

Thoreson-McCosh Inc

# HMI/T-3 DRYER

Thoreson-McCosh Inc.  
PG201004 01/29/10  
CYCLE= 70 MINUTES  
REGEN= 120 MINUTES

<b><i>HMI / T-3</i></b>				MON 1	TUE 2	WED 3	0
OFF	AUTO	ON	ADJ SETPT	THUR 4	FRI 5	SAT 6	RETURN
TEMP	TIME AUTO	DEW POINT	OPT	SUN 7	YES 8	NO 9	ENTER

## INSTRUCTION MANUAL

IB201001

THORESON-McCOSH INC  
1885 Thunderbird St. Troy MI. 48084  
Phone 1-248-362-0960  
Fax 1-248-362-5270  
[sales@thoresonmccosh.com](mailto:sales@thoresonmccosh.com)

# Thoreson-McCosh Inc

## FORWARD

The information contained in this Instruction Manual is provided to you for the maintenance of your Thoreson-McCosh equipment.

Also included in this manual are operating instructions, a service parts list, and wiring diagrams. Please file this manual for future use.

For additional information, please contact:

THORESON-McCOSH Inc. 1885 Thunderbird Street Troy, MI 48084 Phone: (248) 362-0960 Facsimile: (248) 362-5270 <a href="mailto:sales@thoresonmccosh.com">sales@thoresonmccosh.com</a>
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## CUSTOMER RECORDS

Upon receipt of your Thoreson-McCosh equipment, it is very important that you complete the table below. The information will be needed to best serve you when you call the Thoreson-McCosh Service Department with questions or to order replacement parts. The information is located on the Serial Tag on the unit and inside the door of the control box.

Model Name \_\_\_\_\_

Serial No. \_\_\_\_\_

Wiring Diagram No. \_\_\_\_\_

Insert No. \_\_\_\_\_

Program No. \_\_\_\_\_

Layout No. \_\_\_\_\_

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# ***Thoreson-McCosh Inc***

## **SECTION 1 THORESON-MCCOSH PRODUCT WARRANTY**

Thoreson-McCosh warrants each product of its manufacture to be free from defects in material and workmanship for a period of 30 months (2-1\2) year from the date of delivery to the original purchaser. Thoreson-McCosh's obligation under this warranty is limited to repairing or replacing any part returned to the Thoreson-McCosh factory with transportation charges prepaid, and which, on examination by Thoreson-McCosh, shall disclose to Thoreson-McCosh's satisfaction to have been defective.

The purchaser must notify Thoreson-McCosh of such defects and promptly deliver the defective part(s) in accordance with Thoreson-McCosh's shipping instructions, delivery prepaid. Parts will be replaced F.O.B. Thoreson-McCosh factory, by Thoreson-McCosh, and will be invoiced to the purchaser with "credit on return of defective part", if the part is returned within fifteen (15) days after shipment of replacement part. Thoreson-McCosh is not liable for installation or cost to install the replacement part or removal of the defective part.

Thoreson-McCosh is not responsible for any failure of its product due to improper use, installation, or operation. Thoreson-McCosh shall not assume any expense or liability for repairs made to any Thoreson-McCosh unit or equipment outside Thoreson-McCosh's own factory unless specifically agreed to in writing by Thoreson-McCosh.

Equipment and accessories furnished by us, but manufactured by others, are guaranteed to the extent of the original manufacturer's guarantee to Thoreson-McCosh, if that guarantee exceeds one (1) year.

It is expressly understood that Thoreson-McCosh is not responsible for damage and/or injury caused to buildings, contents, products, or persons by reason of installation or use of any of our products. Thoreson-McCosh shall not be liable for loss, damage or expenses arising directly or indirectly from, or being consequential or incidental to, the use of its products or from any other cause.

The above warranty supersedes, and is in lieu of all other warranties expressed or implied; and no person, agent, representative or dealer is authorized to give any warranties on behalf of Thoreson-McCosh, not to assume for Thoreson-McCosh any other liability in connection with Thoreson-McCosh products.

## **SECTION 2 TD DRYER MECHANICAL METHOD OF OPERATION**

### **SECTION 2.1 INTRODUCTION**

Your Thoreson-McCosh dryer was thoroughly tested prior to shipment and checked to insure that its performance is up to specifications. Upon arrival in your plant, the unit should be carefully inspected for physical damage which might have occurred in transportation. Should any damage be observed, it should be reported to the carrier at the earliest possible time.

Dryers are held to the crate bottom with a Z bracket. The side panels must be removed before the Z brackets can be removed. Use a hi-low or a lift to raise the unit off of the crate bottom. We recommend that a person steady the unit while on the hi-low.

#### **NOTE:**

**For the TD-150 and up, there are cross supports and some wood supports to secure the beds during shipping, these must be removed before power and air are connected to the unit. Failure to remove these items will damage the unit.**

The dryer should be located as close as possible to the material drying hopper it will service. This will minimize thermal and air flow losses. The unit should be placed on any reasonable level area or platform. The unit should be connected to the power source indicated on the model nameplate. If the return air temperature will be above 165°F/ 74°C, than an After-Cooler should be installed into your unit.

This dryer is a triple desiccant bed unit which continuously removes moisture from the process air stream by adsorption. While two of the beds are adsorbing moisture from the process air, the third is being automatically recharged.

This unit is a re-circulating dryer, recycling the drying air from the material hopper through the desiccant beds. The regeneration air flow is completely independent of the process air flow. The only atmospheric air that enters the process system is a small quantity which may leak in via the material loading system, if present on the hopper. A process air filter and regeneration air filter are provided to prevent contaminants from reaching the desiccant material.

## SECTION 2.2 TRIPLE BED METHOD OF OPERATION

The operation of the triple bed dryer is based on each of the three beds being indexed to one of three separate stations within the unit.

The first position is the regeneration station. Here, super-heated ambient air is blown through the bed to remove adsorbed moisture from the desiccant material. This moisture is exhausted to the atmosphere near the bottom of the dryer.

The second position is the cool down station. Here, a small percentage of return air from the hopper passes through the bed to gradually cool down the hot desiccant material. The heat captured by this air is used to heat the process air, thus minimizing process heater energy requirements. As the bed cools, it begins to contribute to the material drying process.

The third position is the process station. Here, the rest of the return air from the hopper passes through this desiccant bed. The dried, cooled, desiccant material is now permitted to adsorb any moisture removed from the plastic resin that is carried in with the return air, before it is heated and sent back to the drying hopper in a completely closed loop cycle.

Automatic indexing of the beds is performed by separating the manifolds upper and lower airflow from the desiccant beds with an electric lineal actuator motor. The beds are then rotated with a gear motor/chain drive assembly. A limit switch stops the beds at the next sequential station. The lineal actuator motor then clamps the manifold seals located on the upper and lower air flow manifolds against the beds for an airtight operation.

On standard units, the automatic bed indexing time cycle is controlled by the microprocessor, which is maximized to guarantee very dry process air, even while operating under extremely severe drying conditions.

In the optional dewpoint control mode, the dewpoint of the process air is continuously monitored. Automatic bed indexing will occur only when the dewpoint is approaching an unacceptable level.

The process air heating elements are located in the heater box which is nearest the control box mounted on the upper deck. An indicating light is provided to indicate when the process heater elements are activated.

The regeneration air heating elements are located in the heater box, on the upper deck, furthest from the control box. On standard units the regeneration heater and blower are timed to be on during the first portion of the bed index cycle, and off during the remainder of the cycle. Only units with the optional **regeneration power saver**, the heaters and blower will shut off early if the regeneration of the bed is sensed as being completed (regeneration exhaust temperature reaches a minimum of 325°F/ 163°C). An indicating light is provided to indicate when the regeneration heater elements are on.

## SECTION 2.3 QUICK START

**NOTE:** Please read this section, as it contains information not found elsewhere in the manual. Most steps will refer you to the correct section for reference.

1. Uncrate equipment (Section 2.1).
2. Clean drying hopper. All hoppers are shipped with a light coat of oil.
3. Connect power. (Section 2.4)
4. Connect water lines to after-cooler (optional equipment). Requires 3 to 4 gallons per minute, maximum 100 P.S.I., 80°F/ 27°C.
5. Connect compressed air to the units requiring compressed air. (TD-480 & up). 60 P.S.I. minimum, 120 P.S.I. maximum.
6. Check process blower rotation (Section 2.4).
7. Connect Air hoses. The smaller diameter red process hose connects from the dryer to the diffuser on the hopper. The black hose returns air from the connection near the top of the hopper back to the dryer unit.
8. Set process temperature setpoint (Section 4).
9. Visually inspect drying system (Section 9.1).
10. Fill hopper with material.
11. Begin drying, giving first batch of material sufficient residence time before beginning to use material (typically 3 to 4 hours). Check with resin manufacturer.

## SECTION 2.4 POWER CONNECTIONS

The power line terminals are identified as L1, L2, and L3. All heater and blower circuits are individually fused. It is highly recommended, and required by many local codes, that a fusible disconnect of adequate capacity be installed by user. The unit is ready to operate after connecting the power lines to their respective terminals and properly grounding the machine.

Blower motor rotation on three phase units must be checked when the unit is first started and after any reconnection of power to the unit. All Tech-3 dryers from the TD-12 up to the TD-360 include a Blower Rotation Alarm. This alarm will activate the alarm light and display a message on the digital readout indicating that the dryer is phased incorrectly.

On larger dryers (TD-480 and above), the Blower Rotation Alarm is optional. If the alarm is not included on your dryer, you must check that the process blower is rotating in the right direction by removing the side panel and checking that the process blower motor is rotating clockwise.

To correct the blower rotation, reverse any two of the three incoming power leads to the terminal block. Do not swap the power leads at the blower itself.

**CAUTION:** The correct phase is extremely important. Incorrect phasing can damage the dryer.



**SECTION 2.5 UNITS WITH COMPLETE DRYING HOPPER**

Clean the inside of your hopper thoroughly to avoid contamination of plastics resin to be processed. Install the balanced flow air diffuser inside of the drying vessel with the mounting plate and bolts supplied. Your drying hopper is made in two sections for ease of cleaning and installation. To remove the barrel of the hopper, lift it out of its “seat” on the hopper cone. If you have purchased a machine-mounted hopper, install the hopper cone mounting plate to the feed throat of your molding machine, being sure that it is well secured. Refit the hopper barrel into its “seat” on the hopper cone, being sure that it is located and clamped properly with the stainless steel ring clamp provided.

