



**THERMAL CARE**

*Superior equipment, Exceptional service*

# Temperature Controller

OPERATION, INSTALLATION, AND MAINTENANCE MANUAL

**Vactherm RV**



**Where water means business.**



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## Foreword

The temperature control unit is a packaged unit that typically includes a fluid pump, electric immersion heater, and temperature control valve in a cabinet. The purpose is to provide circulation and temperature control of a cooling fluid.

This manual is to serve as a guide for installing, operating, and maintaining the equipment. Improper installation, operation, and maintenance can lead to poor performance and/or equipment damage. Use qualified installers and service technicians for all installation and maintenance of this equipment.

This manual is for our standard product. The information in this manual is general in nature. Unit-specific drawings and supplemental documents are included with the equipment as needed. Additional copies of documents are available upon request.

Due to the ever-changing nature of applicable codes, ordinances, and other local laws pertaining to the use and operation of this equipment, we do not reference them in this manual.

## Safety Guidelines

Observe all safety precautions during installation, start-up, and service of this equipment. The following is a list of symbols used in this manual and their meaning.



General Warning



Electricity Warning



Sharp Element Warning



Hot Surface Warning



Flammable Material Warning



Explosive Material Warning



General Mandatory Action



Wear Eye Protection



Wear Protective Gloves



Wear Ear Protection



Disconnect Before Carrying Out Maintenance or Repair



Connect an Earth Terminal to Ground

Only qualified personnel should install, start-up, and service this equipment. When working on this equipment, observe precautions in this manual as well as tags, stickers, and labels on the equipment.



**WARNING:** Any use or misuse of this equipment outside of the design intent may cause injury or harm.



**WARNING:** This equipment contains hazardous voltages that can cause severe injury or death.



**WARNING:** This equipment contains hot oil and water or coolant under pressure. Accidental release of hot water or coolant under pressure can cause personal injury and or property damage.



**WARNING:** This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.



**WARNING:** The exposed surfaces of motors, piping, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.



**CAUTION:** Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. Shut off the electric power at the main disconnect before opening access panels for repair or maintenance.



**CAUTION:** Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** The equipment will exceed 70 dBA sound pressure at 1 meter distance and 1 meter elevation when operating. Wear ear protection as required for personal comfort when operating or working in close proximity to the chiller.



**CAUTION:** Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

## Pre-Installation

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### Receiving Inspection

When the unit arrives, verify the information on the unit nameplate agrees with the order acknowledgement and shipping papers. Inspect the equipment for any visible damage and verify all items shown on the bill of lading are present. If damage is evident, document it on the delivery receipt by clearly marking any item with damage as "unit damage" and notify the carrier. In addition, notify our Customer Service Department and they will provide assistance with preparing and filing freight damage claims, including arranging for an estimate on repair costs; however, filing the shipping damage claim is the responsibility of the receiving party. Do not install damaged equipment without getting the equipment repaired.

Shipping damage is the responsibility of the carrier. To protect against possible loss due to damage incurred during shipping and to expedite payment for damages, it is important to follow proper procedures and keep records. Photographs of damaged equipment are excellent documentation for your records.

Start unpacking the unit, inspect for concealed damage, and take photos of any damage found. Once received, equipment owners have the responsibility to provide reasonable evidence that the damage did not occur after delivery. Photos of the equipment damage while the equipment is still partially packed will help in this regard. Refrigerant lines can be susceptible to damage in transit. Check for broken lines, oil leaks, damaged controls, or any other major component torn loose from its mounting point.

Record any signs of concealed damage and file a shipping damage claim immediately with the shipping company. Most carriers require concealed

damages be reported within 15 days of receipt of the equipment. In addition, notify our Customer Service Department and they will provide assistance with preparing and filing freight damage claims, including arranging for an estimate on repair costs; however, filing the shipping damage claim is the responsibility of the receiving party.

### Unit Storage

When storing the unit it is important to protect it from damage. Blow out any water from the unit; cover it to keep dirt and debris from accumulating on or getting in and store in an indoor sheltered area that does not exceed 145°F.

## Installation - Mechanical

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### Foundation

Install the unit on a rigid, non-warping mounting pad, concrete foundation, or level floor suitable to support the full operating weight of the equipment. When installed the equipment must be level within ¼ inch over its length and width.

### Unit Location

The unit is available in many different configurations for various environments. Refer to the proposal and order acknowledgement document for the equipment to verify the specific design conditions in which it can operate.

To ensure proper airflow and clearance space for proper operation and maintenance allow a minimum of 12 inches of clearance between the sides of the equipment and any walls or obstructions. Avoid locating piping or conduit over the unit to ensure easy access with an overhead crane or lift to lift out heavier components during replacement or service.

### Rigging

The unit has a base with casters to facilitate easy movement and positioning. Follow proper rigging methods to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the unit. Use pads where abrasive surface contact may occur.

### Fluid Distribution Piping

Ensure all piping and fittings are suitable for the maximum operating temperature and pressure of

the unit. Proper insulation of chilled process fluid piping is crucial to prevent condensation. The formation of condensation adds a substantial heat load to the cooling system.

The importance of properly sized piping cannot be overemphasized. See the ASHRAE Handbook or other suitable design guide for proper pipe sizing. In general, run full size piping out to the process and then reduce the pipe size to match the connections on the process equipment. One of the most common causes of unsatisfactory unit performance is poor piping system design. Avoid long lengths of hoses, quick disconnect fittings, and manifolds wherever possible as they offer high resistance to water flow. When manifolds are required, install them as close to the use point as possible. Provide flow-balancing valves at each machine to assure adequate water distribution in the entire system. Install shut-off valves at each machine to allow for isolation of the unit.

## Installation - Electrical

All wiring must comply with local codes and the National Electric Code. Minimum Circuit Amps (MCA) and other unit electrical data are on the unit nameplate. A unit specific electrical schematic ships with the unit. Measure each leg of the main power supply voltage at the main power source. Voltage must be within the voltage utilization range given on the drawings included with the unit. If the measured voltage on any leg is not within the specified range, notify the supplier and correct before operating the unit. Voltage imbalance must not exceed two percent. Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. Voltage imbalance is determined using the following calculations:

$$\% \text{ Imbalance} = (V_{\text{avg}} - V_x) \times 100 / V_{\text{avg}}$$

$$V_{\text{avg}} = (V_1 + V_2 + V_3) / 3$$

$V_x$  = phase with greatest difference from  $V_{\text{avg}}$

For example, if the three measured voltages were 442, 460, and 454 volts, the average would be:

$$(442 + 460 + 454) / 3 = 452$$

The percentage of imbalance is then:

$$(452 - 442) \times 100 / 452 = 2.2 \%$$

This exceeds the maximum allowable of 2%.

