for leaks at operating temperatures. As the system reaches the setpoint temperature, visually check for leakage. Pay close attention to the heater elements. (Power On) 	• Repair leaks and/or tighten fittings.
Check that the heater current draw matches the serial tag rating. 	• Verify heater wiring stake-ons secured. • Correct heater wiring. • Verify customer supply voltage is balanced and fluctuations are within 15% of normal. • Resistance reading is approximately 100 ohms across each element. • Replace element(s) if necessary.
Check that the "Warning," "High Voltage," and "Caution" labeling are adhering to their correct locations.	• Replace torn or damage labels.
Clean drain line from Packing area of Viking Pump.	• Disconnect the 90-degree compression fitting from the pipe nipple connected to the packing drain area. Clean out the inside of the steel tubing leading to the reservoir and the nipple leading to pump.
Check heat transfer fluid level through the reservoir sight glass.	• Fill to at least ½ full, if low.
Check Y-type strainer, located on the From &/or To Process Line(s), for debris.	• Remove and clean.

4.2 – HIGH TEMPERATURE PUMP (ZONE PUMP) MAINTENANCE

WARNING: DISASSEMBLING THE VIKING PUMP WILL VOID THE PUMP MANUFACTURERS WARRANTY AS WELL AS THE MOKON WARRANTY.

DANGER: BEFORE OPENING ANY VIKING PUMP OR LIQUID CHAMBER (PUMPING CHAMBER, RESERVOIR, JACKET, ETC.) BE SURE:

1. **THAT ANY PRESSURE IN CHAMBER HAS BEEN COMPLETELY VENTED THROUGH SUCTION OR DISCHARGE LINES OR OTHER APPROPRIATE OPENINGS OR CONNECTIONS.**

2. **THAT THE DRIVING MEANS (MOTOR) HAS BEEN "LOCKED OUT" OR MADE NON-OPERATIONAL SO THAT IT CANNOT BE STARTED WHILE WORK IS BEING DONE ON THE PUMP.**

FAILURE TO FOLLOW THE ABOVE LISTED PRECAUTIONARY MEASURES MAY RESULT IN SERIOUS INJURY.

The Viking pumps are designed for long, trouble-free service life under a wide variety of application conditions with a minimum of maintenance. The following points will help provide long service life.

LUBRICATION: External lubrication must be applied slowly with a hand gun to all lubrication fittings every 500 hours of operation with multi-purpose grease. DO NOT OVER-GREASE.

CLEANING PUMP: Keep pump as clean as possible. This makes inspection, adjustment, and repair work easier and helps prevent overlooking a dirt covered grease fitting when lubricating.

STORAGE: If the pump is to be stored, or not to be used for six months or so, the pump must be drained and a light coat of non-detergent SAE 30 weight oil must be applied to all internal pump parts. Lubricate fittings and apply grease to the pump shaft extension. Viking suggests rotating the pump shaft, by hand, one complete revolution every 30 days to circulate the oil.

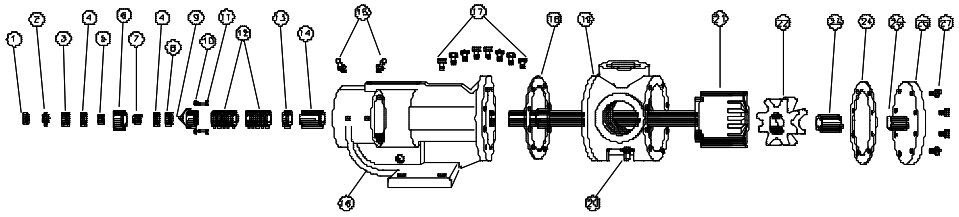


Figure 1
Exploded View

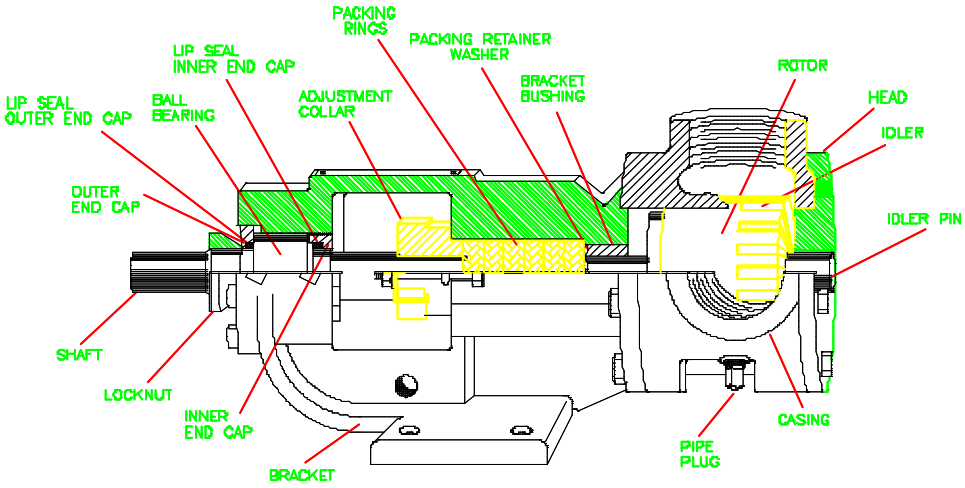


Figure 2
Cut-away View

REF #	QTY	PART #	DESCRIPTION
1	1		Locknut
2	1		Lock Washer
3	1		End Cap Outer
4	2		Lip Seal for End Cap
5	1		Bearing Spacer Collar Outer
6	1		Ball Bering
7	1		Bearing Spacer Collar Inner
8	1		End Cap Inner
9	1		Packing Gland Adjustment Collar
10	2		Adjustment Collar Capscrew
11	2		Adjustment Collar Capscrew
12	6	032030	Packing Rings
13	1		Packing Retaining Washer
14	1		Bracket Bushing (Carbon Graphite)

REF #	QTY	PART #	DESCRIPTION
15	2	032019	Grease Fitting
16	1		Bracket
17	8		Cap Screws For Bracket/ Casing
18	1	032039	Bracket Gasket
19	1		Casing
20	1		Pipe Plug
21	1		Rotor / Shaft
22	1		Idler
23	1		Idler Bushing (Carbon Graphite)
24	1	032038	Head Gasket
25	1		Idler Pin
26	1		Head
27	8		Cap Screw for Head

4.2.1 – PUMP ALIGNMENT

The pump and motor were properly aligned during assembly. During shipping and with time the alignment can be disturbed. Use the following procedure to check the alignment:

1. Check the pump ports to be sure that they are square and in the proper position.

2. Place a straight edge across the coupling. It should reset evenly on both rims at the 3, 6, 9, and 12 o'clock positions. See figure 3.