**NOTE: The T-bolt should have a light application of grease on the threads or the T-bolt will score and lock-up in the clamp.**

**SECTION 2.6 UNITS WITH HOPPER EXTENSIONS**

Clean the inside of your extension thoroughly to avoid contamination of plastic resin. Install the balanced flow air diffuser with the mounting plate and bolts supplied.

Place the extension on your machine hopper, being sure that the extension is centrally located on the machine hopper and properly secured.

## SECTION 3 TECH 3 INSTRUCTIONS

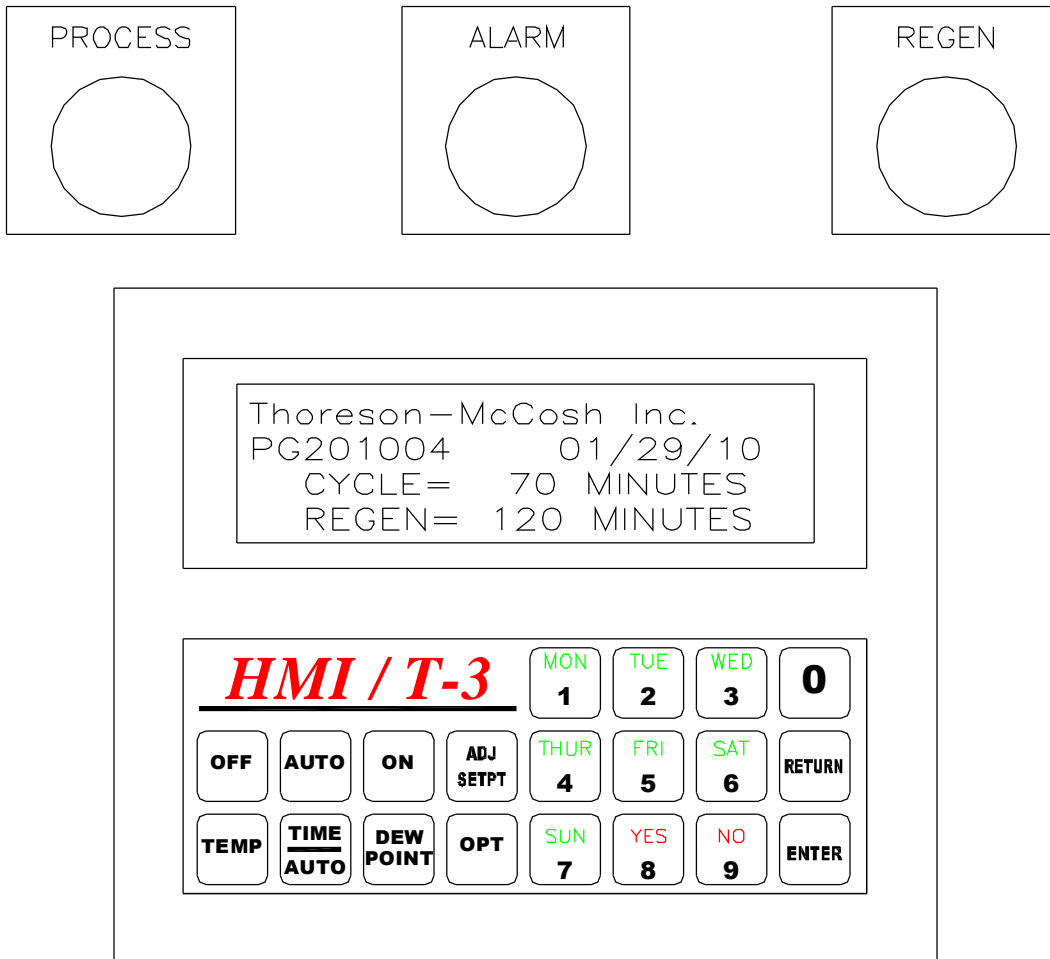
### SECTION 3.1 DISPLAYING THE PROGRAM # & CYCLE TIMES

When the dryer is first powered up, for a few seconds, the screen will display the Program # and the Dryer Process & Regen Cycle times.

### SECTION 3.2 OPERATOR INTERFACE TERMINAL

The operator interface terminal includes:

- 20 key touchpad with dual functions;
- Four line by 20 character Liquid Crystal Display.



**FIGURE 3.2 OPERATOR INTERFACE TERMINAL:**

Display shows the Key Pad and the “Start-up Screen.”

## SECTION 3.3 DESCRIPTION OF KEYPAD

The keypad consists of twelve regular function keys, similar to a pocket calculator, and eight special keys, that allow monitoring and adjusting of the setpoints.

## SECTION 3.4 .SPECIAL KEYS

OFF Turns the dryer Off

AUTO Puts the dryer into Auto Mode so the seven day timer can be utilized.

ON Turns the dryer On.

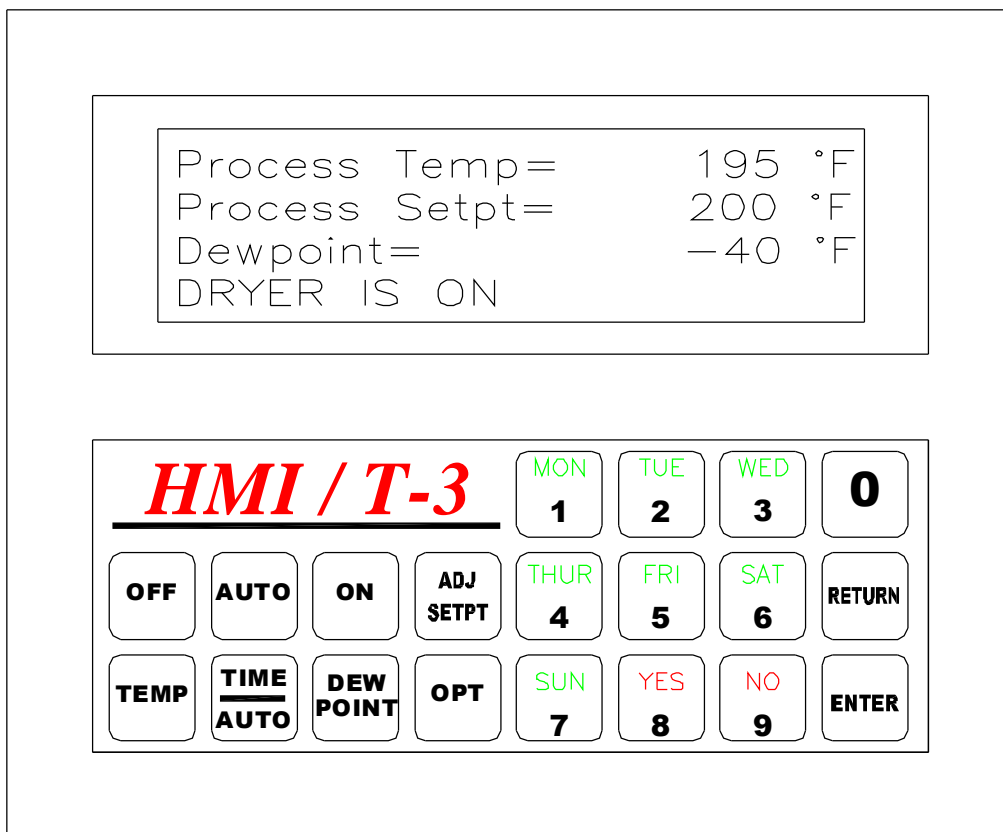
ADJ SETPT Toggles off and on to enable the ability to change or just view setpoints

TEMP Is used to adjust or view the temperature setpoints.

TIME/AUTO Is used to adjust or view the Present day and time and the AUTO setpoints.

DEW POINT Is used to adjust or view the DEW POINT setpoints.

**NOTE:** Pressing the "RETURN" key in most cases will abort the current operation and return the display to the First Screen



**FIGURE 3.4 FIRST SCREEN:**

Display shows the first screen.

## **SECTION 4 TEMPERATURE SETPOINTS**

### **SECTION 4.1 CHANGING THE TEMPERATURE DISPLAY FROM FAHRENHEIT TO CELSIUS**

Locate SW1 on the main control board (see page 29) and move Dip Switch #1 to the on position. All Fahrenheit temperature readings will be converted to Celsius.

NOTE: Because the unit is converting from °F to °C, the Celsius setpoint entered may be a few degrees above or below the desired setpoint.

### **SECTION 4.2 MODIFYING THE PROCESS TEMPERATURE SETPOINT (PLASTIC RESIN DRYING TEMPERATURE)**

When the “TEMP” key is pressed, the display shows the current process setpoint and allows the user to enter a new process setpoint.

Select the new setting, then press enter. The display will go back to the first screen.

```
Process Setpoint = 100 ° F
New = 225 ° F

Press ENTER
```

**FIGURE 4.2 Editing the Process Temperature Setpoint**

### **SECTION 4.3 REGENERATION & PRE-COOLER EXHAUST TEMPERATURE DISPLAY**

Two consecutive presses of the Temperature Setpoints key displays the regeneration temperature, the Return Air Temperature and the Regen Exhaust temperature if the Regen Power saver option was installed.

```
REGEN Temp = 550 ° F
REGEN Exhaust = 225 ° F
Retrn Air Temp = 165 ° F

Press RETURN
```

**FIGURE 4.3 Viewing the Regeneration, Return Air and the Pre-Cooler Dryer Exhaust Temperature.**

NOTE: Dryer Exhaust temperature is displayed only if the **Pre-Cooler** option is purchased.

This allows the user to monitor the regeneration temperature, the Return air Temperature and the Pre-Cooler Dryer Exhaust Temperature for trouble-shooting. You can return to the First Screen by pressing the “RETURN” key. The regeneration temperature setpoint cannot be modified and has been preset to provide your unit with an optimum regeneration cycle. The Pre-Cooler Water Valve Control will monitor the temperature of the Pre-cooler dryer exhaust temperature.