There is a terminal block for main power connection to the main power source. The main power source should be connected to the terminal block through an appropriate disconnect switch. There is a separate lug in the main control panel for grounding the unit. Check the electrical phase sequence at installation and prior to start-up. Operation of the unit with incorrect electrical phase sequencing will result in improper pump performance. Check the phasing with a phase sequence meter prior to applying power. The proper sequence should read "ABC" on the meter. If the meter reads "CBA", open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). Do not interchange any load leads that are from the unit contactors or the motor terminals.



**WARNING:** This equipment contains hazardous voltages that can cause severe injury or death.



**WARNING:** This equipment contains hot water or coolant under pressure. Accidental release of hot water or coolant under pressure can cause personal injury and or property damage.



**WARNING:** This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.



**WARNING:** The exposed surfaces of motors, piping, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.



**CAUTION:** Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.



**CAUTION:** Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



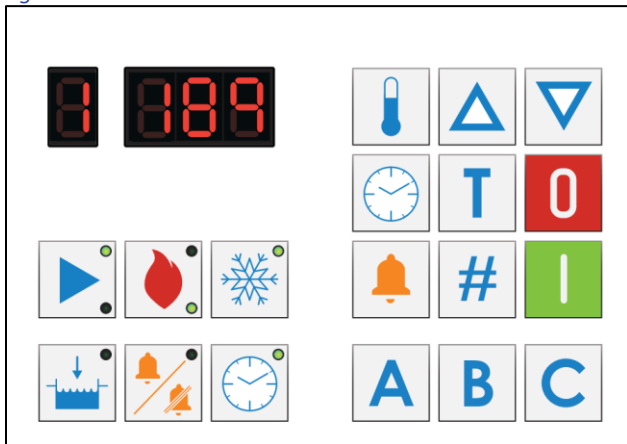
**CAUTION:** Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** Wire the unit ground in compliance with local and national codes.

# Controller Operation

Figure 1 – Control Panel



The controller uses a set of digital LED displays to show various temperatures as well as status and alarm conditions.

## Start



To start the unit press the Start button. If the water level in the reservoir is below the level required to satisfy the low level sensor, the controller will initiate an initial fill sequence. During this sequence, the fill valve opens and will remain open until the proper water level is achieved. The automatic fill cycle has a four-minute timer that will close the fill solenoid valve and stop the pump. This safety has been included in case there is a leak present that does not allow the reservoir to fill up. After the initial fill cycle is complete, the unit will automatically fill the tank if the level gets too low. If the fill valve remains open for more than 20 seconds, the unit will close the fill solenoid valve and shut off the pump. The display will show a **I** as the first digit followed by the tank temperature.

## Stop



To stop the unit press the Stop button. When the unit is stops, the status display and the last digital display on the right will display a dot.



**CAUTION:** Stopping the unit without cooling the water in the reservoir can lead to potential user injury during servicing of the unit. In order to allow the water in the reservoir to be cooled automatically during shut down, depress the Temperature Adjust button and the Password 'C' button to initiate an automatic cool down cycle. The controller will open the cooling valve and keep it open until the temperature of the water in the reservoir is below 105°F (40°C). The automatic cool down cycle can be stopped at any time by depressing the Off button.

## Temperature Adjust



The Temperature Adjust button is used to view and change the set point temperatures.

### Display Set Point Temperature

To display the Set Point temperature press and release the Temperature Adjust button. This will show the Set Point temperature in the display. If no other buttons are pressed for 5 seconds, the display will return to the actual temperature.

### Setting Set Point Temperature

To change the Set Point temperature press the Temperature Adjust button and release to display the current Set Point temperature and then immediately used the Increase or Decrease buttons to change the Set Point temperature until the desired temperature is displayed. Once the desired Set Point temperature displays, release all buttons. After 5 seconds, the display will return to the actual temperature and the new set point is active.

## Increase



Pressing the Increase button increases the value of the set point, deviation alarm, and timer settings when those adjustment features are active.

## Decrease



Pressing the Decrease button decreases the value of the set point, deviation alarm, and timer settings when those adjustment features are active.

## Date & Time



Press the Timer button to display and adjust pump running hours and automatic start/stop timers as indicated below.



#### Displaying Pump Running Hours

Press the Date & Time button and release and immediately press the Start button to display the pump running hours. The pump running hours will display for 5 seconds. If no other buttons are pressed for 5 seconds, the display will return to the actual temperature. The pump running hour counter counts running hours in intervals of 1 hour up to 9,999 hours.

#### Resetting Pump Running Hour Counter

Resetting the pump running hour counter requires three button presses in sequence. Press the Date & Time button and release, press the Start button and release, and press the Stop button and release to reset the pump running hour counter. If no other buttons are pressed for 5 seconds, the display will return to the actual temperature.

#### Displaying Clock Time

Press and release the Date & Time button once to display the current clock time. The time will display for 5 seconds. If no other buttons are pressed for 5 seconds, the display will return to the actual temperature.

#### Setting Clock Time

The clock timer is used for programming automatic start and stop times. If the power to the unit is disconnected, the clock resets to 0000 hours (based on a 24-hour clock with 0000 hours being midnight) and will begin keeping time from that point forward until reset. To adjust the time, press the Date & Time button and release and immediately use the Increase and Decrease buttons to set the current time. Releasing all buttons sets the time to the time shown in the display. After 5 seconds, the display will return to the actual temperature and the new time is set.

#### Displaying Day of the Week

Press and release the Date & Time button twice to display the internal clock timer day of the week. The day of the week will display for 5 seconds. If no other buttons are pressed for 5 seconds the display will return to the actual temperature.

#### Setting Day of the Week

The day of the week is used for programming automatic start and stop times. If the power to the unit is disconnected, the day resets to Monday (Day 1) based on a 24-hour clock and will begin keeping dates from that point forward until reset. To adjust the day, press the Date & Time button twice, release,

and immediately use the Increase and Decrease buttons to set the current day of the week as follows.

Releasing all buttons sets the day to the one shown in the display. After 5 seconds, the display will return to the actual temperature and the new day is set.

#### Timer On/Off



Pressing the Timer On/Off button is used to program times and days for which the automatic 7 day, 24 hour timer will start and stop the unit. This is an optional feature; however, it is available for applications that require automatic preheating and shutdown. It uses a common start and stop time for all days of the week programmed to be active for the timer program. Each day can be included or excluded; however, all days will have the same start and stop time. Once programmed, it is possible to turn the timer on and off as desired.

#### Display Status of Timer

To display the status of the timer, three keystrokes are required. Press the Date & Time button and release, press the Date & Time button again and release, and press the Timer On/Off button and release to display the current timer status.

#### Turning Timer On/Off

To change the status of the timer, four keystrokes are required. Press the Date & Time button and release, press the Date & Time button again and release, press the Timer On/Off button and release, and if the timer status is not as desired press the On button to toggle between timer on and timer off status until the desired status is displayed as shown in the above examples. Release all buttons after selecting the timer status. If no other buttons are pressed for 5 seconds the timer status is set and display will return to the actual temperature.