3. Loosen the motor bolts and realign if adjustment is necessary.

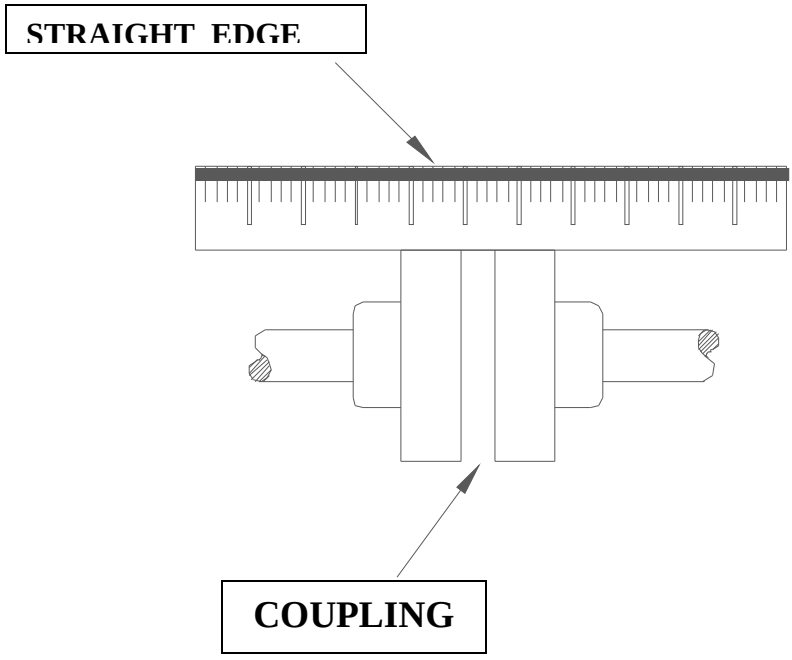


Figure 3

4.2.2 – THRUST BEARING ADJUSTMENT

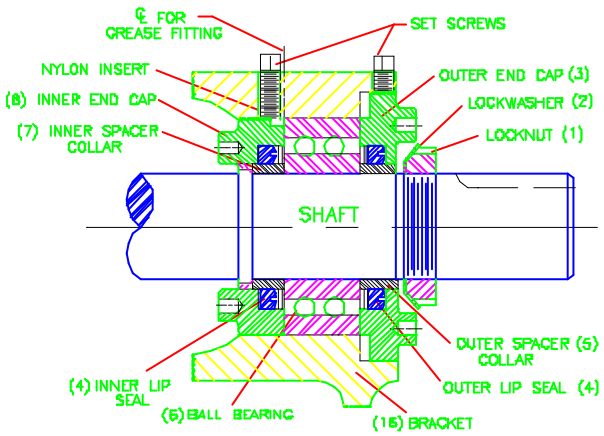


Figure 3

1. Loosen both setscrews over the outer and inner end caps. See figures 1 and 3.

2. Using a spanner wrench, turn inner end cap (8) clockwise, viewed from the motor end, until it projects from bracket (16), exposing approximately three threads.

3. Turn the outer end cap (3) clockwise, by hand, until rotor is tight against the pump head (26) and rotor/shaft (21) can not be turned.

4. Make a reference mark on the bracket end, opposite a notch on the outer end cap (3). Back off outer end cap (3) counterclockwise nine notches. Each notch represents 0.001 inch (0.0254mm) end clearance.

5. End clearances set per Step 4 are for Mokon recommended heat transfer fluids (see section 4.11) or other heat transfer fluids with similar viscosity characteristics within the operating range of 150°F to 600°F (38°C to 316°C).

6. Tighten inner end cap with a spanner wrench. Tap spanner wrench lightly but DO NOT OVERTIGHTEN as it will damage the threads.

7. Tighten both setscrews that hold inner and outer end caps.

   CAUTION: THE SETSCREWS HAVE NYLON SEATS AND YOU MAY SENSE A FALSE SEATING. BE ASSURED THEY ARE TRULY SET.

8. Rotate the rotor/shaft slowly, by hand, one complete revolution. If the rotor/shaft does not turn smoothly, repeat steps 1 – 7.

4.2.3 – PACKING GLAND LUBRICATION



The pump gland should drip approximately 1 drop per minute at 150°F (66°C) operating temperature.

EXERCISE EXTREME CAUTION WHILE WORKING ON OR IN THE AREA OF THE MOKON TEMPERATURE CONTROL SYSTEM. THE HIGH TEMPERATURE OF THE FLUID WILL CAUSE THE PROCESS LINES, SYSTEM COMPONENTS, AND METAL CABINETRY TO BECOME VERY HOT AND THEREFORE THEY SHOULD NOT BE TOUCHED.

To check/correct the packing gland lubrication:

1. Remove the front and back panels from the system (system should not be on at this point).
2. Remove the splashguard from the pump gland area.
3. Start pump by pressing the start button.
4. Set temperature controller to 150°F (66°C). (See section 5 for controller instructions)
5. Observe the oil dripping from the packing gland. If it is not dripping at the recommended 1 drip per minute, adjustment is needed.
   NOTE: If installing new packing rings it will be necessary to allow the system to run for a period of time before checking the dripping rate of the oil.
6. The pumps adjustment collar mechanism consists of two capscrews (11), one on each side. They may be tightened to decrease the dripping or loosened to increase the dripping. See figure 1.

   NOTE: The adjustment collar capscrews must be EVENLY tightened or loosened, one flat at a time, to achieve proper adjustment. Failure to do so will result in damage to the pump. Overtightening will destroy the packing.