**SECTION 4.4 SOLID STATE RELAYS & MASTER HEATER CONTACTOR**

The Solid State Relay, or SSR, is the accepted way to replace the Mercury contactors. Since SSRs normally close when they malfunction, a Master Heater Contactor, or MHC, is installed ahead of the SSR. The MHC is controlled by a safety thermostat, that opens when the heater temperature has exceeded the maximum controlled temperature. The Process is 425°F (218°C), and the Regen is 575°F (302°C). To keep the cost of controls down, on 3 phase heater banks, the center leg of power is not interrupted by the SSR, so the MHC is also open when the dryer is in the OFF position, this disables all three power legs

**SECTION 4.5 PRECOOLER & WATER SAVER VALVE**

When drying a resin below 170°F (77°C), a pre-cooler will need to be installed on the dryer. There is a water valve installed to control the flow of water. The valve will open when the air temperature exiting the pre-cooler is 1°F (-1°C), above the Process Set point. There is an orifice installed in the out port of the water valve, that allows a reduced flow of water through the valve.

**SECTION 5 DELTA-T OPTION**

**SECTION 5.1 INTRODUCTION TO DELTA-TEMPERATURE**

The Delta T function determines the material has achieved an acceptable dry level based on the idea that when the hopper air return temperature approaches the hopper air inlet temperature, the material is dry. Obviously, due to losses of energy in a drying environment, the air inlet and outlet will never be the same, but at some point, the difference is small enough to indicate that the material can be considered dry. At this point, the process air flow heaters will turn off. The process blower will continue to cycle keeping positive dry air pressure in the drying hopper. This will prevent the material from being over dried and also keep it from being saturated with moisture. This also saves energy.

The **Process Setpt** should be set to the drying temperature recommended by the material manufacturer or supplier. The **Hop Exh Setpt** is determined by drying the material for the manufactures suggested residence time. (typically 3 to 4 hours). Note the **Hop Exh Temp** at the end of the residence time and set the **Hop Exh Setpt** at this temperature. If the **Hop Exh Temp** falls below the Low Temp Return Setpoint, the Process heaters will come back on.

**SECTION 5.2 READING THE DELTA-T FIRST SCREENS**

The first screen is special for the Delta T dryer. The first screen is actually made of 2 screens that will scroll from one to the other. To freeze the screens, Press the ENTER key, to make the screens resume scrolling, press the RETURN key.

```
Process Setpt =      2 2 5 ° F
Process Temp =      2 2 4 ° F
Hop Exh Setpt =     1 8 5 ° F
Hop Exh Temp =      1 8 0 ° F

Regen Temp =        2 2 5 ° F
Dewpoint =          - 4 0 ° F
(Dryer Alarm)
Dryer is ON
```

**FIGURE 5.2 The Delta-T First Screens Display**

**SECTION 5.3 MODIFYING THE DELTA-T PROCESS TEMPERATURE SETPOINT**

When the “TEMPERATURE SETPOINTS” key is pressed, the display shows the current process setpoint and allows the user to enter a new process setpoint.

```
Process Setpoint = 100 ° F
New = 225 ° F
Press ENTER
```

**FIGURE 5.3.1 Editing the Delta T Process Temperature Setpoint**

```
Hopper Exhaust
Setpt = 185 ° F
New = 180 ° F
Press ENTER
```

**FIGURE 5.3.2 Editing the Hopper Exhaust Setpoint**

```
Low Temp Return
Setpt = 10 ° F
New = ° F (05 to 15)
Press ENTER
```

**FIGURE 5.3.3 Editing the Low Temp Return Setpoint**

**SECTION 5.4: DELTA-T EXAMPLE**

Resin Manufacture suggested drying temperature. **225°F (107°C)**

Hopper Exhaust temperature after 3 hours: **195°F (91°C)**

Low Temp Return

Small hopper **11-15°**

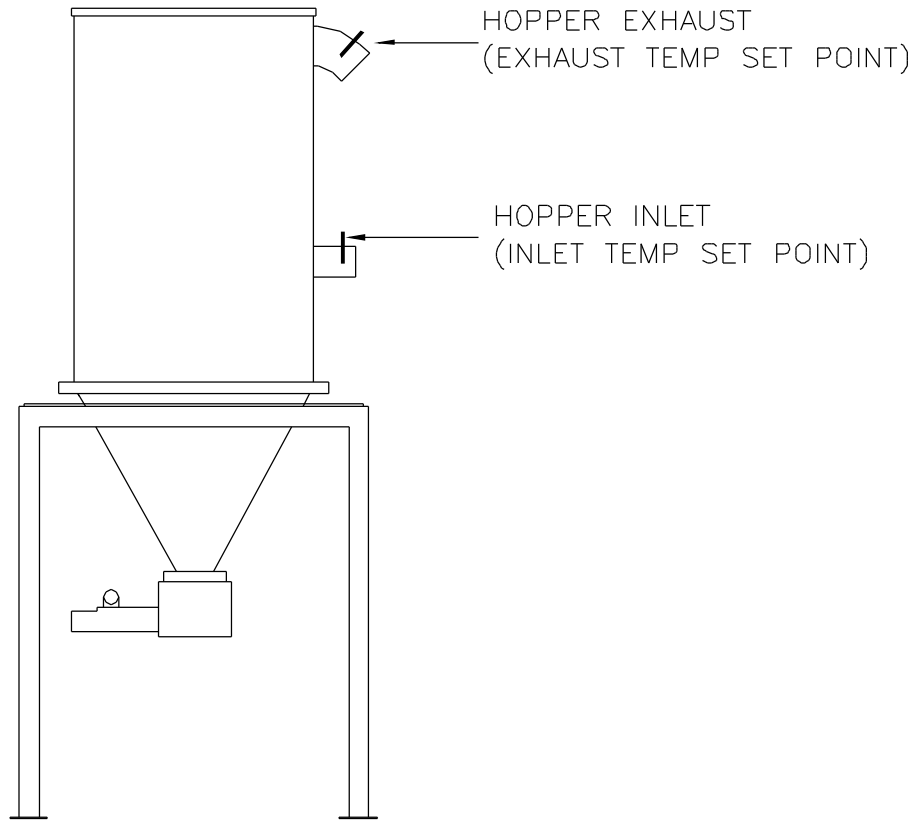
Med hopper **8-10°**

Large hopper **5-7°**

**Process Setpoint .....225°F (107°C)**

**Hopper Exhaust Setpoint.....195°F (91°C)**

**Low Temp Return Setpoint.....9° (medium hopper)**



**FIGURE 5.4 DELTA-T HOPPER PROBE CONFIGURATION**



**SECTION 6 TIME/AUTO START SETPOINTS**

**SECTION 6.1 SETTING THE AUTO START AND AUTO STOP FUNCTIONS**

Pressing the Time/Autostart Setpoints button once will display the following

```
Select the day you
Would like to edit
Or Press the TIME
Key again.
```

**FIGURE 6.1 EDITING THE AUTO START AND STOP FUNCTIONS**

After selecting the proper day with the touch pad dual function keys, the display will now show:

```
MONDAY
1 = dryer ON all day
2 = dryer OFF all day
3 = dryer AUTO OFF/ON
```

**FIGURE 6.1.2 (EXAMPLE FOR EDITING THE MONDAY AUTO START AND STOP FUNCTIONS)**

Pressing 1 will keep the dryer running for the full 24 hours every Monday, and will allow the user to program the temperature setpoint the dryer will use for the process air flow temperature.

Pressing 2 will keep the dryer off for the full 24 hours every Monday, and will return the display to the screen shown in figure 6.3.1.

Pressing 3 will allow the user to program the temperature setpoint that the dryer will use for temperature control, and times that the dryer will turn on and off. Up to 5 temperature setpoints and 5 different On/Off times can be programmed for each day.

EXAMPLE:	5:30am	Dryer ON,	Process temp 150°F
	7:30am		Process temp 220°F
	12:00pm		Process temp 150°F
	1:00pm		Process temp 220°F
	5:00pm	Dryer OFF	

NOTE: When editing the process temperature setpoint, pressing ENTER before inputting a value will force the dryer to use the Process Setpoint. The user can then change process temperature setpoints without re-editing the Auto Setpoints.

**SECTION 6.2 VIEWING CURRENT CYCLE TIMES**

Pressing the Time/Autostart Setpoints button twice will display the current cycle time, and the previous cycle time (up to 999 minutes).

**SECTION 6.3 SETTING THE CURRENT DAY AND TIME**

Pressing the Time/Autostart Setpoints button three times will display the current time and day preset at the factory, and allow the user to enter in a new time and day if required.

**SECTION 7 DEWPOINT**

**SECTION 7.1 DEWPOINT SETPOINTS**

The DEWPOINT SETPOINTS key displays the dew point shift setpoint, dew point shift condition (on or off) and dew point alarm setpoint. All Thoreson-McCosh material dryers have been designed to operate at -40° dewpoint. The dew point shift option keeps the desiccant beds from shifting until its setpoint is reached. Taking the dryer unit off the time line schedule and allowing the desiccant bed to continue to saturate with moisture until it reaches a higher dewpoint set point. The dryer will incur fewer regeneration cycles. Fewer regeneration cycles means a huge reduction of standard operating cost. (NOTE: Minimum time is the standard cycle time preset at the factory). That is, the beds do not shift until the dew point of the process stream reaches the setpoint value after the cycle timer has timed out.

**NOTE:** Since the Dewpoint sensor in many cases will read -40 when the sensor goes bad, If the Dewpoint Shift option is turned on, the unit will only delay the shift for two additional cycle times and then the unit will force a desiccant bed index.