#### Setting Start Time

To change the timer start time, press the Date & Time button and release, press the Timer On/Off button once and release. This will reset the display to 0000. To adjust the start time, use the Increase and Decrease buttons to set the desired start time (based on a 24-hour clock). Releasing all buttons sets the start time to the time shown in the display. After 5 seconds, the display will return to the actual temperature and the new start time is set.

### Setting Timer Stop Time

To change the timer stop time press the Date & Time button and release, press the Timer On/Off button and release, press the Timer On/Off button again and release. This will reset the display to **0 0 0 0**. To adjust the stop time, use the Increase and Decrease buttons to set the desired start time (based on a 24-hour clock). Releasing all buttons sets the start time to the time shown in the display. After 5 seconds, the display will return to the actual temperature and the new start time is set.

### Setting Timer Days for Automatic Start/Stop

Depressing the Timer Adjust button twice and then immediately depressing the Timer On/Off button once will reset the display to show the settings for Monday. When reviewing the settings for each day of the week, the first digit on the left of the display indicates the day of the week and the remaining four digits of the display indicate the activation status of that day. If there is a decimal in the first and third digits for the day, automatic start/stop is scheduled. If there is there is a decimal in the second and third digits for the day, automatic start/stop is not scheduled.

To change the day of the week, use the Increase and Decrease buttons. Once the desired day is displayed, use the On button to toggle the status of the timer for that day.

### Examples of days of week displays

Monday (timer off)	1	. . .
Monday (time on)	1	. . .
Tuesday (timer off)	2	. . .
Tuesday (timer on)	2	. . .
Wednesday (timer off)	3	. . .
Wednesday (timer on)	3	. . .
Thursday (timer off)	4	. . .
Thursday (timer on)	4	. . .
Friday (timer off)	5	. . .
Friday (timer on)	5	. . .
Saturday (timer off)	6	. . .
Saturday (timer on)	6	. . .
Sunday (timer off)	7	. . .
Sunday (timer on)	7	. . .

Starting with Monday, toggle the schedule status using the On button until the desired status is reached, and then used the Increase button to move to the next day and repeat the process until all days are programed as desired and release all buttons. After 5 seconds, the display will return to the actual temperature and the days for automatic start/stop are set.

### Deviation Alarm



Depressing the Deviation Alarm Adjust button will show the current deviation alarm set point in the display. The deviation alarm set point is the number of degrees the tank temperature must rise above the set point before the alarm horn will activate. When active and an alarm condition occurs, the Deviation Alarm light illuminates, the alarm horn sounds, and voltage will be at terminal XI on the control board.

*Note: There is a 45 minute time deviation alarm delay after initial start-up to minimize the potential for unwanted alarms during initial start-up as the unit brings the system up to operating temperature.*

### Setting Deviation Alarm Temperature

To change the deviation alarm temperature press the Deviation Alarm button and release and use the Increase and Decrease button to change the degrees of deviation from the set point temperature at which the deviation alarm will activate. Once the desired deviation is displayed release all button to set. After 5 seconds, the display will return to the actual temperature and the new deviation alarm is set.

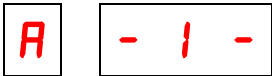
Example of deviation set for 20°F off Set Point temperature



### Activating Deviation Alarm

To activate the deviation alarm, press the Deviation Alarm button and release and immediately press the On button and release. After 5 seconds without a button push, the display will return to the actual temperature and the deviation alarm is activate.

Example of deviation alarm activated



### Deactivating Deviation Alarm

To deactivate the deviation alarm, press the Deviation Alarm button and release and immediately press the Off button and release. After 5 seconds without a button push, the display will return to the actual temperature and the deviation alarm is inactive.

Example of deviation alarm deactivated



### Tank Temperature



Pressing the Tank Temperature button shows the current tank temperature in the display.

### Password Entry



Pressing the Password Entry buttons will allow for secured access to the control program and will prevent unauthorized personnel from making changes. The correct four-letter password will be required to adjust temperatures or timer functions.

The password remains in memory even if the power is disconnected.

### Entering or Changing Password

To enter or change a password, use the following steps.

1. Press the Off button to stop the unit.
2. Press and hold the C button until the display shows the following. This opens the password menu.

Example of password menu open



3. Enter four letters in the desire password sequence using the A, B, and C buttons. The controller will count the number of letters entered and will show the number entered in the far right digital display. When all four letters are entered, the display shows the following.

Example of deviation alarm activated



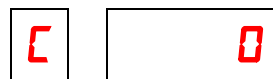
4. Press the Off button to confirm the password.
5. Press the On button to start the unit. The unit will now require a correct password for a change in set point temperature to occur.

### Deleting Password

To delete the password, use the following steps.

1. Press the Off button to stop the unit.
2. Press and hold the C button until the display shows the following. This opens the password menu.

Example of password menu open



3. Press the Off button to clear the password. The display shows the following.

Example of password deleted, no password entered



- Press the On button to start the unit. The set point temperature can occur without the need for a password.

### Pump Status Indicator



There are two indicating lights in the Pump icon. When the pump is on the upper LED will be green. When the pump overloads the lower LED will be yellow.

### Heating Status Indicator



There are two indicating lights in the Heating icon. When Heater 1 is on the upper LED will be green. When Heater 2 is on the lower LED will be green.

### Cooling Status Indicator



When the cooling valve is open, the LED in the Cooling icon will be green.

### Low Level Alarm Indicator



The LED in the Low Level icon will be yellow when the oil level in the reservoir is too low.

### Deviation Alarm Indicator



The LED in the Deviation Alarm icon will be green when the Deviation Alarm is active. The LED will not be on if the Deviation Alarm has been turned off.

### Automatic Timer Status Indicator



The LED in the Timer icon will be green when the Automatic Start/Stop Timer is active. The LED will not be on if the Automatic Start/Stop Timer is not active.

## Controller Control Fault Logic

Alarm Condition	Indication
Tank Low Level	Low Level Alarm indicator light on Temperature display flashing Alarm horn on and X1 output powered
Temperature Deviation	Temperature Deviation Alarm indicating light on Temperature display flashing Alarm horn on and X1 output powered
Temperature Sensor Short Circuit	Temperature display flashing Alarm horn on and X1 output powered
Temperature Sensor Disconnected	Temperature display flashing Alarm horn on and X1 output powered

## Draining the Mold

The temperature control unit is equipped with a specific program that can automatically cool to 105°F before draining the mold. To initiate a mold drain sequence depress the Temperature Adjust button and then immediately depress the On button. The display will show 'E' followed by the actual temperature in the tank. The cooling solenoid valve opens and will remain energized until the tank temperature drops to 105°F. When the tank temperature reached 105°F, the alarm horn will sound to signal the mold is ready for draining. Once the unit has cooled to 105°F, close the vacuum adjusting valve and remove the hose on the valve. The vacuum created will automatically pull the water through the hoses and the mold back to the unit. When the unit is finished draining, turn the unit off by depressing the Off button and remove the hoses.

