

## **OTI Series Water to Water Heat Exchanger Operation and Installation Manual**



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# OTI Series Water to Water Heat Exchanger Operation and Installation Manual

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## Section 1 – Preface

Thank you for choosing OPTI TEMP for your heat transfer equipment needs. We encourage your comments about our products and operation manual. Please feel free to contact us with questions or concerns at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com). We appreciate your business!

## Section 2 – About this Manual

### 2.1 General



This manual is intended to serve as a guide for placing your portable heat exchanger in service, operating it safely, and maintaining it properly. This manual will be supplemented as required to accommodate any special equipment which may have been provided for a specific application.

NOTE: The written information contained in this manual, as well as various drawings, are intended to be general in nature.

OPTI TEMP strives to maintain an accurate record of all equipment produced for the course of its useful life. While every effort is made to standardize the design features of these heat exchangers, the various options may make it necessary to re-arrange some of the components; therefore, some of the general drawings in this manual may differ from your specific unit.

We encourage all personnel to familiarize themselves with this manual's contents. Failure to do so may unnecessarily prolong equipment down time.

### 2.2 Warnings and Safety Symbols

	<p>This symbol marks chapters and sections of this instruction manual which are particularly relevant to safety</p> <p>When attached to the unit, this symbol draws attention to the relevant section of the instruction manual.</p> <p>This manual assumes the OPERATOR is non-technical with limited training and the RESPONSIBLE BODY is technical and fully trained.</p>
	<p>This symbol indicates that hazardous voltages may be present.</p>





## Section 3 – General Information

### 3.1 Safety Precautions

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, please contact our Sales Department at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).

- For safety reasons power supplies must be properly grounded. All federal, state, and local codes should be followed.
- Never use flammable or corrosive fluids with this unit.
- Do not use automobile anti-freeze. Automotive anti-freeze often contains silicates or other components that can damage your system. Only an un-inhibited glycol should be used. Use of automobile anti-freeze will void the manufacturer's warranty.
- Never place the unit in a location where excessive heat, moisture, or corrosive materials are present.
- Do not modify or seal reservoir in any way.
- Performance of installation, operation, or maintenance procedures other than described in this manual may result in a hazardous situation and may void the manufacturer's warranty.
- Transport the unit with care. Sudden jolts or drops can damage internal components.
- Observe all warning labels.
- Never remove warning labels.
- Never operate damaged or leaking equipment.
- Never operate the unit without heat transfer fluid in the reservoir.
- Always disconnect power to the unit before opening the control box.
- Always empty the reservoir before moving the unit.
- Never operate equipment with damaged power cords.
- Refer service and repairs to a qualified technician.

### 3.2 Compliance

	CE: OPTI TEMP products are conformant per EN55011A, EN61326, EN61010-1. NRTL certification to UL 61010-1 part 1 is also available.
	European RoHS: OPTI TEMP products do not fall under the scope of the RoHS directive per categories 8 (medical devices) and 9 (monitoring & control instruments).
	WEEE: OPTI TEMP products with the WEEE mark should be collected, treated, recovered and environmentally disposed of directly through the OPTI TEMP collection scheme. Contact OPTI TEMP to determine the collection scheme for that particular location. As of August 13, 2005, all cooling system products introduced to the EU will be labeled with the "Crossed Wheelie Bin" symbol.
	China RoHS: OPTI TEMP products are compliant per China RoHS guidelines. A RoHS material table, detailing the unit's contents and respective toxic or hazardous substances or element levels is displayed in Section 12.8 Specification of this manual.

### 3.3 Service and Support

OPTI TEMP is committed to customer service both during and after the sale. If you have questions concerning the unit operation, please contact our Service Department at 231-946-2931.

OPTI TEMP systems are built to provide years of trouble free service. All systems are tested prior to shipping to insure you receive the highest quality product. In the unlikely event you experience problems, rest assured our technical service staff will be available to assist you resolve any problems quickly. If your unit fails to operate properly, or if you have questions concerning spare parts or service, contact our customer service department at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).