**SECTION 7.2 SETTING THE DEWPOINT SHIFT SETPOINT**

Pressing the DEWPOINT SETPOINTS key once displays:

```
D e w p o i n t   S h i f t
S e t p t =   - 3 5 ° F
N e w =       - _ _ ° F
P r e s s   E N T E R
```

**FIGURE 7.2.1 DEWPOINT SETPOINT**

# Thoreson-McCosh Inc

At this point any value between -11°F/ -24°C and -40°F/ -40°C can be entered. Pressing the enter key will store the valid entry and display:

```
Dewpoint Shift On?  
Enter <YES> or <NO>
```

## FIGURE 7.2.2 SHIFT SELECTION

Press YES to turn Dew point shifting on, NO to turn it off. At this point, the alarm setpoint will be displayed for editing.

## SECTION 7.3 SETTING THE DEW POINT ALARM SETPOINT

The user should now enter a value that they would like an alarm condition.

NOTE: If using Dew Point Shift, set the dew point alarm to a more positive value to avoid false alarms.

```
Dewpoint Alarm  
Setpt = -30 °F  
New = -__ °F  
Press ENTER
```

## FIGURE 7.3 DEWPOINT ALARM SETPOINT

## SECTION 8 OPTIONAL SETPOINTS

### SECTION 8.1 CFM

```
Air speed = 00 CFM  
  
Press RETURN
```

## FIGURE 8.1 C.F.M. DISPLAY

Pressing the Optional Setpoints key once will display the current air flow rate if this option has been installed.

**SECTION 8.2 FORCING A BED INDEX**

If the Air Flow Rate indication option is installed, a second press of the Optional Setpoints key (single press if not installed) will display the following:

**I n d e x   b e d s ?   ( Y E S / N O )**

**FIGURE 8.2 BED INDEX DISPLAY**

Pressing the “NO” key returns to the First Screen (figure 3.2) and does not affect the dryer. Pressing the “YES” key causes the dryer to shift immediately.

**NOTE: SHIFTING THE BEDS SHOULD NOT BE DONE UNLESS IT IS NECESSARY AS IT WILL CAUSE IMPROPER DRYING, AND MAY CAUSE A SEVERE TEMPERATURE SPIKE.**

Any time a shift is required, make sure two additional shifts are complete so that the dryers desiccant beds are put into their original position.

**SECTION 8.3 REGEN BLOWER OFF-DELAY TIMER**

The Regen Blower Off-Delay Timer allows additional cooling of the regenerated desiccant bed.

Regeneration of the desiccant beds is accomplished by blowing extremely hot (550°F/ 288°C) ambient air through the desiccant for a predetermined length of time. The blower and heaters then shut off until the process cycle is complete. Normal cooling is accomplished through static (conduction) heat transfer during the remainder of the process cycle, then through convection while the bed is in the cool down position during the next process cycle. This is accomplished by bleeding off a small portion of the process air through the lower air flow manifold, thru the desiccant bed, and back into the process heater box. This cools down the bed and allows reuse of the energy used to regenerate the bed.

However, because desiccant, as it captures moisture gives off heat, this energy and the heat from the bed that is cooling down can make it very difficult to attain low process temperatures (<150°F/ 66°C). Therefore, we have made it possible to extend the regen blower running time with the regen heaters off. This allows the convective cooling to be achieved before the bed rotates to the cool down position. The danger is that the ambient air will introduce some moisture as the bed cools down, thereby reducing the effectiveness of the desiccant to dry the process air. This is less of a danger than letting the process air stream go open loop, because desiccant will not adsorb moisture until its temperature is below approximately 200°F/ 93°C. Thoreson-McCosh would not recommend using the off-delay unless necessary, and recommends that the dryer be monitored closely to determine

the effect of the time delay, as ambient conditions change, and plastic resin differ in acceptable process applications.

**SECTION 8.4 SETTING THE REGEN BLOWER OFF-DELAY**

On the second press of the OPTIONAL SETPOINTS key after the Bed Index display is shown, the following will be displayed:

```
Regen Delay time =    0 5
minutes
New =    1 0    ( 3 to 1 5 )
Press ENTER
```

**FIGURE 8.4 REGEN DELAY TIME SCREEN**

This display shows the current off-delay (cool down) time, the new time as you enter it, and the maximum time allowed (15 minutes).

Enter the new time and press the enter key. On the next regen cycle the regen blower will now stay on for this period of time after the dryer has finished the normal regeneration cycle. For dryers with the regeneration power saver option, the blower will stay on for this period of time after the regenerating bed has reached an exhaust temperature of 325°F/ 163°C.

**SECTION 8.5 SETTING THE SHIFT-DELAY**

On the 3rd press of the OPTIONAL SETPOINTS key after the Shift Delay display will be shown.

```
Shift Delay =    6 0
( 3 0 to 3 0 0 seconds )
NEW =    4 5
Press ENTER
```

**FIGURE 8.5 SHIFT DELAY TIME SCREEN**

This display shows the current Shift Delay setting and the new time as you enter a new setpoint. It also shows the minimum and maximum time allowed. This delay time controls two items. The first is output #23 on the main control board which enables the OPTIONAL hopper pre-heater, the second is the Process Heaters. The delay allows the heat in the pre-heater box and the process box to be purged prior to a normal shift so the temperature spike at shift is minimal.

**SECTION 9 PRELIMINARY TD DRYER CHECKS**

**SECTION 9.1 VISUALLY CHECK DRYING SYSTEM**

Check dryer hoses and hopper. Be sure that delivery and return hoses are in good condition routed with a minimum of length and sharp bends. Hopper lid should be in place and well sealed. If a hopper loader is used, it should be mounted so that drying air leakage is minimized.

**SECTION 9.2 CHECK DRYING HOPPER INLET TEMPERATURE**

At the hopper air inlet, the drying temperature should match the recommended temperature specified by the material supplier. In general, as hot as possible without allowing thermal degradation or discoloration of the material being processed. If the hopper inlet temperature is lower than the dryer discharge, the dryer temperature setpoint should be increased to compensate for the temperature drop in the process air flow hose.

**SECTION 9.3 CHECK THE HOPPER TEMPERATURE DISTRIBUTION**

Let dryer run for 3 - 4 hours. Air/material temperature in the hopper should be uniform around the hopper at any level, and hot (within 15°F/ 9°C of inlet temperature) up to 80% of the full hopper height when material is being added at the designed drying rate. Under static drying conditions (no new material added to hopper) the discharge temperature should approach inlet temperature after approximately 4-5 hours of operation. Should these checks show that the heat is not progressing upward through the hopper, the dryer should be checked for low airflow.

**SECTION 9.4 CHECK DRYER RETURN AIR TEMPERATURE**

After 4 hours of residence time, check the return air temperature. If the return air temperature exceeds 165°F / 74°C, than your unit should be equipped with some kind of After-Cooler. This will protect the process blower and allow the desiccant to work at optimum efficiency.

**SECTION 9.5 CHECK DISCHARGE DEW POINT OF DRYER**

For standard dryers, it should be approximately -40°F/ -40°C or lower. Should the dew point run higher than specified, check dryer.

## **SECTION 10 MAINTENANCE**

### **SECTION 10.1 FILTERS**

The process and regeneration filters should be checked weekly and cleaned with compressed air or replaced if necessary.

Remember to check the filter gasket and fix or replace as needed.

### **SECTION 10.2 LUBRICATION**

The regeneration blower motor bearings may be lubricated every 6 months to extend blower life. A couple drops of S.A.E. 20 motor oil at each of the two motor bearings is recommended.

### **SECTION 10.3 MOLECULAR SIEVE TEST**

When it is suspected that the molecular sieve needs replacement, there is a simple test that can be performed. A positive test does not ensure that the molecular sieve is in good condition. If there is a large percentage of broken pellets or dust, contamination from foreign matter, or most of the pellets are discolored, the desiccant should be replaced. New desiccant is light tan in color.

To test the desiccant's effectiveness, a sample should be regenerated in an oven at 600°F/ 316°C for about two hours. At the end of that period, place the desiccant into an air tight jar and allow it to cool down to room temperature for a minimum of 12 hours. Pour 30ml of water into a small glass. Determine and record the temperature of the water using a mercury thermometer. Into a similar dry glass, pour a quantity of desiccant that is 10% greater by volume than the water (33ml). Dry the thermometer and place it into the glass containing molecular sieve. With one quick motion, pour the water into the glass of desiccant. Observe the increase in temperature of the mixture while stirring with the thermometer and record the peak temperature. This will occur in about 20 to 30 seconds. Subtract the water temperature from peak temperature observed. If the temperature difference is 40°F/ 4°C or greater, the sieve is in satisfactory condition.

## SECTION 10.4 DESICCANT BED RECHARGING PROCEDURE

### FOR TD-12 THROUGH TD-360

Read instructions completely before attempting to remove the beds.

1. Set Off/Auto/On switch to On, Set key switch to "Adjust Setpoints".
2. Remove side panels.
3. Follow the procedure in Section 8.2 "Forcing a Bed Index". When the beds are clear of the manifolds, remove power from the dryer.

**Note:** Do not turn the dryer off with the OFF/AUTO/ON switch. The manifold will clamp up against the beds.

4. Loosen the band clamps that hold the bed tight up against the turret plates, and remove the bed from the unit. Remove the band clamps
5. Apply power and repeat items 3 and 4 until all the beds have been removed.

**Note:** On some units, The bed turret assembly can be manually rotated if care is taken to rotate them slowly, and always in a left to right direction.

Inspect the center cavity at the top of the bed for any quantity of beads, which may indicate a damaged inner perforate screen.

Inspect the bottom part of the bed for the presence of any loose beads, which may indicate a damaged outer screen. If when the beds are refilled and there is evidence of bead leakage, the bed must be repaired or replaced.

To replace the desiccant:

- a) Remove the bed bead plate to gain access to the desiccant.
- b) Dump the desiccant beads out and vacuum the remaining beads out.
- c) Fill the beds with new desiccant - use only 4a type 8 x 12 size (0.080" diameter) desiccant beads. Fill beds as full as possible. Rock or vibrate the beds to promote settling of the beads. Add more desiccant to fill the beds and pack tight without breaking beads.
- d) Apply high temperature sealant (G.E. silicone RTV-106n sealant is recommended) and secure bed bead plates to beds.
- e) Reverse the bed removal procedure to replace the beds. Lift the beds into the dryer with bed bead plates up and positioned outward from the shaft. Make sure that the bolts for the band clamps are not strait out from the shaft. (The bolts can catch on frame parts and stall the rotate motor)
- f) Secure the beds tight against the turret plate with the band clamps.
- g) Start the dryer and let it operate for a few bed shift cycles while inspecting for leaks at the upper and lower bed seals.
- h) Shut off dryer and install side panels.
- i) After approximately 1-2 weeks of dryer operation check the bead level and add more desiccant if needed.