## Start-up

Every unit is factory set to deliver oil in accordance with the standard operating specifications for that particular unit. Due to variables involved with different applications and different installations, minor adjustments may be required during the initial start-up to ensure proper operation. Use a qualified technician to perform the start-up procedure in sequence. The following serves as a checklist for the initial start-up and for subsequent start-ups if the unit is out of service for a prolonged time.



**WARNING:** This equipment contains hazardous voltages that can cause severe injury or death.



**WARNING:** This equipment contains hot water or coolant under pressure. Accidental release of hot water or coolant under pressure can cause personal injury and or property damage.



**WARNING:** This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.



**WARNING:** The exposed surfaces of motors, piping, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.



**CAUTION:** Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.



**CAUTION:** Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** Wire the unit ground in compliance with local and national codes.

## Step 1 – Connect Main Power

Connect main power properly ensuring it matches the voltage shown on the nameplate of the unit. Check the electrical phase sequence prior to start-up. Operation of the unit with incorrect electrical phase sequencing will cause damage to components. Check the phasing prior to applying power. The proper sequence is "ABC." If the phasing is incorrect, open the main power disconnect and switch two line leads on the main power terminal blocks (or the unit mounted disconnect). All electrical components are in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals. After making proper power connection and grounding, turn the main power on.

## Step 2 – Fill Coolant Circuit

Check to make sure all piping connections are secure and that all lines are suitable for water or the coolant in the system at the maximum set point temperature

and cumulative pressure rating of the maximum pump pressure and the unit fill fluid pressure.

**NOTE:** A cooling source inlet filter ships loose in the crate with the unit. Install this in the inlet of the chilled water line before connecting the cooling source line.

Make sure that the cooling source is the appropriate temperature and pressure for your application. In most cases, the cooling source is between 40°F and 85°F. The cooling source fluid pressure must be above the set point of the pressure switch in order for the unit to start. For most applications, the design cooling source supply pressure is between 25 psi and 50 psi. Units with the 300°F operating range option require an inlet cooling source pressure of 75 psi. If the total pressure in the unit (cooling source inlet pressure plus the pump pressure) exceeds 150 psi, the pressure relief valve in the unit will open. If this becomes an issue, install a pressure-regulating valve (Part #9616548 available from our Parts Department) on the supply line to help regulate the pressure to ensure it does not exceed the pressure rating of the pressure relief valve. For further assistance in installing a pressure-regulating valve, please contact our Customer Service Department.

## System Fill Water Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a "universal solvent" because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The life giving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity.

### Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

### Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved gases

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved. The table below shows the list of water characteristics and quality limitations.

Table 1 - Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO <sub>3</sub> <sup>-</sup> )	70-300 ppm
Aluminum (Al)	Less than 0.2 ppm
Ammonium (NH <sub>3</sub> )	Less than 2 ppm
Chlorides (Cl <sup>-</sup> )	Less than 300 ppm
Electrical Conductivity	10-500µS/cm
Free (aggressive) Carbon Dioxide (CO <sub>2</sub> )†	Less than 5 ppm
Free Chlorine(Cl <sub>2</sub> )	Less than 1 PPM
HCO <sub>3</sub> <sup>-</sup> /SO <sub>4</sub> <sup>2-</sup>	Greater than 1.0
Hydrogen Sulfide (H <sub>2</sub> S)	Less than 0.05 ppm
Iron (Fe)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm
Nitrate (NO <sub>3</sub> )	Less than 100 ppm
pH	7.5-9.0
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	Less than 70 ppm
Total Hardness (dH)k	4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x 2<sup>[(6.3-pH)/0.3]</sup> where TA = Total Alkalinity, PPM as CaCO<sub>3</sub>

Table 2 – Recommend Glycol Solutions

Chilled Water Temperature	Percent Glycol By Volume
50°F (10°C)	Not required
45°F (7.2°C)	5 %
40°F (4.4°C)	10 %
35°F (1.7°C)	15 %
30°F (-1.1°C)	20 %
25°F (-3.9°C)	25 %
20°F (-6.7°C)	30 %



**CAUTION:** When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. Never use glycol designed for automotive applications. Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the chiller. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.



**WARNING:** Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

### Step 3 – Start the Unit

To start the unit press the Start button. If the water level in the reservoir is too low, the display will show **FILL** and the Low Level Alarm Indicator light will turn on. The Low Level Alarm Indicator light will remain on until the water level is sufficient for operation.

### Step 4 – Check Pump Rotation

Check the rotation of the pump by visually confirming the motor shaft rotation matches the directional arrow sticker on the motor case. If the pump is running backwards, switch two of the main power leads, after shutting off the disconnect switch.

### Step 5 – Enter Set Point Temperature

To display the Set Point temperature press and release the Temperature Adjust button. This will show the Set Point temperature in the display. If no other buttons are pressed for 5 seconds, the display will return to the actual temperature.

#### Setting Set Point Temperature

To change the Set Point temperature press the Temperature Adjust button and release to display

the current Set Point and then immediately used the Increase or Decrease buttons to change the Set Point until the desired temperature displays. Once the desired Set Point displays, release all buttons. After 5 seconds, the display will return to the actual temperature and the new set point is active.

### Step 6 - Adjusting the Vacuum

Adjust the positive/negative flow through the mold by using the vacuum adjusting valve on top of the back panel. Start by fully closing this valve so that the injector makes a vacuum in the return line from process. The vacuum created allows air to enter the circuit through any leaks that are present. Opening the adjusting valve slowly allows water to flow to the mold and pressurizes the supply line. The leak will reappear as the pressure increases. Slowly closing the adjusting valve now eliminates the leak.

The unit is now ready for service.

## Preventive Maintenance

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Once the unit is in service, we suggest following the maintenance procedures as closely as possible. The importance of a properly established preventive maintenance program cannot be overemphasized. Taking the time to follow these simple procedures will result in substantially reduced downtime, reduced repair costs, and an extended useful lifetime for the unit. The following is a list of suggested periodic maintenance.

### Once a Week

1. Check to make sure that the To Process temperature is reasonably close to the Set Point temperature. If the temperature stays more than 5°F away from the set point, there may be a problem with the unit. If this is the case, refer to the General Troubleshooting section of this manual or contact our Customer Service Department.
2. Check the pump discharge pressure. Investigate further if the pressure starts to stray away from the normal operating pressure.
3. Check the pump for leaks in the seal area. Replace pump seal if necessary.

### Once a Month

Repeat items 1 through 3 listed above and continue with the following.

4. With the main power shut off, check the condition of electrical connections at all contactors, starters, and controls. Check for loose or frayed wires.
5. Check the incoming voltage to make sure it is within 10% of the design voltage for the temperature control unit.
6. Check the amp draws to each leg of the pump and heaters to confirm that they are drawing the proper current.
7. Check the heat exchanger inlet strainer and clean debris out as necessary.
8. Check the condition of the oil and replace as necessary as instructed by the oil manufacturer.

### Once a Year

Repeat items 1 through 8 as listed above and continue with the following.