4.2.4 – REPLACING PUMP PACKING

To replace the pump packing:

1. Loosen the adjustment collar capscrews (11).
2. Remove the adjustment collar (9).
3. Using a packing hook, remove the packing rings (12).
4. Install new packing rings (12), staggering the joints left to right. Lubricate the packing rings with oil, grease, or graphite to aid assembly. A length of pipe will help seat each packing ring. Install the same quantity of rings removed. (Typically, 6-7 rings)
5. Replace the adjustment collar (9). Make sure that it is installed squarely.
6. Reinstall the capscrews (11). Tighten wrench tight then back off until gland is slightly loose.
   NOTE: The capscrews must be tightened EVENLY.
7. See section 4.2.3 to check &/or correct the packing gland lubrication.

4.3 – RECIRCULATING PUMP

Mokon 500 series models feature a “Continuous Flow” cool oil reservoir using a recirculating pump to force the flow. When cooling is needed, hot oil from the process loop is released into the reservoir and is replaced by cool oil. The fluid is cooled by forcing the released process oil through the continuous flow heat exchanger where it is mixed with a continuous flow of cool oil from the reservoir.

The recirculating pump requires no maintenance but should you need to replace the pump see the following installation procedures.

POSITION OF THE TERMINAL BOX

Proper installation of the pump will have the terminal box located to one side of the pump or the other, with the conduit entry down.

If the terminal box position needs to be changed, it is best to do so before installation. However, if the pump is already installed, ensure that the electrical supply is turned off and close the isolation valves before removing the Allen screws.

To change the terminal box position:

1. Remove the four (4) Allen screws (4mm) while supporting the stator (motor).

2. Carefully separate the stator from the pump chamber and rotate it to the correct terminal box orientation.

3. Replace the Allen screws and tighten diagonally and evenly (7lb-ft /9.5 Nm) torque.

4. Check that the impeller turns freely. If the impeller does not turn easily, repeat the disassembly/reassembly process.

INSTALLATION REQUIREMENTS

Thoroughly clean and flush the system prior to pump installation.

PUMP MOUNTING

Arrows on the side of the pump volute indicate direction of flow through the pump. The pump must be installed with the motor shaft positioned horizontally. Under no circumstances should the pump be installed with the shaft vertical or where the shaft falls below the horizontal plane.

4.3 – RECIRCULATING PUMP CONT.

ELECTRICAL

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National and local codes and regulations.

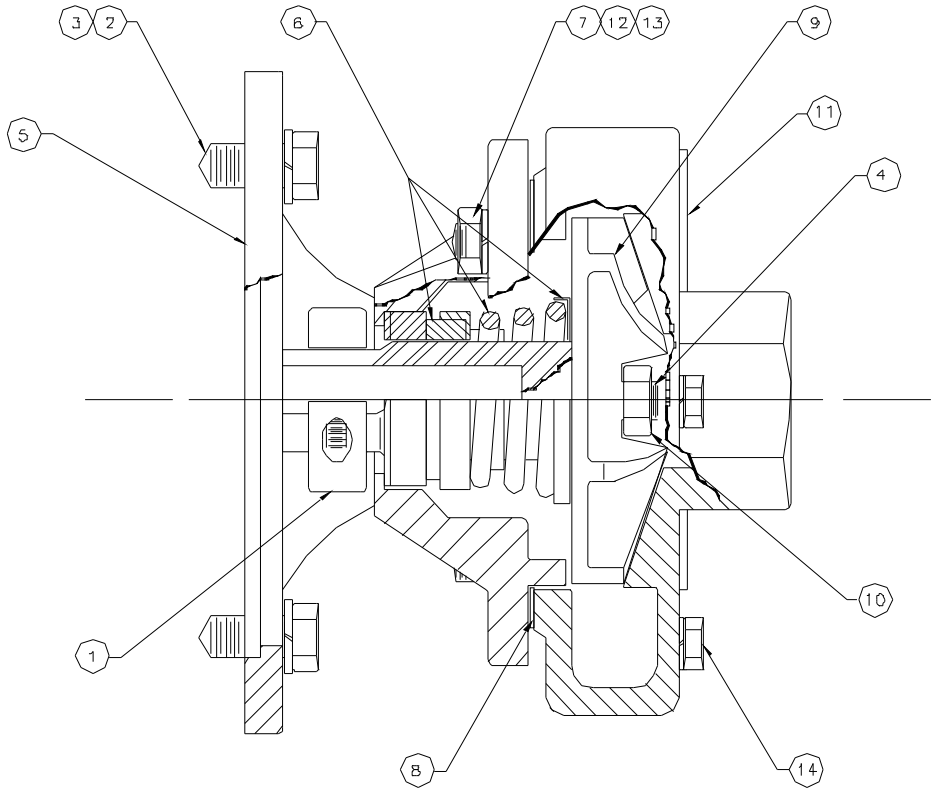
The proper operating voltage and other electrical information can be found on the nameplate attached to the top of the motor. The motor is impedance protected and does not require additional external protection. The temperature of the windings will never exceed allowable limits, even if the rotor is locked.

START-UP

Do Not Start the Pump until the System Has Been Filled. Completely vent the system prior to starting the pump. Never operate the pump dry.

4.4 – SUPPLY PUMPAK ASSEMBLY

NOTE: This section applies only to systems, which include a supply pumpak. Only the H6, XA, and XC series systems contain a supply pumpak.



REF. NO.	QTY.	MOKON NUMBER	DESCRIPTION
1	1	034-020	Clamp Assembly
2	4	034-004	S.S. Lock-washer 3/8 x 1/8
3	4	034-009	S.S. Bolt 3/8 - 16 x 3/4 LG
4	1	034-040	S.S. 5/8 Bore Drive Sleeve
5	1	034-048	Adaptor Frame
6	1	034-022	Seal Assy. 1" Viton Niresist o-ring, seat
7	4	034-043	S.S. Stud 5/16"

REF. NO.	QTY.	MOKON NUMBER	DESCRIPTION
8	1 set	034-039	Gasket (4 per set)
9	1	034-046	Brass Impeller 3.25"
10	1	034-047	S. S. Lock Nut 3/8"
11	1	034-042	Housing
12	4	034-044	Brass Hex Nut 5/16"
13	4	034-045	Brass Washer 5/8"
14	1	017-044	Brass Pipe Plug 1/8"

4.4 – SUPPLY PUMPAK MAINTENANCE & INSTALLATION

NOTE: This section applies only to systems, which include a supply pumpak. Only the H6, XA, and XC series systems contain a supply pumpak.