## FOR TD-480 THROUGH TD-2000

Read instructions completely before attempting to remove the beds.

1. Set Off/Auto/On switch to On, Set key switch to "Adjust Setpoints".
2. Remove side panels.
3. Follow the procedure in Section 8.2 "Forcing a Bed Index". When the manifolds have pulled away from the beds, remove the 4CR (bed shift relay) from its socket. Place a 1" block inside of the upper and lower air cylinders. (2 if a single piston air cylinder). Remove the compressed air from the unit and make sure that the bed seals are far enough away from the beds to be able to slide the beds out of the turret plate. Remove power from the dryer.
4. Loosen the rotate motor bracket and remove the rotate chain. If there is not enough adjustment to remove the chain, use the master link to break the chain.
5. Using a HI-LO, place the forks on both sides of the manifold tube over the process blower. Lift the forks till just touching the beds. (DO NOT LIFT THE BED) Remove the bolts that hold the band clamps together and remove the bed by backing the HI-LO out of the unit.
6. Rotate the beds from left to right by hand so the next bed is in the same position as the first bed removed.
7. Repeat instructions 5 and 6 for the rest of the beds.

Inspect the center cavity at the top of the bed for any quantity of beads, which may indicate a damaged inner perforate screen.

Inspect the bottom part of the bed for the presence of any loose beads, which may indicate a damaged outer screen. If when the beds are refilled and there is evidence of bead leakage, the bed must be repaired or replaced.

To replace the desiccant:

- a) Remove the bed bead plate to gain access to the desiccant.
- b) Dump the desiccant beads out and vacuum the remaining beads out.
- c) Fill the beds with new desiccant - use 4a type 8 x 12 size (0.080" diameter) desiccant beads only. Fill beds as full as possible. Rock the beds to promote settling of the beads. Add more desiccants to fill the beds and pack tight without breaking beads.
- d) Apply high temperature sealant (G.E. silicone RTV-106n sealant is recommended) and secure bed bead plates to beds.
- e) Lift the beds into the dryer with bed bead plates up and positioned outward from the shaft.
- f) Reverse the bed removal procedure to replace the beds. Make sure that the bolts for the band clamps are not straight out from the shaft. (The bolts can catch on frame parts and stall the rotate motor) and the lid clamp pads on the top of the bed don't touch the turret plate alignment bushings.
- g) Start the dryer and inspect for leaks at the upper and lower bed seals. Force a shift to check the seals on all beds in all positions.

**SECTION 10.5 DEWPOINT SENSOR REPLACEMENT**

The dewpoint sensor should be replaced once a year or when contaminated.

Note: Never attempt to measure the resistance of the sensor. This will damage the sensor.

To replace the sensor:

1. Remove power from the unit.
2. Locate the sensor manifold assembly. This is a manifold (block) with wires coming from the socket to the dewpoint board.
3. Remove socket.
4. Unscrew retaining nut.
5. Remove sensor and insert from manifold.
6. Remove the insert from the sensor. Place the insert onto the new sensor.
7. Reverse steps 1-5.

**SECTION 10.6 DISPOSAL OF MERCURY CONTACTORS**

When a mercury contactor needs to be replaced, care must be taken to properly dispose of the defective unit. Remove the contactor and place it in a plastic baggy and seal the bag. Then place the unit or units in a sealable 5 gallon steel drum. If the unit is under Thoreson-McCosh's factory warranty, ship to Thoreson-McCosh for warranty replacement credit. If the unit is no longer under warranty, please contact:

Bethlehem Apparatus  
P.O. Box 890  
Front St.  
Hellertown. PA 18055  
Ph: (215) 838-7034

**SECTION 10.7 MAINTENANCE SCHEDULE**

**TO BE USED IN CONJUNCTION WITH DRYER INSTRUCTION MANUAL**

DRYER#:

DATE:

SPECIAL INSTRUCTIONS:

WEEKLY

CHECK AND CLEAN OR REPLACE FILTERS

CHECK FOR UNUSUAL NOISE

CHECK PROCESS DEWPOINT (MAX.=-40°F)

CHECK SYSTEM FOR AIR LEAKS (HOSES, HOPPER)

SEMI-ANNUALLY

OIL REGENERATION BLOWER MOTOR BEARINGS

CHECK BED INDEXING

CHECK LIGHTS

CHECK CONTACTS

CHECK AMP DRAW OF HEATERS AND BLOWER MOTORS

(SEE WIRING DIAGRAM , INSERT AND INDIVIDUAL MOTORS NAME PLATE)

ANNUALLY

REPLACE DEW POINT SENSOR

TEST MOLECULAR SIEVE

GREASE SHAFT BEARINGS AT TOP AND BOTTOM OF BEDS

(SUGGESTED GREASE: DOW CORNING #41 EXTREME HIGH TEMP. BEARING  
GREASE OR EQUIVALENT

# Thoreson-McCosh Inc

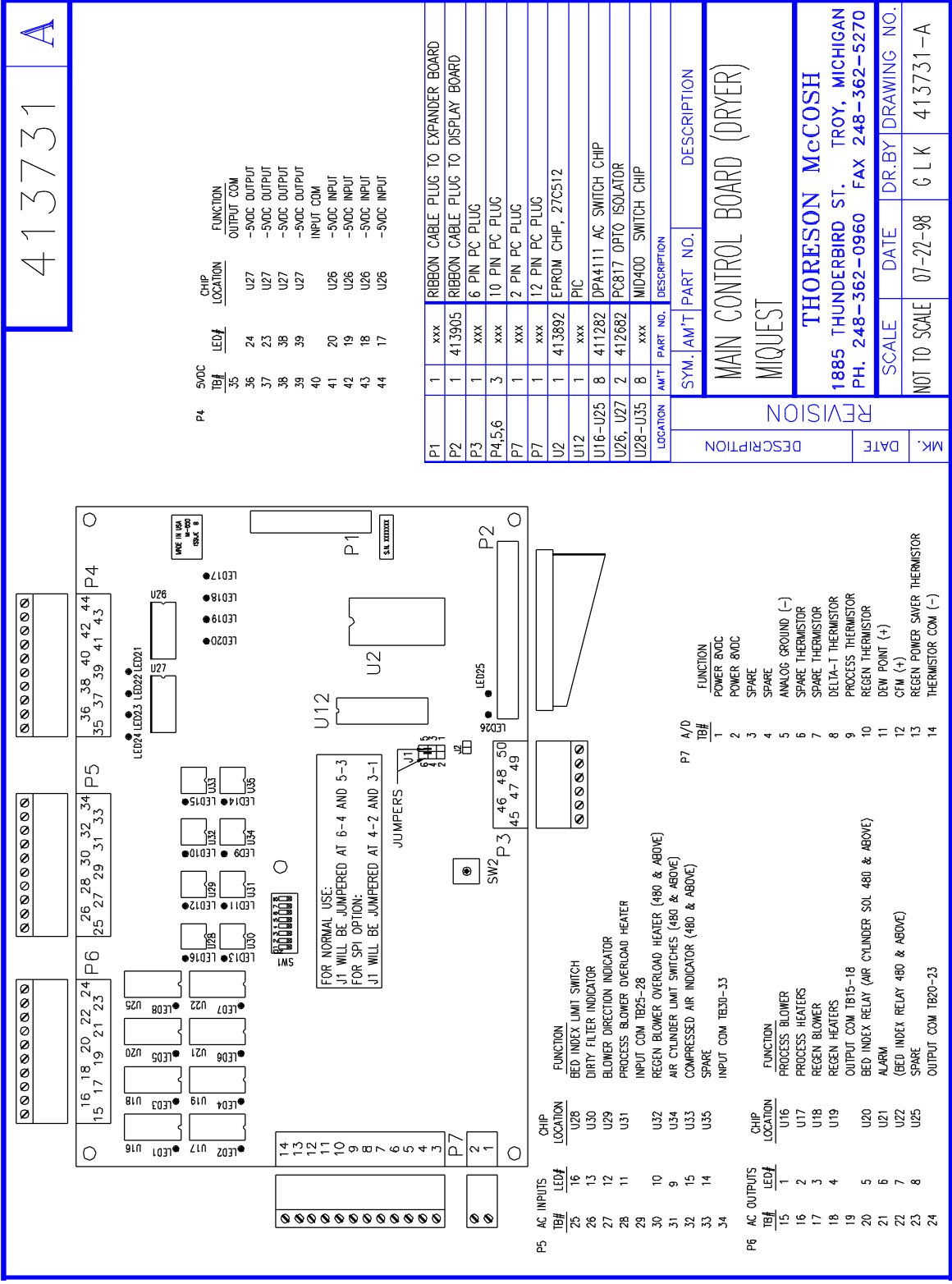
## SECTION 11 ALARM MESSAGE CHART

<u>ALARMS</u>	<u>MESSAGE</u>
Index Switch timed out, beds fail to index.....	BEDS NOT INDEXED
Process Temperature too high ..... (30 degrees above set point for 3 minutes)	TEMP TOO HIGH
Process Temperature too low..... (20 degrees below set point for 3 minutes)	TEMP TOO LOW
Return air temp exceeds 165°F / 74°C. Consult the factory.....	RETURN AIR TEMP HIGH
TD-12 through TD-360 only Push up motor failed to actuate the rotate motor .....	PUSH UP MOTOR FAILURE
(TD-480 through TD-2000 only.) Air cylinder failed to de-activate the air cylinder reed switch .....	AIR CYLINDER FAILURE
Thermistor temperature probe failed. The failed probe's temperature will now read 999°F.....	PROBE FAILED
Process filter dirty.....	FILTER DIRTY
Regen heater failure .....	HEATER FAULT
Incorrect phasing of three phase high power.....	WRONG PHASE
Process Dewpoint exceeds the alarm setpoint.....	HIGH DEW POINT
Process Blower Overload tripped .....	HIGH AMPS
(TD-480 through TD-2000 only) Regen Blower Overload tripped.....	HIGH AMPS
(TD-480 through TD-2000 only) Compressed air pressure has fallen below 65 P.S.I. (unit will shut down) .....	LOW AIR PRESSURE
Heater safety thermostat open (Heaters will be disabled) .....	MASTER HTR CONT OPEN