9. Carefully inspect the heat exchanger for signs of scale build-up and carefully clean and remove scale as necessary.



*CAUTION: The amount of scale build-up is dependent upon the amount of cooling required for each process along with the quality of the cooling water supply. We have supplied the unit with a copper heat exchanger. We recommend you clean the heat exchanger thoroughly on a periodic basis, or after each job, to allow for the longest life and highest heat removal potential of the unit. If the heat exchanger becomes completely blocked, lime scale removal will be impossible.*

## General Troubleshooting

Problem	Possible Cause	Remedy
The unit does not start after connection, tank filling, and pressing the On button	Main fuses blown	Replace blown fuses
	Motor defective	Contact factory
	Reset tripped	Reset
	Control circuit breaker tripped	Reset
Motor buzzes after pressing the On button and overload trips	Voltage on two of the phases only	Check incoming power supply, check and replace blown fuse
	Motor defective	Contact factory
No water circulation, even though the pump is rotating	Pump is rotating in the wrong direction	Change two of the incoming power leads
	Process water lines clogged	Clean lines
The unit does not heat	Contactors defective	Replace contactor
	Thermostat defective	Replace thermostat
	Heating element defective	Replace heating element
	Safety fuse defective	Replace safety fuse
The unit does not cool	Solenoid valve at "Cooling Water In" defective	Replace solenoid valve
	Cooling heat exchanger clogged	Clean coil
	Thermostat defective	Replace thermostat
The unit cooling all the time	Dirt in the cooling solenoid valve	Take apart the valve, clean out, replace if required
	Thermostat defective	Replace thermostat
Water comes out the overflow pipe	Tank overfilled	Drain some water
	Dirt in the fill solenoid valve	Take apart the valve, clean out, replace if required
	Level sensing probe dirty or defective	Clean probe, replace if required
The unit does not fill the tank, level lamp is not on	Level sensing probe dirty or defective	Clean probe, replace if required
	Defective microprocessor	Contact factory
The unit does not fill the tank, level lamp is on	Water supply not connected	Connect supply
	Defective fill solenoid valve	Replace if required



# Charts and Drawings

Figure 1 – Pump Performance (60 Hz)