Before calling, please refer to the serial number tag to obtain the serial number:

**Unit Serial Number** \_\_\_\_\_

## **Section 4 – Unpacking**

### **4.1 Receiving / Inspection**

Each unit is skid mounted and either boxed or crated prior to shipment depending on size and/or shipping destination. Before accepting delivery, check the overall equipment condition for any visible damage. If damage is evident the unit should be thoroughly inspected in front of the delivery driver. Any and all damage should be properly documented on the delivery receipt. Shipping damage is the responsibility of the carrier. In order to expedite payment for damages it is important that proper procedures be followed and records kept. Photographs provide an excellent means of documenting damaged equipment. Once the unit is removed from the box or crate, it should be inspected for hidden damage. Fluid lines can be susceptible to damage in transit. Check for broken lines, leaks, damaged controls, or any other major component torn loose from its mounting point.

NOTE: Any sign of damage should be recorded and a claim filed immediately with the shipping company. OPTITEMP will provide assistance in preparation and filing of your claims, including arranging for an estimate and quotation on repairs; however, filing the claim is the responsibility of the receiving party.

NOTE: You may notice a small amount of fluid in your heat exchanger system when it arrives. During the winter months (between October 1<sup>st</sup> and April 30<sup>th</sup>) a small amount of non-hazardous Propylene Glycol solution may be added to protect critical components from freeze damage. This solution can be flushed from the system prior to connecting to your process. Contact OPTI TEMP at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com) with any questions or disposal concerns.

### **4.2 Handling, Transporting and Storage**

Smaller units are normally equipped with casters (two fixed and two swivel) to provide in-plant mobility. Proper rigging methods must be followed to prevent damage to components when removing units from pallets and/or placing into the desired service location. Avoid impact loading caused by sudden jerking when lifting or lowering the heat exchanger. Use pads where abrasive surface contact is anticipated. The skid supporting the heat exchanger can be used for positioning the unit with a fork lift.

- Storage temperature: -10 to 55°C (14 to 131°F)
- Operating ambient humidity conditions: 0 to 90 % relative humidity up to 40°C (non-condensing), 10 to 50% relative humidity from 40 to 55°C (non-condensing)

### **4.3 Package Contents**

- OTI Series water heat exchanger
- Operation and installation manual
- Rubber vibration pads (optional)
- Filters and spare cartridges (optional)
- Hose Kits and/or other accessories (optional)



## Section 5 – Description

### 5.1 Overview of Liquid Heat Exchangers

The OPTI TEMP non-refrigerated heat exchanger is a re-circulating system designed to provide a continuous supply of heat transfer fluid (usually water) at a constant temperature and flow rate. The system consists of a fluid to fluid or fluid to air system, fluid pump, fluid reservoir, and is controlled by a Proportional Integral Derivative (PID) controller.

The OPTI TEMP OTI Series heat exchangers feature our PID temperature controller, which provides temperature stability. See operating temperature range limits in section “5.2 Specifications” for more information about available operating ranges of OPTI TEMP systems.

A wide range of pumps, flow controls, monitoring devices, and filtration options are provided making the OTI Series heat exchangers a flexible solution for a range of applications.



\*Standard OTI-1W to 15W Heat Exchanger

## 5.2 Specifications and Available Options

### OTI Series Fluid to Fluid Heat Exchanger: Specifications

For Laser, Semiconductor, Medical & Laboratory Applications

Proprietary Information-Please Do Not Distribute



#### Ordering Information

Description <sup>(1)</sup>		Code	OTI-1W		OTI-5W	OTI-10W	OTI-15W	OTI-20W	OTI-30W	OTI-40W	OTI-60W	OTI-100W
Standard Flow Rating	GPM @ PSI <sup>(2)</sup>		4 @ 65				5.5 @ 65	12 @ 45		15 @ 54	25 @ 59	40 @ 56
Max Available Flow Range	GPM		5.5				5.5	26		38	48	96
Pump (Standard)	HP		0.33				0.5	1		1.5	2	3
	Code		P3				P5	C2		C3	C4	C5
Connection (MNPT)	Size		0.5				0.5	1		1.25		1.5
Capacity <sup>(3)</sup>	KW		1	5	10	15	20	30	40	60	100	
	BTU/hr		3,412	17,060	34,120	51,180	68,240	102,360	136,480	204,720	341,200	
	tons		0.28	1.42	2.84	4.27	5.69	8.53	11.37	17.06	28.43	
Full Load Amps <sup>(4)</sup>	115/1/60 Hz	116	6	6	6	9.8						
	100/1/50 Hz	115	6	6	6	9.8						
	230/1/60 Hz	216	3	3	3	4.9	8	8	10	12	17	
	230/1/50 Hz	215	3	3	3	4.9	8	8	10	12	17	
	230/3/60 Hz	236	3	3	3	2	3.6	3.6	5.2	6.8	9.6	
	460/3/60 Hz	436					1.8	1.8	2.6	3.4	4.8	
Dimensions <sup>(5)</sup>	Height		22.5				27.5			45		
	Width		10				28			34.5		
	Depth		32				25			26		
Weight	lbs.		90	90	105	120	145	165	265	315	415	
Internal Reservoir	Gallon		2.5						9			
Temp Stability	°F		±0.2									
			OTI-1W	OTI-5W	OTI-10W	OTI-15W	OTI-20W	OTI-30W	OTI-40W	OTI-60W	OTI-100W	