## **Thoreson-McCosh Inc**

### **TD DRYERS COMMON SPARE PARTS LIST**

<b>MODEL</b>	<b>MANIFOLD UPPER SEAL</b>	<b>MANIFOLD LOWER SEAL</b>	<b>PROCESS FILTER</b>	<b>REGEN FILTER</b>	<b>DEW POINT SENSOR</b>	<b>MANIFOLD SEPARATION DEVICE</b>	<b>BED INDEX MOTOR</b>
TD-6	413987 (3PCS)	413987 (3PCS)	404663	404663	-----	413989	409650
TD-12	413987 (3PCS)	413987 (3PCS)	410086	404663	411335	410213	409650
TD-24	413987 (3PCS)	413987 (3PCS)	410086	404663	411335	410213	409650
TD-40	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-60	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-90	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-120	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-150	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-180	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-240	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-360	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-480	411204 (3PCS)	411204 (3PCS)	404658	409951	411335	Call Factory	410713
TD-600	411204 (3PCS)	411204 (3PCS)	404658	409951	411335	Call Factory	410713
TD-800	411204 (3PCS)	411204 (3PCS)	404658	409951	411335	Call Factory	410713
TD-1000	410865 (3PCS)	410865 (3PCS)	404658 (2PCS)	409951	411335	Call Factory	413663
TD-1500	410865 (3PCS)	410865 (3PCS)	404658 (2PCS)	404656	411335	Call Factory	413663
TD-2000	411792 (3PCS)	411792 (3PCS)	404658 (3PCS)	404656	411335	Call Factory	413663



XX
A

PROCESS BOX

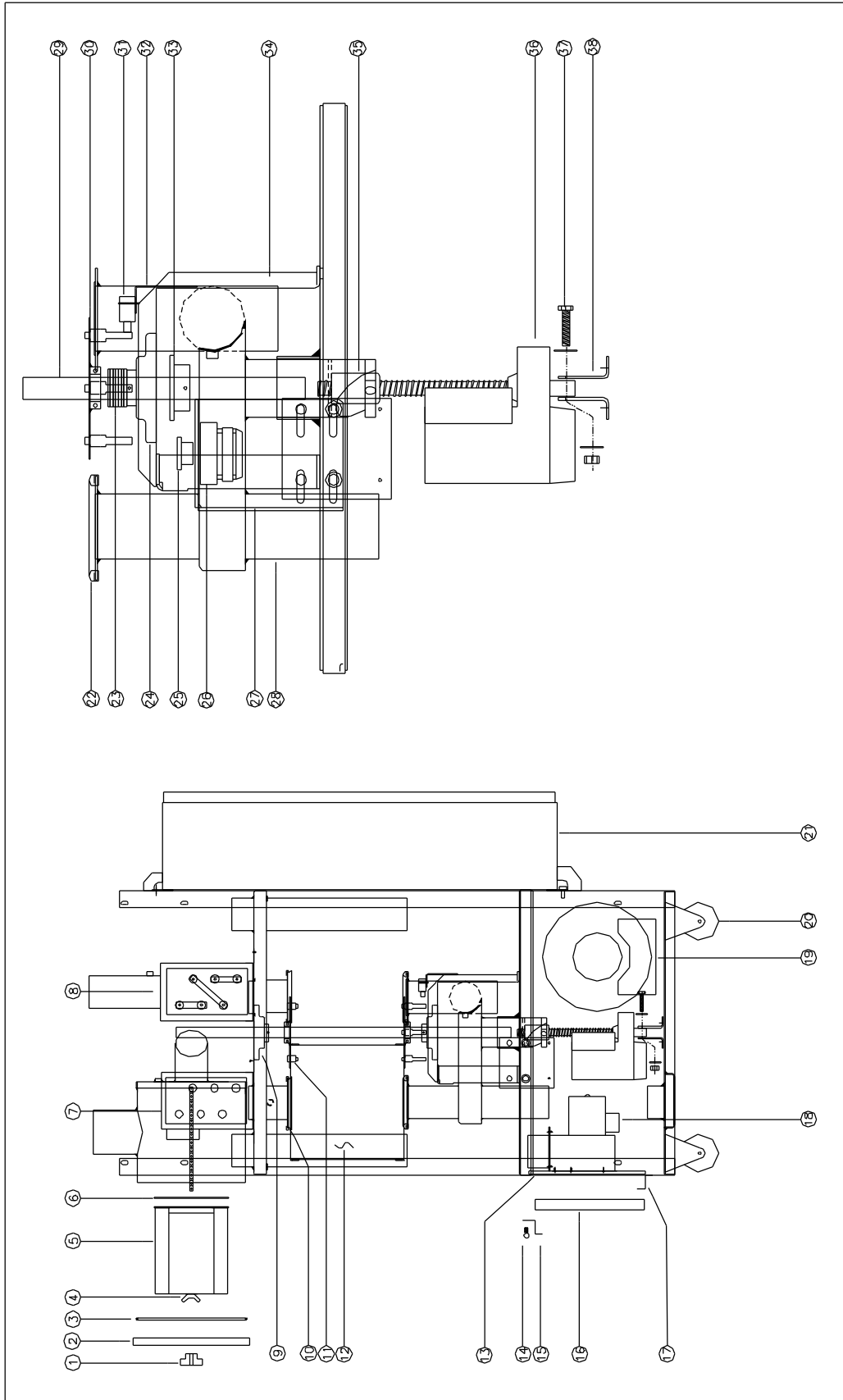
TO CALIBRATE THE REGEN HEATER THERMISTOR, REMOVE THE SAMPLE SCREW AND INSERT A EXTERNAL TEMPERATURE PROBE. FIND THE HOTTEST TEMPERATURE IN THE TUBE. LOOSEN THE BRASS FITTING AND MOVE THE THERMISTOR IN AND OUT UNTIL THE TEMPERATURE READ-OUT IS THE SAME AS THE EXTERNAL PROBE. SNUG THE FITTING ONTO THE PROBE.DO NOT OVER TIGHTEN THE FITTING.

TO CALIBRATE THE PROCESS, POKE A HOLE IN THE HOSE CONNECTED TO THE PROCESS BOX TO CHECK THE TEMPERATURE WITH AN EXTERNAL PROBE.

SYM. AM'T	PART NO.	DESCRIPTION
XX		
XXX		

THORESON McCOSH		
1885 THUNDERBIRD ST. TROY, MICHIGAN		
PH. 248-362-0960 FAX 248-362-5270		
SCALE	DATE	DR. BY DRAWING NO.
NOT TO SCALE	00-00-00	GLK XX





# Thoreson-McCosh Inc

20	4	CASTERS, 2 SWIVEL, 2 RIDGID	
19	1	PROCESS BLOWER	
18	1	REGEN BLOWER	
17	1	LOWER REGEN FILTER BRACKET	
16	1	REGEN FILTER BRACKET	
15	1	UPPER REGEN FILTER BRACKET	
14	1	THUMB SCREW	
13	1	REGEN FILTER GASKET	
12	3	DESICCANT BED	
11	1	UPPER TURRET PLATE	
10	3	UPPER BED SEAL	
9	1	UPPER BEARING	
8	1	PROCESS HEATER BOX	
7	1	REGEN HEATER BOX	
6	1	PROCESS FILTER GASKET	
5	1	PROCESS FILTER	
4	1	WING NUT WITH FLAT WASHER	
3	1	PROCESS FILTER COVER GASKET	
2	1	PROCESS FILTER COVER	
1	1	KNOB	
SYM.	AM'T	DESCRIPTION	

40	X	---	
39	X	---	
38	2	PUSH-UP MOTOR BRACKETS	
37	1	SHOULDER BOLT, LOCK-NUT, 2 WASHERS	
36	1	PUSH-UP MOTOR	
35	1	PUSH-UP MOTOR NUT	
34	1	LOWER BEARING SUPPORT ASSEMBLY	
33	1	SHAFT GEAR	
32	1	BED INDEX LIMIT SWITCH BRACKET	
31	1	BED INDEX LIMIT SWITCH	
30	1	LOWER TURRET PLATE	
29	1	BED SHAFT	
28	1	MANIFOLD	
27	1	ROTATE MOTOR BRACKET	
26	1	ROTATE MOTOR	
25	1	ROTATE MOTOR GEAR	
24	1	LOWER BEARING	
23	X	SHIMMS, AM'T VARIES TO MAINTAIN MAX 3/8" GAP	
22	3	LOWER BED SEAL	
21	1	ELECTRICAL CONTROL ENCLOSURE	
SYM.	AM'T	DESCRIPTION	

**MSDS** Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151  
CHEMTREC: 1-800-424-9300

National Response in Canada  
CANUTEC: 613-996-6666

Outside U.S. and Canada  
Chemtrec: 703-527-3887

**NOTE:** CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

**MERCURY**

MSDS NUMBER: M1599 --- *EFFECTIVE DATE: 07/09/2001*

**1. PRODUCT IDENTIFICATION**

**Synonyms:** Quicksilver; hydrargyrum; Liquid Silver

**CAS No.:** 7439-97-6

**Molecular Weight:** 200.59

**Chemical Formula:** Hg

**Product Codes:**

J.T. Baker: 2564, 2567, 2569, 2572

Mallinckrodt: 1278, 1280, 1288

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Ingredient	CAS No	Percent	Hazardous
Mercury	7439-97-6	90 - 100%	Yes

**3. HAZARDS IDENTIFICATION**

**Emergency Overview**

**DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup> Ratings** (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 1 - Slight

# Thoreson-McCosh Inc

Contact Rating: 3 - Severe (Life)

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

Storage Color Code: Blue (Health)

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## Potential Health Effects

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### **Inhalation:**

Mercury vapor is highly toxic via this route. Causes severe respiratory tract damage. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Can be absorbed through inhalation with symptoms similar to ingestion.