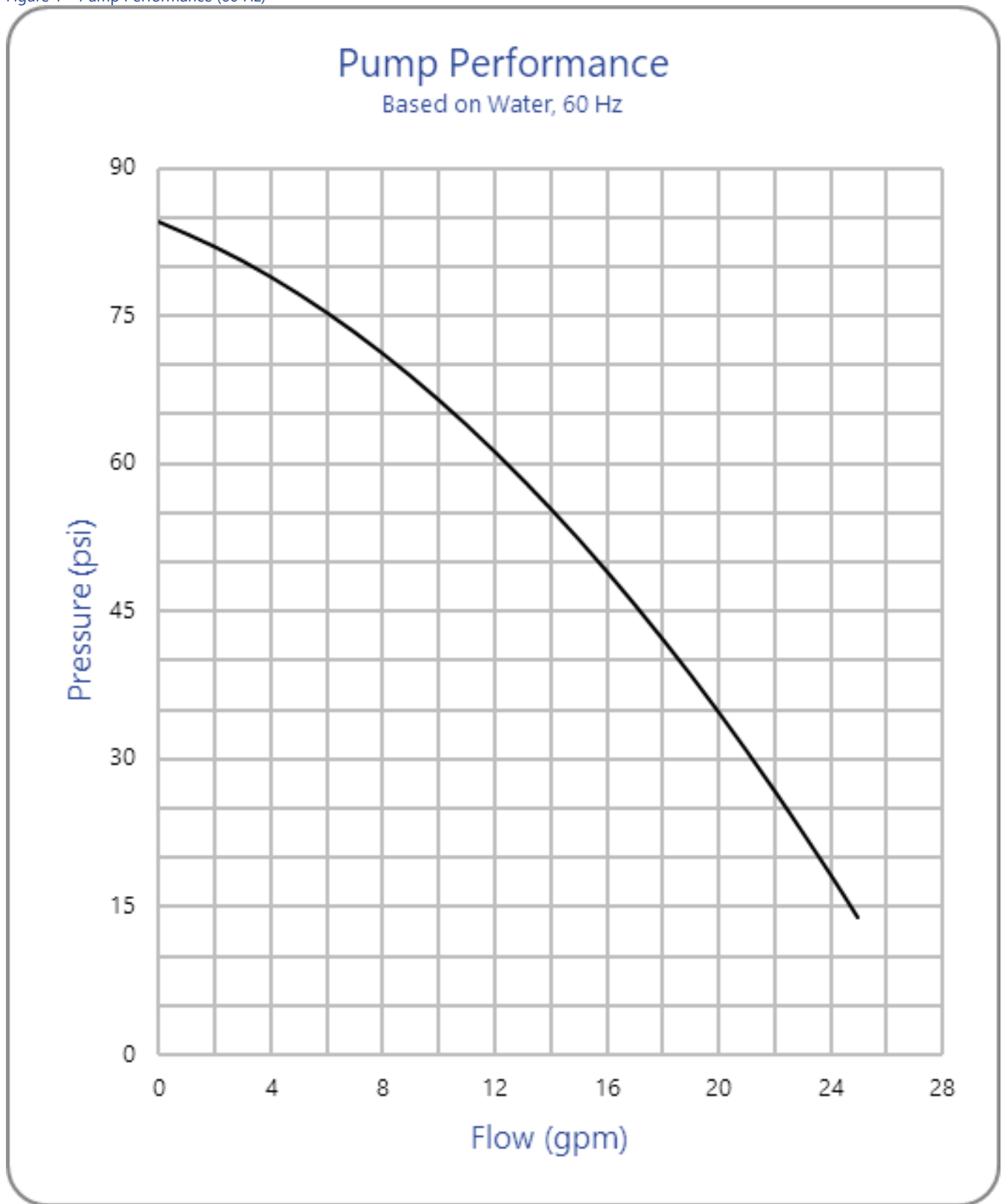


Figure 2 – Cooling Capacity

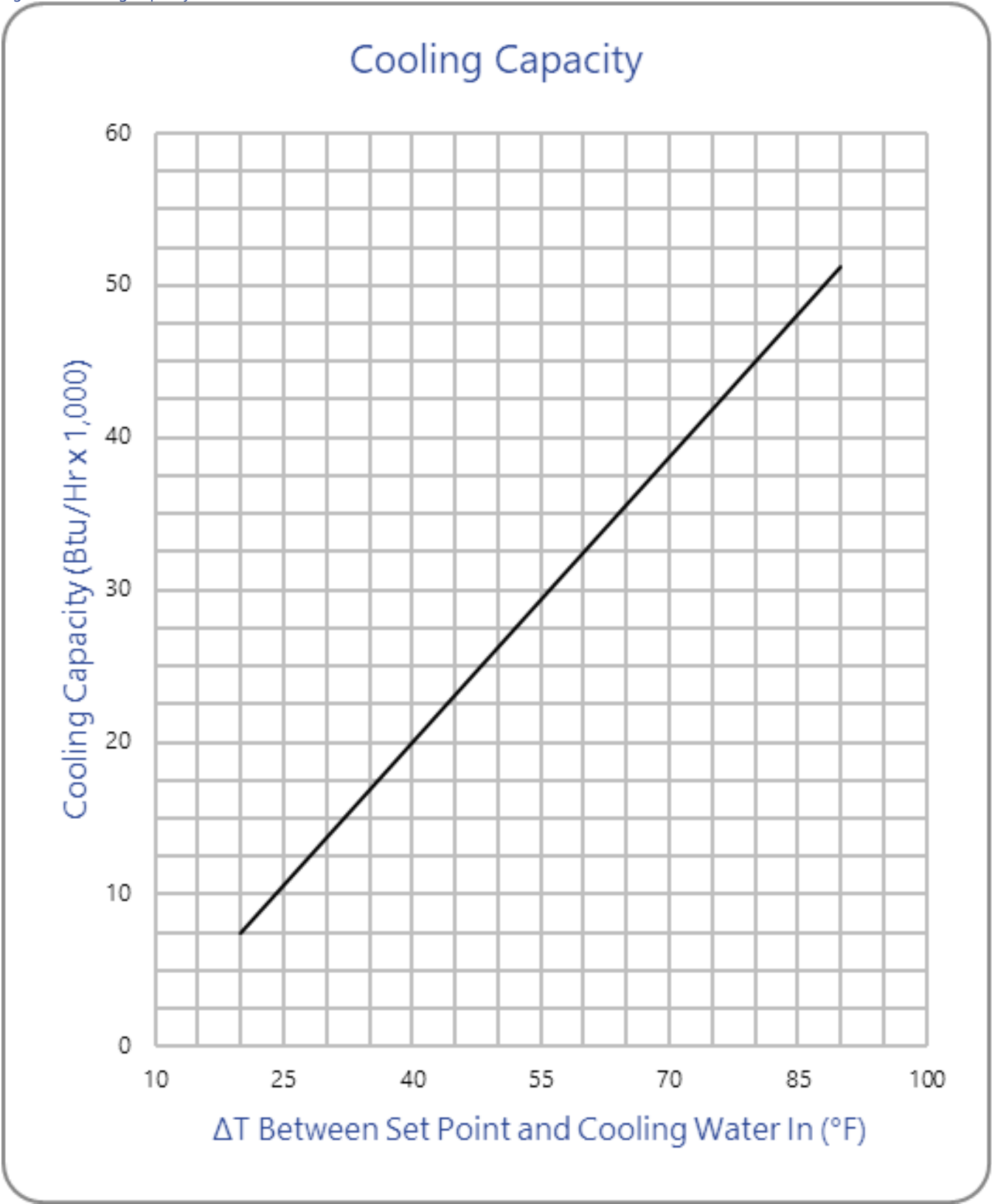


Figure 3 –High Voltage Wiring Diagram

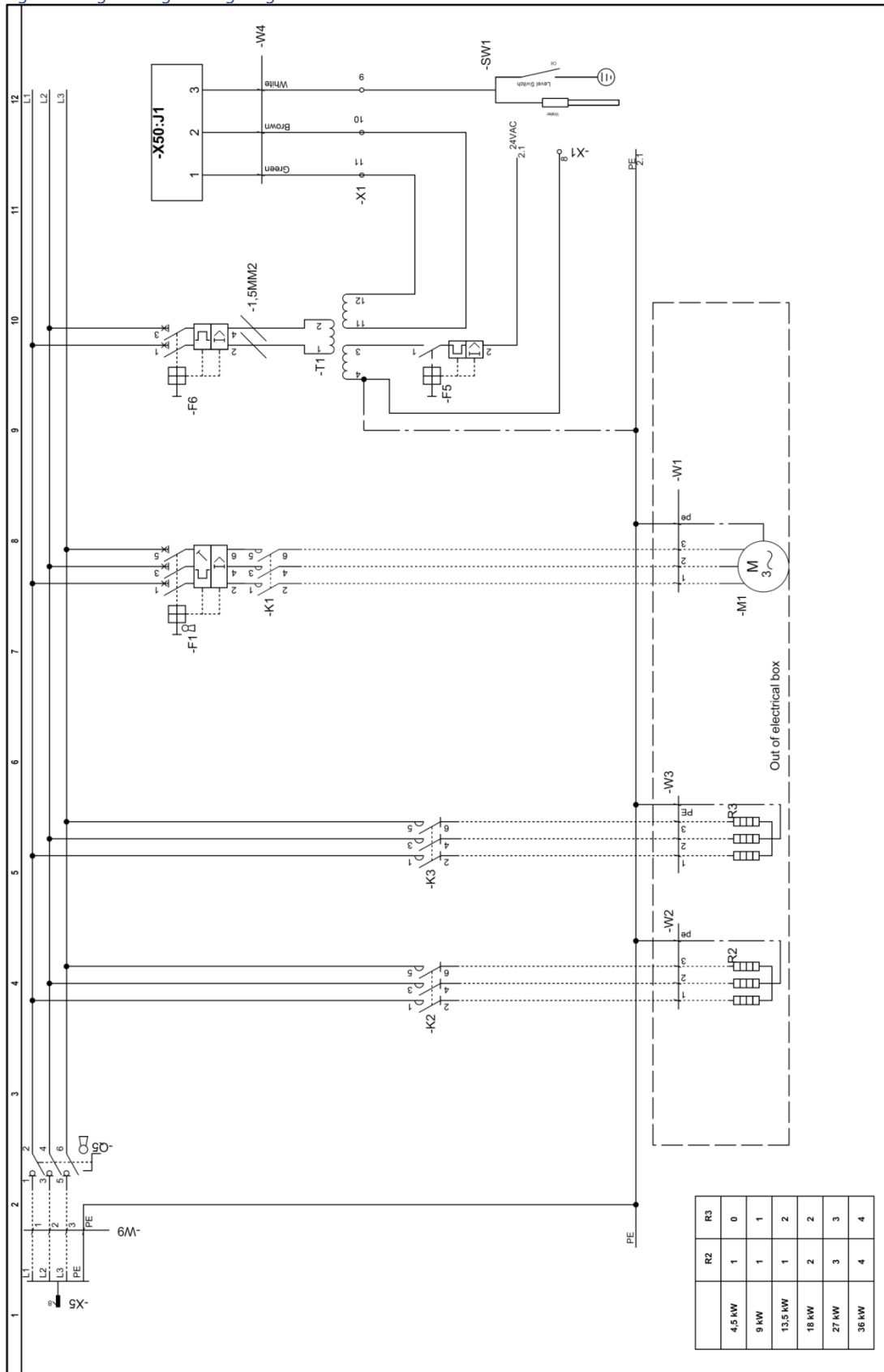


Figure 4 – Low Voltage Wiring Diagram