Example: ↓  
**OTI-10W**

Select Model

(1) As a result of continuous improvement efforts, specifications are subject to change without notice or liability. (2) Pump pressures at pump discharge. (3) Capacity based on 10°C approach temperature. (4) Full load amps for models with standard pumps

		O=Optional		S=Standard		N/A=Not Available					
<b>Wetted Construction/Temperature Range Options:</b>											
Standard Non-ferrous <sup>(1)</sup>											
Fluid Temperature Range (45 to 104°F)	L	S	S	S	S	S	S	S	S	S	S
Extended Range Non-ferrous <sup>(2)</sup>											
Fluid Temperature Range (45 to 190°F)	H	O	O	O	O	O	O	O	O	O	O
Stainless Steel/Plastic Conststruction <sup>(3)</sup>											
Fluid Temperature Range (45 to 140°F)	S	O	O	O	O	O	O	O	O	O	O
High Purity (DI Compatible) <sup>(4)</sup>											
Fluid Temperature Range (45 to 140°F)	D	O	O	O	O	O	O	O	O	O	O
Specialty construction - Limited availability. <sup>(5)</sup>											
Contact applications engineering department.	C	O	O	O	O	O	O	O	O	O	O

(1) Wetted materials include Br, Cu, 304 & 316 S.S., Ni, HDPE, Polypropylene, & Clearbraid® hose. (2) Wetted materials include Br, Cu, 304 & 316 S.S., Ni. High temperature hose & stainless steel reservoir used on this model. High temperature stainless

Example: ↓

**OTI-10WL**

**Select Wetted Construction**

						OTI-1W	OTI-5W	OTI-10W	OTI-15W	OTI-20W	OTI-30W	OTI-40W	OTI-60W	OTI-100W
<b>Pumps:</b>						O=Optional      S=Standard      N/A=Not Available								
<u>Type</u>	<u>HP</u>	<u>GPM<sup>(1)</sup></u>	<u>PSI</u>	<u>Construction<sup>(2)</sup></u>										
PD	0.33	2.3	65	NF	P1	O	O	O	O					
PD	0.33	2.3	65	SS	P2	O	O	O	O					
RT	0.33	3.5	86	NF	R1	O	O	O	O					
RT	0.33	3.5	86	SS	R2	O	O	O	O					
RT	0.33	3.2	70	SS	RG	O	O	O	O					
MD	0.46	4	36	SS	M1	O	O	O	O					
MD	0.75	3.5	43	SS	M2	O	O	O	O					
PD	0.33	4	65	NF	P3	S	S	S	O					
PD	0.33	4	65	SS	P4	O	O	O	O					
PD	0.50	5.5	65	NF	P5	O	O	O	S					
PD	0.50	5.5	65	SS	P6	O	O	O	O					
RT	0.50	5	65	NF	R3	O	O	O	O					
RT	0.50	5	65	SS	R4	O	O	O	O					
CF	0.50	12	30	SS	C1					O	O	O	O	O
RT	1.00	7	70	NF	R5					O	O	O	O	O
RT	1.00	7	70	SS	R6					O	O	O	O	O
CF	1.00	18	43	SS	C2					S	S	O	O	O
CF	1.50	26	48	SS	C3					O	O	S	S	O
RT	1.50	16	69	NF	R7					O	O	O	O	O
RT	1.50	16	69	SS	R8					O	O	O	O	O
CF	2.00	30	55	SS	C4							O	O	O
RT	5.00	38	65	NF	R9							O	O	O
RT	5.00	38	65	SS	R0							O	O	O
CF	3.00	48	48	SS	C5									S

Example: ∩ (1) Pump characteristics shown represent a specific operating point on the pump curve. Actual flow characteristics will depend upon fluid circuiting and associated frictional losses. Pump upgrades may result in reduced heat removal capacities and increase