The supply pumpak consists of a housing, adaptor frame, stainless steel sleeve, shaft seal, seal spring, impeller, drive clamp, gaskets, impeller lock nut, and stainless steel fasteners. See the previous page for a drawing and a parts breakdown.

The impeller is threaded onto the shaft sleeve and locked in place by a lock nut. The shaft sleeve is machined to precisely fit the shaft on the recommended motor. No provision is made for an internal drive key and none is required. The drive clamp assembly replaces internal drive keys, securely locks the shaft sleeve to the motor shaft, and serves additionally as a liquid slinger to protect your motor.

The mechanical seal is the self-adjusting, greaseless type being lubricated by the liquid in the pump. It requires no maintenance and provides long and trouble-free operation. Because the seal is lubricated by liquid in the pump, THE PUMP SHOULD NEVER BE OPERATED WITHOUT LIQUID IN THE HOUSING.

4.4.1 – MOUNTING MOTOR TO PUMPAK

1. Check the rotation of the motor to be sure it coincides with the required rotation of the PUMPAK assembly.

2. Loosen the drive clamp assembly (1) but do not remove.

   NOTE: If the motor shaft is a keyed shaft, remove the key before installing the Mokon Pumpak. The drive clamp assembly on the Mokon Pumpak is all that is required to drive the pump.

3. Slide the Pumpak assembly onto the motor drive shaft (4), aligning the holes in the adaptor frame (5) with tapped holes in the motor mounting face, until adaptor frame (5) contacts the motor mounting face.

4. Install two S.S. bolts (3) (diagonally opposite) and tighten to secure the Pumpak assembly to the motor.

5. Center the drive clamp assembly (1) and tighten.

6. Proceed to section 4.3.2 to check the impeller clearance.

4.4.2 – SUPPLY PUMPAK IMPELLER CLEARANCE ADJUSTMENT

Remove the strip stock shim from the suction eye of the pump housing. This shim was inserted to establish clearance between the face of the impeller and the housing. Rotate the motor slowly, by hand, to make certain that the impeller does not rub the housing or the adaptor frame. If the impeller does not rub install and tighten the remaining S.S. bolts to secure the Pumpak to the motor.

If the impeller rubs, the impeller clearance can be adjusted by the following procedure:

1. Loosen the drive clamp assembly (1), but do not remove.

2. Move the impeller (9) either forward or backward using a screwdriver or move impeller drive sleeve forward.

If the impeller still rubs after using the above procedure, it can then be adjusted as follows:

1. Remove the S.S. studs (7) and the housing (11).

2. Loosen the drive clamp assembly (1), but do not remove.

3. Remove the gaskets (8) from the housing (11).

4. Replace the housing (11), pushing against the impeller face. Secure the housing with two S.S. studs (7), 180° apart.

5. Tighten the drive clamp assembly.

6. Remove the housing (11) and install one gasket (8).

7. Replace the housing (11) securing with two S.S. studs (7) 180° apart.

8. Rotate the motor shaft to check that the impeller does not rub. If it does, return to step 6 and add another gasket. If not, install and tighten all remaining S.S. studs (7).

If none of above procedure stops the impeller from rubbing, CONSULT THE FACTORY.

4.4.3 – SUPPLY PUMPAK INSTALLATION

Use high temperature Teflon tape or high temperature RTV on all connections and be sure all fittings are airtight, especially on the suction side of the pump. An air leak on the suction side of the pump will prevent proper operation.

4.4.4 – SUPPLY PUMPAK DISASSEMBLY

1. Close the gate valve on the reservoir tank.

2. Remove the S.S. studs (7) holding the housing (11) to the adaptor.

3. Remove S.S. bolts (3) which hold the adaptor frame (5) to the motor.

4. Loosen the drive clamp assembly (1) and remove the PUMPAK.

The seal seat and seal cup will remain in the pump adaptor frame. If not damaged or worn, do not remove. If necessary, remove the adaptor frame counter bore with a piece of wood or a screwdriver handle inserted through the adaptor frame from the drive end. A sharp tap or two is usually sufficient to knock out the seal seat. Use caution when removing the seal seat so as not to damage the face or distort the metal seat.

4.4.5 – SUPPLY PUMPAK IMPELLER REMOVAL

1. Remove the seal bellows and the spring assembly (6).

2. NOTE: The seal bellows will be bonded to the shaft sleeve and will require some patience and caution to remove in order not to damage the seal bellows and cage.

3. Place the impeller drive sleeve (4) between two pieces of wood in a vise. Take care so as not to damage sleeve.

4. Remove the impeller S.S. lock nut (10) from the end of the shaft sleeve. Unthread the impeller (9) by turning counterclockwise (left hand).

4.4.6 – SUPPLY PUMPAK INSPECTION

Check all parts for wear. For ease of reassembly, the shaft sleeve should have all nicks and burns removed. Replace damage parts with new parts. Inspect the seal seat and seal cup for grooves, scuff marks, or other deterioration. If a perfect lapped surface remains on the seal seat, it may be reused. If the seal cup is in good condition it may be reused. If the seal seat, cup, washer, or bellows are damaged or worn, a new seal assembly should be installed. (see section 4.4)