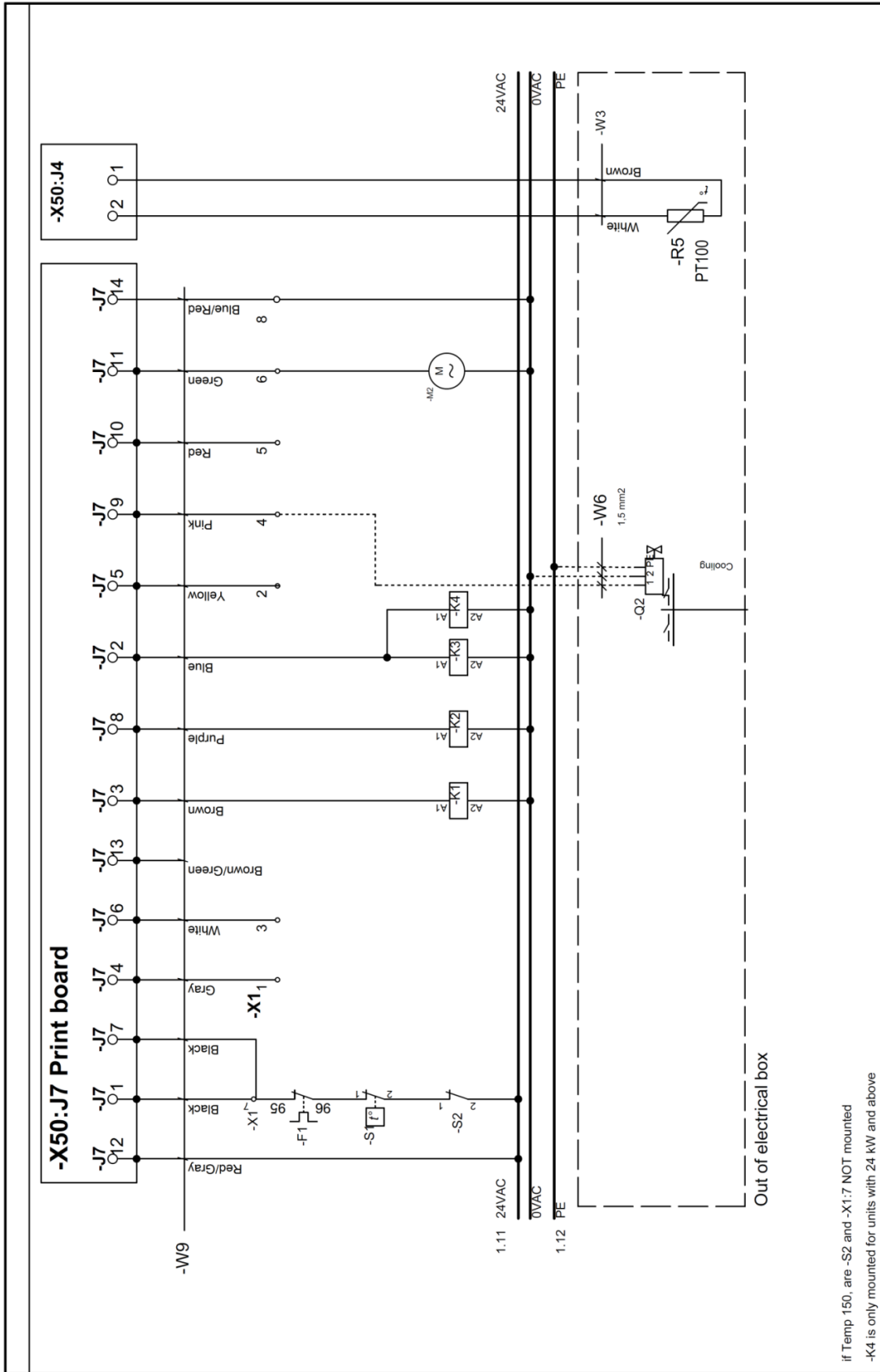


Figure 5 – Control Board Details

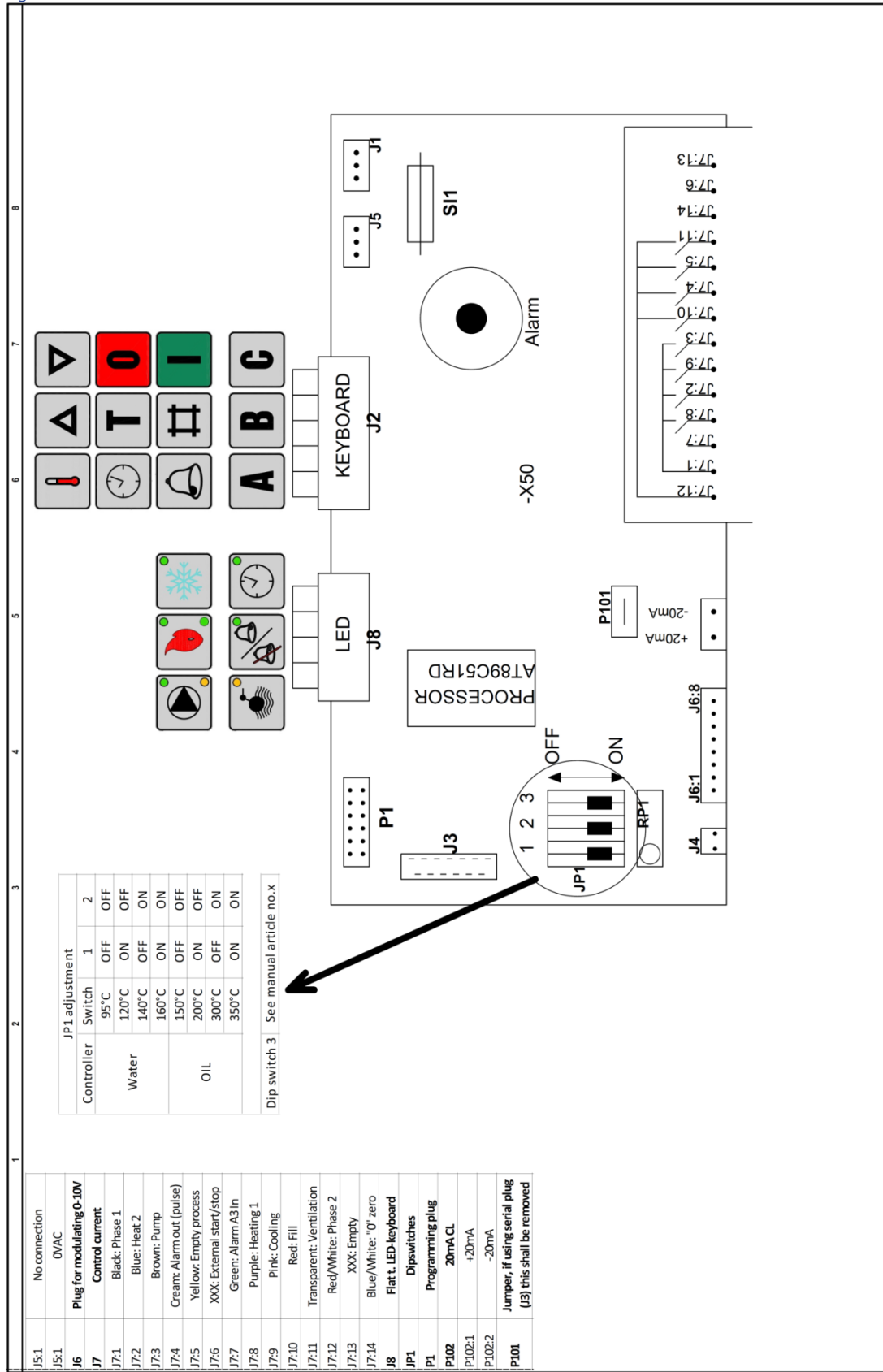
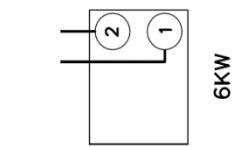
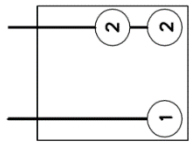