**Select Pump**      **OTI-10WL-P3**

**PD=Positive Displacement, RT=Regenerative Turbine, CF=Centrifugal, MD=Magnetic Drive**

Electrical Configuration			● = Available Voltages										
<u>Nominal</u>	<u>Operating Range</u>												
100V, 1 φ, 50 HZ	95 -110V	116	●	●	●	●							
115V, 1 φ, 60 HZ	109-126V												
110V, 1 φ, 50 HZ	105 -121V	115	●	●	●	●							
127V, 1 φ, 60 HZ	120-139V												
200V, 1 φ, 50 HZ	190 -220V	216	●	●	●	●	●	●	●	●	●	●*	
230V, 1 φ, 60 HZ	198-253V												
220V, 1 φ, 50 HZ	209 -264V	215	●	●	●	●	●	●	●	●	●	●	
253V, 1 φ, 60 HZ	217-278V												
200-220V, 3 φ, 50 HZ	180-242V	236	●	●	●	●	●	●	●	●	●	●	
208-230V, 3 φ, 60 HZ	198-253V												
380-420V, 3 φ, 50 HZ	361-462V	436					●	●	●	●	●	●	
460V, 3 φ, 60 HZ	368-506V												

Example: ∩ OPTI TEMP units are 50/60 Hz compatible. Some countries/destinations require compliance with established safety standards. Consult applications engineering for more information. \* Extended lead time. Consult applications engineering for lead time.

**Select Voltage**      **OTI-10WL-P3-116**

Controller Packages			OTI-1W	OTI-5W	OTI-10W	OTI-15W	OTI-20W	OTI-30W	OTI-40W	OTI-60W	OTI-100W
Standard Controller			O=Optional				S=Standard		N/A=Not Available		CF=Consult Factory
<i>Includes microprocessor based PID control with LED display, calibration offset, auto restart, C/F toggle, self tune, and high/low alarm.</i>											
SC1			S	S	S	S	S	S	S	S	S
Enhanced Controller											
<i>Same as the basic control plus RS-232 or RS-485 communication, via 9 Pin D-sub (male).</i>											
RS232 - Lovelink		EC1	O	O	O	O	O	O	O	O	O
RS232 - Modbus		EC2	O	O	O	O	O	O	O	O	O
RS485 - Lovelink		EC3	O	O	O	O	O	O	O	O	O
RS485 - Modbus		EC4	O	O	O	O	O	O	O	O	O
Ethernet Ready Controller											
<i>View, read, &amp; write capability via ethernet connection.</i>											
ETC			O	O	O	O	O	O	O	O	O
Programmable Logic Controller											
<i>Contact Factory for details.</i>											
PLC			O	O	O	O	O	O	O	O	O
Example: ⌵											
Select Controller			OTI-10WL-P3-116, SC1								

Factory Installed Options:				O=Optional				S=Standard		N/A=Not Available		CF=Consult Factory	
Water Quality Options													
Particle Filtration	Particle Size	Max. Flow (gpm)											
Model 5 Slim	30 µ	5	M5	O	O	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Model 10 Slim	30 µ	5	M1L	O	O	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Model 10	30 µ	10	M1T	O	O	O	O	N/A	N/A	N/A	N/A	N/A	N/A
Model 12	30 µ	20	M12	N/A	N/A	N/A	N/A	O	O	O	N/A	N/A	N/A
Model ST-1	30 µ	15	MS1	O	O	O	O	O	O	O	N/A	N/A	N/A
Model 20	30 µ	40	M20	N/A	N/A	N/A	N/A	O	O	O	O	O	O
Model LC04	50 µ	~50	LC04	N/A	N/A	N/A	N/A	O	O	O	O	O	O
Model LC08	50 µ	~100	LC08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	O
De-ionization Package													
<u>Active DI Control System</u> <sup>(1)</sup> includes monitor/control board, digital display, mixed bed resin cartridge, associated plumbing, and installation. Adjustable range 0 - 2 Mohm-cm. (Requires "S" or "D" wetted construction/temperature range option.)				D02	CF	CF	CF	CF	O	O	O	O	O
<u>Passive DI Control System</u> includes resistivity indicator lamp, resin cartridge, associated plumbing, and installation. Avail. with 200KOhm or 1 Mohm Indicator lamps. (Requires "S" or "D" wetted construction/temperature range option.)				D01	CF	CF	CF	CF	O	O	O	O	O
pH Control Package													
Controls pH of De-ionized water. Includes monitor/controller, probe, resin cartridges, plumbing, installation, and "Active DI Control System" (D02). (Requires "S" or "D" wetted construction/temperature range option.)				PH1	CF	CF	CF	CF	O	O	O	O	O
UV Filtration <sup>(1)</sup>													
High Intensity UV lamp. Effective against disease causing microbes. (Requires Requires D01 or D02 De-ionization Package ).				UVB	CF	CF	CF	CF	O	O	O	O	O
Resistivity Alarm Contacts				RR1	CF	CF	CF	CF	O	O	O	O	O
Resistivity Retransmission (0 - 10 VDC)				RR2	CF	CF	CF	CF	O	O	O	O	O