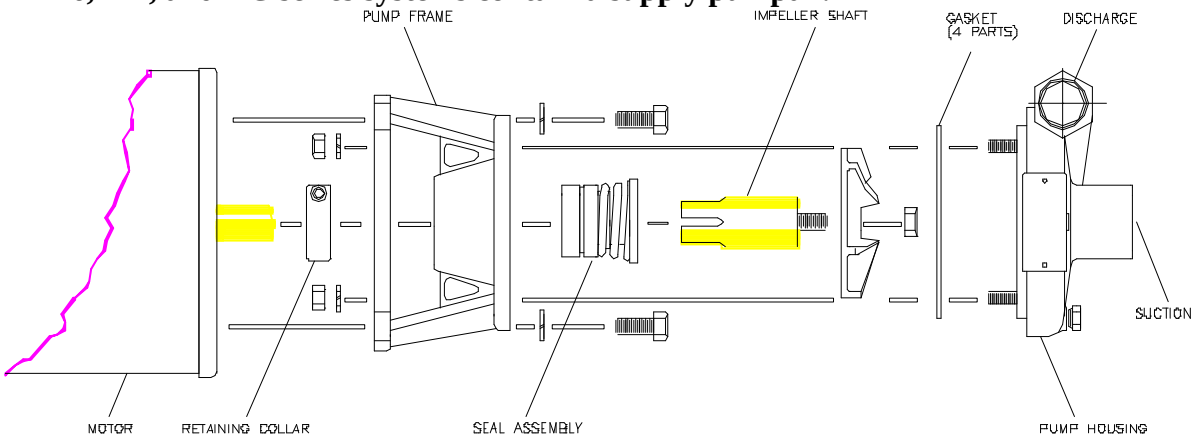
4.4.7 – SUPPLY PUMPAK REASSEMBLY

Clean all castings with mild solvent such as kerosene. All dirt and foreign matter should be removed.

Reassemble the Pumpak. See section 4.3.1 for instructions on mounting the motor to the Pumpak.

4.5 – SEAL ASSEMBLY REPLACEMENT

NOTE: This section applies only to systems, which include a supply pumpak. Only the H6, XA, and XC series systems contain a supply pumpak.



1. Make sure impeller shaft is CLEAN and free of nicks or burns. Use fine steel wool to polish sleeve.

2. Lubricate the shaft with any good grade of water pump grease.

3. Lightly lubricate all internal surfaces of the seal spring with grease.

NOTE: DO NOT USE OILS OR S.T.P. They allow the seal bellows to set up too quickly on the sleeve thus preventing free movement of the seal cage after assembly.

4. Place the spring over the impeller shaft (large diameter end) against the impeller hub. Place the seal cage over the sleeve with carbon washer facing away from the impeller.

5. Press the seal assembly down far enough to compress spring and release. The seal assembly will return to free height.

6. Lubricate the seal seat cavity in the pump frame with grease.

7. Lubricate the seal seat gasket with grease.

8. Use a wood dowel of sufficient diameter to press the seal seat squarely into cavity on pump frame. HAND PRESSURE ONLY.

NOTE: Polished metal surface must face opposite the seal seat cavity on pump frame. Optional ceramic seal assemblies require less pressure to seat squarely, too much pressure will crack ceramic seal.

4.5 – SEAL ASSEMBLY REPLACEMENT CONT.

9. Place the impeller and the seal assembly in the pump housing. Affix the gasket on the frame over the drive sleeve onto the housing.

10. Attach the pump frame to pump head with bolts and secure evenly. Install the shaft retaining collar onto the shaft and attach entire assembly to motor. Tighten the retaining collar with Allen wrench.

11. See maintenance section 4.2.2 to adjust impeller clearance.

4.6 – PUMP RELIEF VALVE

NOTE: THE PUMP RELIEF VALVE IS NOT TO BE USED AS A PROCESS BYPASS!

There is a pump relief valve on each pumping circuit. The pump relief valve is set at 100 PSI (689 kPa) on MR, HC, HA, XC, XA, H5, and H6 Series; 60 PSI (414kPa) on MK and H4 Series systems. When restrictions in the process are such that it will not accept the full pump output at less than the set pressure, this valve opens and maintains full oil flow over heaters regardless of the flow to the process.

The valve has been factory set and should not require further adjustments. If it is necessary to recalibrate, **CONSULT THE MOKON FACTORY.**

4.7 – PROCESS PURGE OPTION (REVERSE FLOW SWITCH)

To facilitate mold changes with a minimum amount of oil loss from the hoses and the process, a reverse flow purge system is provided as an option. There will be a switch labeled "Process Purge" on the control plate if you have this 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:

1. Turn the controller to the minimum setting and wait until the process temperature is below 130°F (54°C). (See section 5 for controller instructions.)

2. Shut off the zone by pressing the "Stop" button.

3. Turn the three position selector switch labeled "Process Purge" to the "Rev" position.

4. Start the pump by pressing and holding in the "Start" button. The "Start" button must be pressed and held during the entire reverse purge sequence. The fluid in the process loop will be returned to the reservoir.

5. Turn the pump off by releasing the "Start" button.

6. Turn the three position selector switch to the forward position.

7. Repeat steps 1 – 6 for each zone.

8. Refer to section 3.1.7 to restart the system.

NOTE: The time required to purge the system is based on the hold up volume of the process.

4.8 – 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:

1. Turn the controller to the minimum setting and wait until the process temperature is below 130°F. (See section 5 for controller instructions.)

2. Shut off the zone by pressing the "Stop" button.

3. Open the steel gate valve located on the "From Process" connection on the system. (Not for 500 and 600 Series systems.

4. Connect the Air Supply to the Air Inlet on the system.

WARNING: AIR SUPPLY PRESSURE SHOULD NOT EXCEED 15 PSIG (103 kPa).

5. A. (500 and 600 Series systems) Depress the "Process Purge" button on the control panel.

B. (all other systems) Slowly open the steel gate valve located on the "To Process" connection on the system.

The fluid in the process loop will be returned to the reservoir.

6. After the system is purged, close the steel gate valves on both the "Process" connection and the "From Process" connection.

7. Repeat steps 1 – 6 for each system.

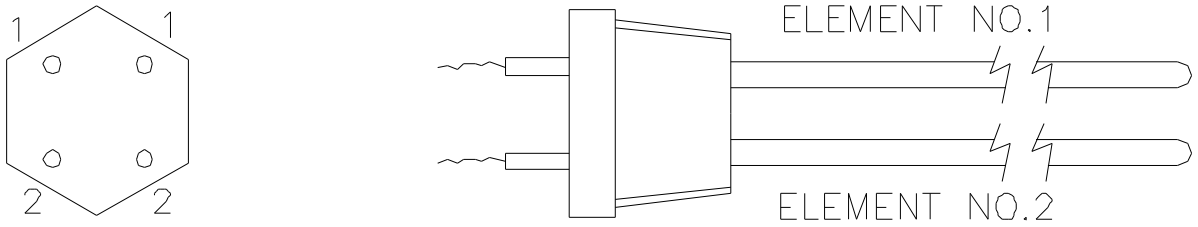
8. Refer to section 3.1.7 to restart the system.