### **Ingestion:**

May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, tremors and collapse. Delayed death may occur from renal failure. Gastrointestinal uptake of mercury is less than 5% but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

### **Skin Contact:**

Causes irritation and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

### **Eye Contact:**

Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision; may cause serious and permanent eye damage.

### **Chronic Exposure:**

Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. A suspected reproductive hazard; may damage the developing fetus and decrease fertility in males and females.

### **Aggravation of Pre-existing Conditions:**

Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

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## 4. FIRST AID MEASURES

### **Inhalation:**

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

### **Ingestion:**

# Thoreson-McCosh Inc

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Skin Contact:**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

## 5. FIRE FIGHTING MEASURES

**Fire:**

Not considered to be a fire hazard.

**Explosion:**

Not considered to be an explosion hazard.

**Fire Extinguishing Media:**

Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Undergoes hazardous reactions in the presence of heat and sparks or ignition. Smoke may contain toxic mercury or mercuric oxide. Smoke may contain toxic mercury or mercuric oxide.

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## 6. ACCIDENTAL RELEASE MEASURES

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapor. Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate misting. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Do not flush to sewer. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker CINNASORB(R) and RESISORB(R) are recommended for spills of this product.

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## 7. HANDLING AND STORAGE

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Do not use or store on porous work surfaces (wood, unsealed concrete, etc.). Follow strict hygiene practices.

Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### **Airborne Exposure Limits:**

- OSHA Acceptable Ceiling Concentration:

mercury and mercury compounds: 0.1 mg/m<sup>3</sup> (TWA), skin

- ACGIH Threshold Limit Value (TLV):

inorganic and metallic mercury, as Hg: 0.025 mg/m<sup>3</sup> (TWA) skin, A4 Not classifiable as a human carcinogen.

- ACGIH Biological Exposure Indices:

total inorganic mercury in urine (preshift): 35 ug/g creatinine;

total inorganic mercury in blood (end of shift): 15 ug/l.

### **Ventilation System:**

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

### **Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded, a half-face respirator with a mercury vapor or chlorine gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with a mercury vapor or chlorine gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

### **Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

### **Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

### **Appearance:**

Silver-white, heavy, mobile, liquid metal.

### **Odor:**

Odorless.

### **Solubility:**

# Thoreson-McCosh Inc

Insoluble in water.

**Density:**

13.55

**pH:**

No information found.

**% Volatiles by volume @ 21C (70F):**

100

**Boiling Point:**

356.7C (675F)

**Melting Point:**

-38.87C (-38F)

**Vapor Density (Air=1):**

7.0

**Vapor Pressure (mm Hg):**

0.0018 @ 25C (77F)

**Evaporation Rate (BuAc=1):**

4

---

## 10. STABILITY AND REACTIVITY

**Stability:**

Stable under ordinary conditions of use and storage.

**Hazardous Decomposition Products:**

At high temperatures, vaporizes to form extremely toxic fumes.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.

**Conditions to Avoid:**

Heat, flames, ignition sources, metal surfaces and incompatibles.

---

## 11. TOXICOLOGICAL INFORMATION

**Toxicological Data:**

Investigated as a tumorigen, mutagen, reproductive effector.

**Reproductive Toxicity:**

All forms of mercury can cross the placenta to the fetus, but most of what is known has been learned from experimental animals. See Chronic Health Hazards.

**Carcinogenicity:**

EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	

-----

---

## **12. ECOLOGICAL INFORMATION**

### **Environmental Fate:**

This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.

### **Environmental Toxicity:**

This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

---

## **13. DISPOSAL CONSIDERATIONS**

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

## **14. TRANSPORT INFORMATION**

### **Domestic (Land, D.O.T.)**

-----

**Proper Shipping Name:** RQ, MERCURY

**Hazard Class:** 8

**UN/NA:** UN2809

**Packing Group:** III

**Information reported for product/size:** 2.5KG

### **International (Water, I.M.O.)**

-----

**Proper Shipping Name:** MERCURY

**Hazard Class:** 8

**UN/NA:** UN2809

**Packing Group:** III

**Information reported for product/size:** 2.5KG

### **International (Air, I.C.A.O.)**

-----

**Proper Shipping Name:** MERCURY

**Hazard Class:** 8

**UN/NA:** UN2809

**Packing Group:** III

**Information reported for product/size:** 2.5KG

**15. REGULATORY INFORMATION**

-----\Chemical Inventory Status - Part 1\-----  
 Ingredient TSCA EC Japan Australia

-----  
 Mercury (7439-97-6) Yes Yes No Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient Korea DSL --Canada-- NDSL Phil.  
 -----

Mercury (7439-97-6) Yes Yes No Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient -SARA 302- -----SARA 313-----  
 RQ TPQ List Chemical Catg.  
 -----

Mercury (7439-97-6) No No Yes No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient CERCLA -RCRA- -TSCA-  
 261.33 8(d)  
 -----

Mercury (7439-97-6) 1 U151 No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No  
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No  
 Reactivity: No (Pure / Liquid)

**WARNING:**

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

**Australian Hazchem Code: 2Z**

**Poison Schedule: S7**

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

**16. OTHER INFORMATION**

**NFPA Ratings:** Health: **3** Flammability: **0** Reactivity: **0**

**Label Hazard Warning:**

DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.

**Label Precautions:**

Do not get in eyes, on skin, or on clothing.



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Do not breathe vapor.  
Keep container closed.  
Use only with adequate ventilation.  
Wash thoroughly after handling.

**Label First Aid:**

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

No changes.

**Disclaimer:**

\*\*\*\*\*

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\*\*\*\*\*

**Prepared by:** Strategic Services Division  
Phone Number: (314) 539-1600 (U.S.A.)

# MATERIAL SAFETY DATA SHEET

## 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

**Product Name:** Molsiv Adsorbents 4A 8x12

**Product Use:** Adsorbent

UOP LLC  
25 E. Algonquin Road  
Des Plaines, IL 60017-5017  
USA  
Tel: +1-847-391-3189  
Fax: +1-847-391-2953

UOP M.S. S.p.A.  
Viale Milanofiori  
Strada 1 - Palazzo E1  
20090 Assago Mi, Italy  
Tel : +39-02-892241  
Fax : +39-02-57500145

**Emergency Assistance - 24 hour Emergency Telephone Numbers:**

USA (UOP LLC) : + 1-847-391-2123  
USA (CHEMTREC) : + 1-800-424-9300  
Canada (CANUTEC) : + 1-613-996-6666  
Outside USA (CHEMTREC) : + 1-703-527-3887

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

<b><u>INGREDIENT &amp; CAS No</u></b>	<b><u>% WEIGHT</u></b>	<b><u>ACGIH TLV-TWA</u></b>	<b><u>OSHA PEL-TWA</u></b>	<b><u>UNITS</u></b>
Silicon oxide (synthetic) 7631-86-9	< 50	10(I) 3(R)	15(TD) 5(R)	mg/m <sup>3</sup>
Sodium oxide 1313-59-3	< 30	N.E.	N.E.	N.A.
Aluminum oxide (non-fibrous) 1344-28-1	< 30	10	15(TD) 5(R)	mg/m <sup>3</sup>
Magnesium oxide 1309-48-4	< 5	10 as Fu	15 as Fu (Total Particulate)	mg/m <sup>3</sup>
Quartz 14808-60-7	< 3	0.05 (R)	TD: 30/(%SiO <sub>2</sub> +2) RD: 10/(%SiO <sub>2</sub> +2)	mg/m <sup>3</sup>

Note: The OSHA Permissible Exposure Limits (PEL) are determined from the percentage of quartz from airborne samples.

Abbreviations:  
 N.A. - Not Applicable      RD - Respirable Dust      Fu - Fume      IS - Insoluble  
 N.E. - None Established      TD - Total Dust      I - Inhalable  
 SC - Soluble Compounds      FuD - Fume and Dust      R - Respirable

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F89415

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**3. HAZARDS IDENTIFICATION**

**Emergency Overview**

In the fresh unused state, this product is not flammable. When first wetted, the product can heat up to the boiling point of water. Flood with water to cool material. Repeated and prolonged inhalation of crystalline silica in the form of quartz from occupational sources may cause cancer.

**Form:** Beads  
**Color:** Tan

**Potential Health Effects:**

**Primary Routes of Exposure:** Contact with skin and eyes. Exposure may also occur via inhalation or ingestion if product dust is generated.

**Skin Contact:** May cause skin irritation. The product gets hot as it first adsorbs water.

**Eye Contact:** Dust and /or product may cause eye discomfort and/or irritation seen as tearing and reddening.

**Ingestion:** The product gets hot as it first adsorbs water. Burns to moist body tissues can result if contact is prolonged.

**Inhalation:** Exposure to dust particles generated from this material may cause irritation of the respiratory tract. Repeated and prolonged inhalation of crystalline silica in the form of quartz from occupational sources may cause cancer.

**Target Organ:** Prolonged or repeated inhalation may cause lung injury/cancer.

**Carcinogenicity Classification:**

**International Agency for Research on Cancer (IARC):**

Silicon oxide (synthetic) - Unclassifiable as to carcinogenicity in humans (Group 3).  
Inhaled crystalline silica in the form of quartz from occupational sources is carcinogenic to humans (Group 1).

**U.S. National Toxicology Program (NTP):**

Quartz - Known human carcinogen.

**U.S. Occupational Safety and Health Administration (OSHA):**

Quartz - Known Carcinogen.

**American Conference of Governmental Industrial Hygienists (ACGIH):**

Aluminum oxide - Not Classifiable as a Human Carcinogen (A4).  
Quartz - Suspected Human Carcinogen (A2)

## 4. FIRST AID MEASURES

- 4.1 Eye contact:** Flush immediately with plenty of water for at least 15 minutes. If eye irritation persists, consult a physician.
- 4.2 Skin contact:** Wash off with soap and plenty of water. If skin irritation persists, call a physician.
- 4.3 After inhalation:** Remove the victim into fresh air. If symptoms persist, call a physician.
- 4.4 After ingestion:** Immediately give large volume of water to drink. If symptoms persist, call a physician.
- 4.5 Notes to physician:** This product is a desiccant and generates heat as it adsorbs water. The used product can contain material of a hazardous nature. Identify that material and treat symptomatically.