(1) Some options may not available on OTC-.25A, .33A, & .5A when equipped with active DI Control System.

(1) Some options may not available on OTC-.25A, .33A, & .5A when equipped with active DI Control System.

		OTI-1W	OTI-5W	OTI-10W	OTI-15W	OTI-20W	OTI-30W	OTI-40W	OTI-60W	OTI-100W
Factory Installed Options Cont.:		<div> <div>O=Optional</div> <div>S=Standard</div> <div>N/A=Not Available</div> <div>CF=Consult Factory</div> </div>								
<b>Fluid Monitoring &amp; Control Options</b>										
Low Flow Indicator w/ indicator lamp & contacts	LF1	O	O	O	O	O	O	O	O	O
Flow Meter & Digital Display	FS1	CF	CF	CF	CF	O	O	O	O	O
Critical Water Level Safety Switch	CW1	S	S	S	S	S	S	S	S	S
Low Water Indicator lamp	LW1	O	O	O	O	O	O	O	O	O
Pressure Gauge (for "S" & "D" Wetted Const. options)	PG1	O	O	O	O	O	O	O	O	O
Pressure Gauge (for "L" & "H" Wetted Const. options)	PG2	O	O	O	O	O	O	O	O	O
Pressure Transducer & Digital Display	PT1	CF	CF	CF	CF	O	O	O	O	O
Anti Drain Back Valve Package (S & D Wetted Const.)	AD1	O	O	O	O	O	O	O	O	O
Anti Drain Back Valve Package (L & H Wetted Const.)	AD2	O	O	O	O	O	O	O	O	O
Reservoir Check Valve	AD3	O	O	O	O	O	O	O	O	O
Audible Alarm w/Silence	AA1	O	O	O	O	O	O	O	O	O
Audible & Visual Alarm Beacon	AV1	O	O	O	O	O	O	O	O	O
Remote Start/Stop via 24VDC	RS1	O	O	O	O	O	O	O	O	O
<b>Remote Control Tether Package</b>										
Remote controls on tether (up to 100 ft. in length). Includes PID control interface, start/stop, faults.	RC1	O	O	O	O	O	O	O	O	O
Remote Temperature Sensing	RT1	CF	CF	CF	CF	CF	CF	CF	CF	CF
<b>Other Factory Options</b>										
Heater Package <sup>(2)</sup> (Requires Extended Range wetted construction/temperature range option) (Capacity-kW)	HT1	O	O	O	O	O	O	O	O	O
Side Mounted Filter Housing	SF1	CF	CF	CF	CF	CF	CF	CF	CF	CF
CPC Fittings	CPC	CF	CF	CF	CF	CF	CF	CF	CF	CF
Silicon Hose	SBH	CF	CF	CF	CF	CF	CF	CF	CF	CF
Phase Monitor	PM1	CF	CF	CF	CF	CF	CF	CF	CF	CF
Reservoir Construction (Stainless Steel) <sup>(3)</sup>	RE1	O	O	O	O	O	O	O	O	O
Outdoor Operation Package	OD1	CF	CF	CF	CF	CF	CF	O	O	O
OPTI TEMP Patented Control Circuitry	OTP	S	S	S	S	S	S	S	S	S
Reservoir Drain Kit	RDK	O	O	O	O	O	O	O	O	O
Sound Reduction Package	SR1	O	O	O	O	O	O	O	O	O
Fluid Circuit Insulation (internal) <sup>(3)</sup>	FC1	O	O	O	O	O	O	O	O	O
Manifolds	MA1	CF	CF	CF	CF	CF	CF	CF	CF	CF
25 Ft Power Cord	PC1	O	O	O	O	O	O	O	O	O
Castors	CA1	S	S	S	S	S	S	S	S	O
<b>Compliance/NRTL Certifications</b>										
CE	NR1	S	S	S	S	S	S	S	S	S
CSA	NR2	O	O	O	O	O	O	O	O	O
UL 61010	NR3	O	O	O	O	O	O	O	O	O
UL 1995	NR4	O	O	O	O	O	O	O	O	O
One Year Extended Warranty	W01	O	O	O	O	O	O	O	O	O
Re-Usable International Rated Shipping Crate	CTE	O	O	O	O	O	O	O	O	O
<b>Select Options</b> <div> Example: ↓ (1) UV System option includes a circulation pump upgrade for the De-ionization package. (2) Contact factory for amp draws on units with heaters. (3) Fluid circuit insulation standard for high temperature (Extended Range) package. </div>		<b>OTC-5AL-C1-116, EC1, D01</b>								