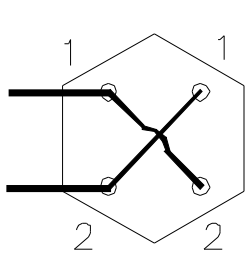
NOTE: The time required to purge the system is based on the hold up volume of the process and the air supply to the system.

4.9 – HEATER ELEMENT WIRING

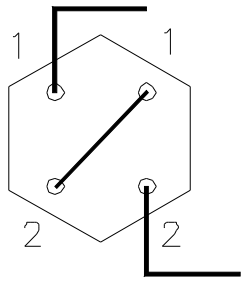
Using the following chart to select between wiring method A and wiring B to wiring Mokon replacement heaters (dual element – hair pin type). Refer to the Mokon system electrical schematic in section 8 for complete heater wiring illustrations.

	190-240 Volts	380-460 Volts	550-575 Volts
Oil Systems	A	B	B





A



B

4.10 – LOW PRESSURE SAFETY SWITCH

Mokon systems are equipped with a low pressure safety shut down switch. The low pressure switch is standard on the 500 and 600 Series systems but optional on MK, HC, and XC oil systems. This switch incorporates an interlock to prevent the operation of the system should the heat transfer fluid be insufficient. The switch is factory set at 5 PSI (34 kPa) and should not be adjusted without **WRITTEN CONSENT FROM THE MOKON FACTORY.**

4.11 – HIGH TEMPERATURE SAFETY SWITCH (STANDARD)

The high temperature safety cut off is located in the heater manifold. This switch is factory set to shut the Mokon system off at the following temperature limits:

1. MK/MR Series systems 460°F (238°C)

2. HC/HA/500 Series systems 510°F (266°C)

3. XC/XA/600 Series systems 610°F (321°C)

This switch should not be adjusted without **WRITTEN CONSENT FROM THE MOKON FACTORY.**

4.12 – RECOMMENDED HEAT TRANSFER FLUIDS

Heat transfer systems manufactured by Mokon are thoroughly tested prior to shipment for leaks, component operation, and accuracy (calibration).

All Mokon heat transfer systems are tested using Mokon's DELF600 heat transfer fluid.

NOTE: The use of any heat transfer fluid other than the ones listed below may void your warranty. Consult the Mokon service department with questions on fluid selection.

When operating the Mokon system, routine fluid samples should be taken and analyzed regularly. These samples can help determine your unique change point. A fluid sample should be taken from a flowing line and cooled below 100°F (38°C) before placing in a clean sample container and sent to the heat transfer manufacturer for analysis. The information gathered from the sample can then be useful in developing a heat transfer fluid maintenance program.

Mokon recommends the following heat transfer fluids for use in Mokon systems. A short description of each fluid offered including the recommended applications for the fluids.

Mokon's heat transfer fluids:

Mokon's heat transfer fluids last longer and help keep your system cleaner...which means longer life for parts like pumps and rotary seals!

Mokon's heat transfer fluids are:

- Extremely stable
- Highly refined using naturally resilient base stocks like, severely hydro treated paraffinic oils
- Enhanced with a proprietary blend of additives.

DELF450 - engineered for applications between 30°F and 450°F (-1 to 232°C) offering an excellent alternative to costly synthetics and aromatic fluids. The fluid delivers superior resistance to sludging, a problem plaguing most other fluids, and defends against extreme oxidation.

DELF600 - rated to 600°F (315°C), it contains the industry's most aggressive blend of additives specifically engineered to withstand the extreme oxidation environments in open systems and give unsurpassed levels of protection and service life. All Mokon HTF systems are tested using this fluid!

DELF450FG and **DELF600FG** - are engineered to comply with the demands of food grade applications and meet USDA requirements for incidental food contact (H1) and 21CFR1783570, and are NSF registered.

DELF 450 & 600 and DELF 450FG & 600FG may be used safely in the Mokon HTF 350, 500, 600, and HF Series systems.

4.8 Recommended heat transfer fluids, Oil (cont)

Other heat transfer fluids suitable for use with Mokon's systems:

Multitherm
PG-1 is a food grade heat transfer fluid for use up to 600°F (316°C). PG-1 meets specifications of 21CFR72.878, which covers the use of white mineral oils in food applications according to the limits and conditions of the regulations. PG-1 is Kosher certified and rated HT-1 for incidental contact by NSF.

IG-4 for use in systems up to 600°F.

Paratherm
NF is formulated for service up to 600°F (316°C). NF fluid provides excellent heat transfer and is low in viscosity.

HE is a high flash and fire point heat transfer fluid is rated for an optimal service range of 150°F - 600°F (66°C - 316°C).

Petro-Canada Products
Calflo FG for use in closed loop, non-pressurized, indirectly heated, liquid phase heat transfer systems with operating temperatures up to 620°F (326°C). It is accepted by the Canadian Department of Agriculture and approved USDA H1 for incidental food contact.

Calflo HTF is recommended for use in heat transfer systems with operating temperatures up to 620°F (326°C) and film temperatures up to 650°F (343°C). Calflo HTF is a unique heat transfer fluid that combines the thermal efficiency and cleanliness of paraffinic hydrocarbon with the high temperature stability of a chemical synthetic.

Solutia Inc.
Therminol 66 heat transfer fluid is designed for use in non-pressurized/low pressure, indirect heating systems with maximum bulk temperatures up to 650°F (343°C) and film temperatures up to 705°F (374°C).
Duratherm
Duratherm 450 – Heat transfer fluid rated to 450°F.

Duratherm 600 – Heat transfer fluid rated to 600°F, used in a variety of applications.

Duratherm Lite - Heat transfer fluid with the same physical properties as Duratherm 600 but formulated with a lighter dose of additives. Duratherm Lite is economically ideal for applications that are prone to fluid loss or attrition due to equipment change.

Duratherm FG is rated for use up to 620°F and is engineered and manufactured to comply with the demands of food grade applications. Duratherm FG meets USDA requirements for incidental food contact (H1) and meets the requirements of 21CFR1783570 and is NSF registered.