Figure 6 – Heating Element Details

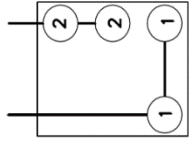
HEATING ELEMENT (HEATING 1 AND HEATING 1)



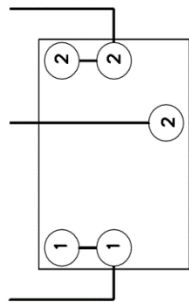
6KW



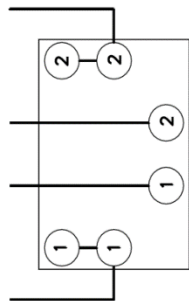
9KW



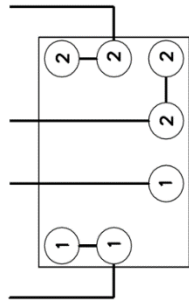
12KW



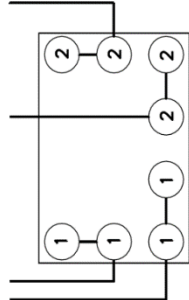
15KW



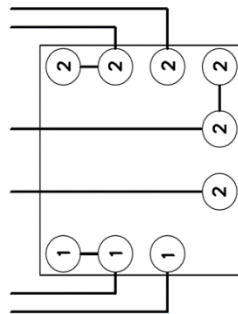
18KW



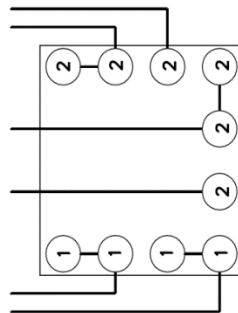
21KW



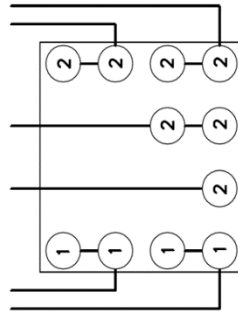
24KW



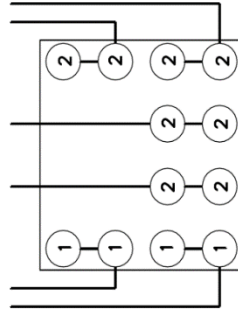
27KW



30KW

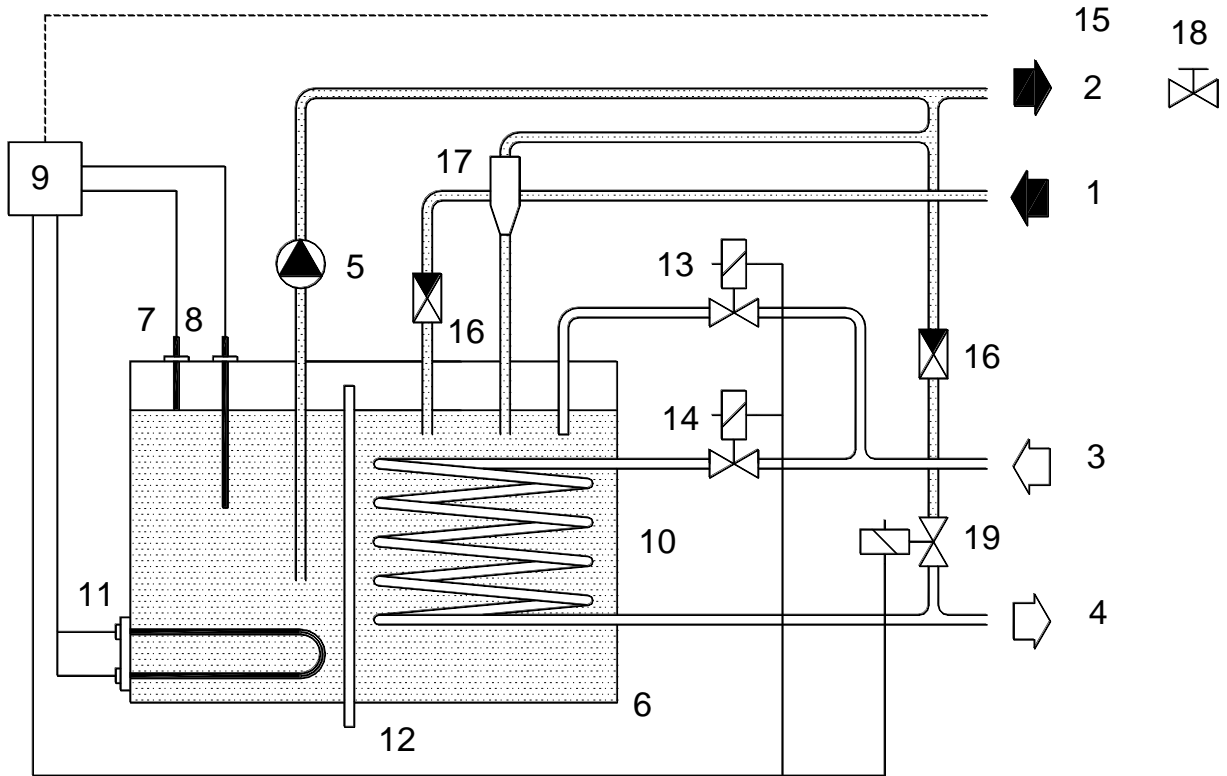


33KW



36KW

Figure 7 – Principle of Operation



1. From mold
2. To mold
3. Cooling water in
4. Cooling water out
5. Pump
6. Tank
7. Level sensor
8. Temperature sensor
9. Microprocessor control
10. Heat exchanger
11. Heating element
12. Overflow pipe
13. Solenoid valve for water filling
14. Solenoid valve for cooling
15. Connection for external sensor
16. Check valve
17. Venturi
18. Adjusting valve, vacuum
19. Solenoid valve, mold draining

## Notes

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## Notes

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## Notes

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