## 5. FIRE FIGHTING MEASURES

- 5.1 Suitable extinguishing media:** Non-combustible. Use extinguishing media for surrounding fire.
- 5.2 Unsuitable extinguishing media:** N.A.
- 5.3 Fire and explosion hazards:** The product itself does not burn. The used product can retain material of a hazardous nature. Identify that material and inform the fire fighters.
- 5.4 Special protective equipment:** In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit.
- 5.5 Flash Point:** N.A.

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## 6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal protection:** See 8.2
- 6.2 Environmental precautions:** No special environmental precautions required.
- 6.3 Clean-up:** Sweep, shovel or vacuum spilled product into appropriate containers (do not use a vacuum if material has contacted a hydrocarbon material). Pick-up and arrange disposal without creating dust. Never use spilled product. Spilled product should be disposed of in accordance with all applicable government regulations.

## 7. HANDLING AND STORAGE

- 7.1 Handling:** Handle and open container with care. Avoid formation of dust particles. Avoid contact with skin and eyes. Provide an electrical ground connection during loading and transfer operations to avoid static discharge in an explosive atmosphere and to prevent persons handling the product from receiving static shocks. A copy of UOP's booklet, "Precautions and Safe Practices for Handling Molecular Sieves in Process Units", M-100C, can be obtained from your UOP representative at no cost.
- 7.2 Storage:** Store in original container. Keep in a dry place.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Engineering measures:** Ensure adequate ventilation, especially in confined areas.
- 8.2 Personal protection equipment:** Handle in accordance with good industrial hygiene and safety practice.
- Eye protection:** Safety glasses or goggles.
- Hand protection:** Protective gloves.
- Skin and body protection:** Work uniform and gloves to prevent prolonged contact.
- Respiratory protection:** In case of insufficient ventilation wear suitable respiratory equipment. Breathing apparatus with filter: NIOSH classification N-100 or if oil/liquid aerosols are present P-100 (42 CFR 84).

## 9. PHYSICAL AND CHEMICAL PROPERTIES

These data do not represent technical or sales specifications.

<b>9.1 Form:</b>	Beads
<b>9.2 Color:</b>	Tan
<b>9.3 Odor:</b>	None
<b>9.4 pH:</b>	8 - 11 (AS)
<b>9.5 Boiling point/range:</b>	N.A.
<b>9.6 Melting point/range:</b>	N.A.
<b>9.7 Flash point:</b>	N.A.
<b>9.8 Autoignition temperature:</b>	N.A.
<b>9.9 Bulk density:</b>	N.D.
<b>9.10 Explosion limits:</b>	N.A.
<b>9.11 Vapor pressure:</b>	N.A.
<b>9.12 Relative density/Specific Gravity:</b>	N.A.
<b>9.13 Vapor density:</b>	N.A.
<b>9.14 Viscosity:</b>	N.A.
<b>9.15 Water solubility:</b>	N.D.
<b>9.16 Solubility:</b>	N.D.

Abbreviations:	AS	- Aqueous slurry
	N.D.	- Not Determined
	N.A.	- Not Applicable

## 10. STABILITY

<b>10.1 Stability:</b>	Stable.
<b>10.2 Hazardous decomposition products:</b>	No decomposition if used as directed. Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use.
<b>10.3 Conditions/Materials to avoid:</b>	Sudden contact with high concentrations of chemicals having high heats of adsorption such as olefins, HCl, etc. When first wetted, the product can heat up to the boiling point of water. Flood with water to cool material.

**11. TOXICOLOGICAL INFORMATION**

**11.1 Acute toxicity:**

**LD50/oral/rat =** > 32 000 mg/kg \*

**LD50/dermal/rabbit =** > 2 000 mg/kg \*

**LC50/inhalation/rat =** No data available.

**11.2 Chronic toxicity: Classification of Ingredients**

**EC Carcinogenic:** Not listed.

**EC Mutagenic:** Not listed.

**EC Toxic for Reproduction:** Not listed.

**Carcinogenicity (ACGIH):** A4 (Aluminum oxide)  
A2 (Quartz)

**IARC classification:** Group 3 (Silicon oxide - synthetic)  
Group 1 (Quartz)

**11.3 Routes of exposure:** Exposure may occur via inhalation, contact with skin and eyes.

**11.4 Irritation:**

**Skin (rabbit):** Not classified as a skin irritant in animal testing. \*

**Eye (rabbit):** Moderate eye irritation. \*

**11.5 Additional product information:**

\* The toxicological data has been taken from products of similar composition.

**11.6 Additional component information:**

No data available.

# Thoreson-McCosh Inc

## 12. ECOLOGICAL INFORMATION

- 12.1 Mobility:** No data available.
- 12.2 Biodegradation:** No data available.
- 12.3 Bioaccumulation:** No data available.
- 12.4 Aquatic toxicity:** No data available.
- 12.5 Further Information:** No information available.

## 13. DISPOSAL CONSIDERATIONS

- 13.1 Provisions relating to waste:** EPA - Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Management Regulations.
- 13.2 Disposal information:** This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's RCRA regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity or toxicity). Materials of a hazardous nature that contact the product during normal use may be retained on this product. The user of the product must identify the hazards associated with the retained material in order to assess the waste disposal options.

## 14. TRANSPORT INFORMATION

- 14.1 Proper shipping name:** Not applicable.
- 14.2 UN-No.:** N.A.  
**Packing group:** N.A.
- 14.3 U.S. DOT** Not regulated.  
**DOT Shipping name:** N.A.  
**Hazard classification** N.A.
- 14.4 IMO:** Not regulated.  
**EmS:** N.A.  
**MFAG:** N.A.  
**Marine pollutant:** No
- 14.5 ICAO - IATA:** Not regulated.  
**Instruction "passenger":** N.A.  
**Instruction "cargo":** N.A.
- 14.6 Further Information:**  
Not classified as hazardous or dangerous in the meaning of transport regulations.



## 15. REGULATORY INFORMATION

### UNITED STATES

#### Toxic Substances Control Act (TSCA):

All the ingredients of this mixture are registered on the TSCA Chemical Substance Inventory.

#### CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the

Reportable Quantity (RQ):

-- None --

#### SARA Title III (Superfund Amendments and Reauthorization Act of 1986):

##### Section 302 (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are

amounts equal to or greater than the Threshold Planning Quantity (TPQ):

-- None --

##### Section 313 (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the

Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

-- None --

#### The following components are listed in U.S. State Regulations:

##### State Reg Reference:

##### Component(s)

California - Proposition 65:

Silica, crystalline

Massachusetts Right-To-Know:

Aluminum oxide  
Quartz

New Jersey Right-To-Know:

Silica, amorphous  
Aluminum oxide  
Magnesium oxide  
Silica, quartz

Pennsylvania Right-To-Know:

Silica  
Aluminum oxide  
Magnesium oxide  
Quartz

Note: Other U.S. State Regulations may exist, check your local sources if available or contact the UOP Product Stewardship Manager (see Section 16).

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## Canada

### **Canadian Hazardous Products Act:**

This product is classified as a material causing other toxic effects, carcinogenicity - Class D, Division 2, Subdivision A, under regulations pursuant to the Federal Hazardous Products Act (e.g. WHMIS)

### **Canadian Environmental Protection Act:**

All the ingredients of this mixture are notified to CEPA and on the DSL (Domestic Substances List).

## European Union (EU)

### **European Inventory of Existing Commercial Chemical Substances:**

All components of this product are included in EINECS/ELINCS.

### **Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):**

No Dangerous Goods Label Required.

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## 16. OTHER INFORMATION

**Summary of changes:** Sections 3, 11, 15 (US)  
**Supersedes:** August 2000  
**Prepared by:** UOP Health, Safety & Environmental Department

### **HMIS™ - Hazardous Material Information System:**

HMIS™ Ratings: 0-minimal hazard, 1- slight hazard, 2- moderate hazard, 3- serious hazard, 4- severe hazard.

**HEALTH : 1\* - \* MAY CAUSE CANCER**

**FLAMMABILITY :** 0  
**REACTIVITY :** 1

For additional information concerning this product, contact the following:

### **FOR HEALTH, SAFETY AND ENVIRONMENTAL INFORMATION, FOR TECHNICAL OR**

**please contact:**

**purchasing information,  
please contact:**

Product Stewardship Manager  
UOP LLC  
25 E. Algonquin Road  
Des Plaines, IL 60017-5017  
USA  
Tel: +1-847- 391-3189  
Fax: +1-847-391-2953

Product Safety Steward Europe  
UOP N.V.  
Noorderlaan 147  
B-2030 Antwerpen  
Belgium  
Tel: +32-3-5409-971  
Fax: +32-3-5417-806

Adsorbent Sales  
UOP - Molsiv Dept.  
13105 Northwest Freeway  
Suite 600  
Houston, TX 77040 USA  
Tel: +1-713-744-2811  
Fax: +1-713-744-2802

## **PRODUCT EMERGENCIES**

If you have a product-related emergency, resulting in an incident such as a spill or release of product or human exposure and need assistance from UOP, please contact the following number :

**24-Hour EMERGENCY NUMBER (UOP LLC) : + 1 - 847 - 391 – 2123**

The data and recommendations presented in this data sheet concerning the use of our product and the materials contained therein are believed to be accurate and are based on information which is considered reliable as of the date hereof. However, the customer should determine the suitability of such materials for his purpose before adopting them on a commercial scale. Since the use of our products by others is beyond our control, no guarantee, express or implied, is made and no responsibility assumed for the use of this material or the results to be obtained therefrom. Information on this form is furnished for the purpose of compliance with Government Health and Safety Regulations and shall not be used for any other purposes. Moreover, the recommendations contained in this data sheet are not to be construed as a license to operate under, or a recommendation to infringe, any existing patents, nor should they be confused with state, municipal or insurance requirements, or with national safety codes.

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