4.6 Recommended system cleaning fluids, Oil

NOTE: The use of any system cleaning fluid other than the ones shown below may void your warranty. Consult the Mokon service department with questions on fluid selection.

The use of these fluids is done at the owners own risk. Mokon assumes no responsibility for the effectiveness or the liability for damages that may occur while using these fluids. Please consult the manufacturer's instructions for safe and proper use prior to using any of the cleaning fluids listed in this manual.

*When operating the Mokon HTF system, routine fluid samples should be analyzed. Fluid samples for analysis should be taken regularly. These samples can help determine your unique change point. A fluid sample should be taken from a flowing line and cooled below 100°F (38°C) before placing in a clean sample container and sent to the heat transfer manufacturer for analysis. The information gathered from the sample can then be useful in developing a heat transfer fluid maintenance program.

Mokon's heat transfer system cleaner:

The industry's first heat transfer system cleaner that provides full production while cleaning!

Mokon's DELFClean - a long life, preventative maintenance and light duty system cleaner that is capable of functioning as a long-term heat transfer fluid up to 550°F (288°C). This fluid is odorless and easily handles long term operation while seamlessly allowing production to continue uninterrupted for a complete oil cycle.

Other cleaners suitable for use with Mokon's systems:

Multitherm

Multitherm PSC cleaning fluid is designed for use in general maintenance of larger heat transfer fluid systems. PSC is formulated to be compatible with all MultiTherm heat transfer fluids as well as most others so that small residual amounts left in the system will not cause a problem.

Paratherm

Paratherm SC® system cleaning liquid is formulated to dissolve and suspend sludge and carbon lumps frequently produced in hot oil temperature control units where petroleum or glycol-based heat transfer fluids have been used.

Duratherm

Duratherm Duraclean is a preventative maintenance and light duty system fluid up to 550°F.

Duratherm's Duraclean Ultra is a high performance, fast acting and High flash point terpene solvent. A unique combination of terpene, alcohols, penetrants, and surfactants designed to remove grease, oil, and carbon deposits. This fluid can be run to 150°F max. Duraclean Ultra is environmentally safe, low toxicity, biodegradable, and comes from a renewable natural resource.

SECTION 5 – COMPUMATE 2500 CONTROLLER

REFER TO THE 4TH CHARACTER IN THE MODEL CODE ON THE SERIAL TAG AND THEN THE MODEL CODE IN SECTION 9 TO DETERMINE YOUR CONTROLLER TYPE

OPERATING INSTRUCITON MANUAL

SECTION 6 - OPTIONS

6.1 - NITROGEN BLANKET INSTRUCTIONS

- For units with this option, the unit is provided with a sealed reservoir top in order to accommodate a blanket of nitrogen inside the oil reservoir.

- The purpose of the blanket is to prevent oxidation of the heat transfer fluid.

- Once the reservoir is filled, the ¾" fill connection may be utilized to maintain a blanket of nitrogen side the tank.

- Pressure 0.1 inches of water column is all that is required to maintain an adequate blanket.

  USE EXTREME CAUTION WHEN PURGING THE RESERVOIR. THE RESERVOIR IS NOT DESINGED AS A PRESSURE VESSEL. THE NITROGEN BLANKET SHALL NOT EXCEED 5.0 INCHES OF WATER COLUMN.

- Note: Any inert gas such as argon or helium may be used in place of nitrogen.

6.2 - "Z" PURGE INSTRUCTIONS

- A three (3) inch diameter threaded pipe connection is provided to receive an air or nitrogen supply. The air or nitrogen needs to be supplied in the range of 1.0 to 3.0 inches of water column. A three (3) inch exhaust connection is also provided. ***Due to temperature considerations, the purge gas must flow through unit to insure adequate ventilation.***

- Once the purge gas is introduced, the Dwyer 1950-02 pressure switch will close, energizing a time delay relay. The relay prevents start up of the Mokon unit until an adequate sweep inside the unit has taken place.

- The magnehelic gauge has scale of 0 to 1.0 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 an alarm.

SECTION 7 – TROUBLE SHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE MEASURE
1. System will not start	- 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
	- High temperature safety switch	- Consult Factory
	- Process purge switch (if supplied) in the neutral position	- Switch to “Forward” or “Reverse”
2. Running pilot does not go on	- System unplugged / power off	- Plug system in / turn power on
	- Blown fuse at power supply	- Isolate open fuse and replace
	- Blown control circuit fuse	- Replace and check for ground condition
	- Bulb burn out	- Replace bulb
3. System runs momentarily	- High temperature safety switch	- Consult Factory
	- Motor starter thermal overloads tripped due to motor overload	- Consult Factory
4. Pressure will not build up	- Incorrect pump location	- See section 3.1.6 to check and correct motor rotation
	- Entrapped air	- See section 3.1.8
	- Pump relief valve stuck open	- Consult Factory
	- Inadequate fluid level	- Check that sight glass reads at least ½ full, if not add fluid
	- Pump needs adjusting	- See section 4.2.2
	- No fluid in the pump	- Prime the pump
	- Reservoir tank valve closed	- Open valve

SECTION 7 – TROUBLE SHOOTING GUIDE CONT.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE MEASURE
5. Pressure surges erratically and system will not hold temerature	- Entrapped air	- See section 3.1.8
	- Inadequate fluid level	- Check that sight glass reads at least ½ full, if not add fluid
	- Suction line leak	- Repair leak
	- Contaminated fluid	- Drain & replace fluid
6. Extreme pressure build up	- Plugged flow paths, inadequate circulation through process and connecting lines	- Inspect; if plugged, dislodge
		- Clean strainers
7. High pressure and erratic temperature	- Plugged flow paths, inadequate circulation through process and connecting lines	- Inspect; if plugged, dislodge
		- Clean strainers
	- Entrapped air	- See section 3.1.8
8. Loss of pressure and volume output	- Zone pump needs adjusting	- See section 4.2.2
	- Pressure gauges	- Inspect / replace valve
	- Inadequate fluid level	- Check that sight glass reads at least ½ full, if not add fluid
	- Cooling Valve	- Inspect / replace valve
	- Pump relief valve stuck open	- Consult Factory
9. Temperature climbs beyond setpoint	- Heater Contactor	- Inspect / replace component
	- Temperature Controller	- Inspect / replace controller
	- Thermocouple or RTD	- Inspect / replace component
	- Controller calibration	- See controller section 5
10. Variance in temperature readings	- Plugged flow paths, inadequate circulation through process and connecting lines	- Inspect; if plugged, dislodge
		- Clean strainers
	- Contaminated fluid	- Drain & replace fluid
	- Kilowatt capacity inadequate	- Consult Mokon engineering

SECTION 7 – TROUBLE SHOOTING GUIDE CONT.

PROBLEM	POSSIBLE CAUSE	CORRECTIVE MEASURE
11. System does not reach and/or hold temperature or slow response after changing temperature setting	- Contaminated fluid	- Drain / replace fluid
	- Heater burn out	- Inspect / replace component
	- Kilowatt capacity inadequate	- Consult Mokon engineering
	- Loose electrical connections	- Tighten connection or replace broken wires
	- Thermocouple or RTD	- Inspect / replace component
	- Cooing valve stuck open	- Consult Factory
12. Reservoir tank overheating	- Inadequate fluid level	- Check that sight glass read at least ½ full, if not add fluid
	- Water not flowing through heat exchanger	- Consult Factory
	- Cooling valve stuck open	- Consult Factory
	- Relief valve stuck open	- Inspect / replace component
13. Noisy Pump	- Entrapped air	- See section 3.1.8
	- Pump needs adjusting	- See section 4.2.2
	- Pump needs alignment	- See section 4.2.1
	- Worn coupling and/or grommet between pump and motor	- Inspect / replace component
	- Worn bearing on pump	- Inspect / replace component
	- Leak on suction side of pump	- Repair leak

SECTION 8 – CONDENSED PARTS LIST

MOKON OIL SYSTEMS

PART NO.	DESCRIPTION
006-256	Motor Starter Contactor 110 Volt Coil
006-257	40 Amp Heater Contactor 110 Volt Coil
006-260	1.0 – 2.9 Amp Overload (Refer to motor Name
006-261	1.6 – 5.0 Amp Overload Plate Information for
006-263	3.7 – 12.0 Amp Overload Proper Overload)
008-005	0-160# Pressure Gauge (Older style models)
008-021	0-160# Pressure Gauge (Glycerine)
011-002	1 KW Steel Immersion Heater (for systems 230 and 460 Volt)
011-011	1 KW Steel Immersion Heater (for systems 208 and 380 Volt)
011-013	1 KW Steel Immersion Heater (for systems 575 Volt)
022-038	Start/Stop Button (Complete)
022-142	Low Pressure Safety Switch
023-070	High Temperature Safety Switch (N.C.)
025-107	Cooling Solenoid Valve
032-030	Packing for Pump (All systems except Compact Oil Systems)
032-069	Lip Seal for Compact Oil Systems (H2 and H3)
032-072	Seal Kit for Mechanical Pumps
040-002	Type J Thermocouple

FOR ADDITIONAL PART NUMBERS REFER TO THE SPECIFIC SECTION IN THE INSTRUCTION MANUAL OR CONSULT THE MOKON FACTORY (716) 876-9951

SECTION 9 – MODEL CODES

Oil Model Codes

Model #
H34109H6

Maximum Operating Temperature	
C	345o F Maximum (1987)
H	500o F Maximum (1985*/1997**)
M	450o F Maximum (1985)
X	600o F Maximum (1985)

*1985-500ºF Max when followed by C, H, K
** 1997-HTF series when followed by 3, 4, 5, 6

Pumping Capacity	
A	30 GPM/100 PSI (1985)
C	20 GPM/100 PSI (1985)
K	10 GPM/60 PSI (1985)
R	10 GPM/100 PSI (1985)
2	5 GPM / 350ºF Maximum (350 Series)
3	10 GPM / 350ºF Maximum (350 Series)
4	10 GPM / 500ºF Maximum (500 Series)
5	20 GPM / 500ºF Maximum (500 Series)
6	20 GPM / 600ºF Maximum (600 Series)

Voltage	
2	230 Volts / 3 Phase / 60 Hertz
3	380 Volts / 3 Phase / 50 Hertz
4	460 Volts / 3 Phase / 50/60 Hertz
5	500-575 Volts / 3 Phase / 60 Hertz
6	415 Volts / 3 Phase / 50/60 Hertz
7	208 Volts / 3 Phase / 60 Hertz
9	Special Voltage, see option code

New Style Replacements "Old" Style Systems are now "New"	
MK	H4
HC (20 gal)	H5
XC (20 gal)	H6
HA (30 GPM)	HF/320
XA (30 GPM)	HF/320

See Option Code

Kilowatt Capacity	
00	Special Combination or no heat
03	3 KW
06	6 KW
09	9 KW
12	12 KW
18	18 KW
24	24 KW
30	30 KW
36	36 KW
48	48 KW

Controller	
A	Special, One Zone
B	Special, Two Zones
C	Special, Three Zones
F	Comp 1000, One Zone
G	Comp 1000, Two Zones
H	Comp 1000, Three Zones
L	Comp 4000, Three Zones
N	Comp 4000, Two Zones
P	Comp 4000, One Zone
R	Comp 3800, Three Zones
S	Comp 3800, Two Zones
T	Comp 3800, One Zone
Z	Comp II, One Zone
Y	Comp II, Two Zones
X	Comp II, Three Zones
1	***Eurotherm, One Zone**
2	***Eurotherm, Two Zones**
3	***Eurotherm, Three Zones**
7	Comp 2500, One Zone
8	Comp 2500, Two Zones
9	Comp 2500, Three Zones

***Prior to 6/4/01, was Barber-Colman**

OIL SYSTEMS WARRANTY

All new temperature control systems manufactured by MOKON are guaranteed to be free from defective material or workmanship for one (1) year from the date of purchase. 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, UPON CUSTOMERS 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 which 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.

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 ANY HEAT TRANSFER FLUID OTHER THAN THE ONES RECOMMENDED IN THE INSTRUCTION MANUAL MAY VOID YOUR WARRANTY. CONSULT THE MOKON SERVICE DEPARTMENT WITH QUESTIONS ON FLUID SELECTION.

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.

MOKON

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