### **5.3 Description Standard System Components**

#### **Coolant Circuit**

The pump draws coolant from the reservoir and circulates it to the process and returns it to the heat exchanger. It is in the heat exchanger where the heat is transferred from the coolant to the cooling fluid. Adjusting the amount of heat transferred in the heat exchanger controls the temperature of the coolant being delivered to the process. There is a reservoir float and flow switch (optional) in the coolant circuit to serve as safety controls. There is also a thermocouple to sense the temperature of the coolant being delivered to process and communicates this temperature to the microprocessor based PID temperature controller. An adjustable bypass valve allows the heat exchanger to operate with sufficient flow through the evaporator even if the flow is restricted or completely shut off through the process.

NOTE: Closing the bypass valve off too far may result in a situation that could damage components in the heat exchanger. The main purpose of the bypass line is to avoid deadheading of the pump and reduce the possibility of heat exchanger damage. See Section 7.8 for more information on adjusting the bypass valve.

#### **Fluid to Air Heat Exchanger**

This component is only used in the air cooled heat exchangers. The heat exchanger is constructed of heavy gauge copper tubing and aluminum fins for maximum heat transfer capabilities. The heat exchanger has been generously sized so the heat exchanger can operate with full cooling capacities in ambient air temperatures of up to 95°F (35°C). When the ambient air temperatures are above 95°F (35°C) the heat exchanger will lose approximately 1% of its cooling capacity per 1°F (0.5°C) above 95°F (35°C). The heat exchanger should be able to operate with ambient temperatures of up to 110°F (43°C). The fan(s) draw the air flow through the fin tubes and blows the warm discharge air through the heat exchanger cabinet and out the other side. The fan(s) are designed to draw sufficient air flow through the heat exchanger as long as there are no obstructions. The fan(s) are not capable of drawing air in through ductwork on the intake or discharging air through ductwork on the exhaust. The discharge air will be significantly warmer than the intake air.

#### **Fluid to Fluid Heat Exchanger**

The standard heat exchanger is constructed of stainless steel plates and copper brazing. (An optional "nickel brazed" evaporator is available with the high purity construction option.) The house coolant passes between every other set of plates, while the process coolant flows on the other side of the plates in the opposite direction.

#### **Modulation Valve (On Fluid to Fluid Units Only)**

The standard modulation valve is sized to provide optimum pressure drop and control of the house cooling fluid to the heat exchanger. These valves actuate as the temperature controller calls for more or less cooling on the process coolant side.

#### **Reservoir**

The reservoir material will vary depending upon the materials of construction option selected. There is a removable cover on the top of the reservoir. During heat exchanger operation the reservoir should be at least half full. For most installations the reservoir has sufficient capacity to handle coolant drain back from the process equipment which occurs during heat exchanger shut down. For installations with overhead piping special precautions will have to be made during installation. Contact OPTI TEMP customer service department for details at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).

NOTE: The reservoir must not be pressurized. Modifications to the heat exchanger that would result in pressurization of the reservoir will void the warranty.

### **Coolant Pump**

The standard close coupled pump is typically equipped with a mechanical seal. Material of construction and seal type will vary by model and the options selected. The pump is factory tested for the specified operating conditions and meets NEMA specifications / industry standards.

### **5.4 System Construction Standards**

OPTI TEMP standard heat exchangers are designed with NEMA 1 construction suitable for indoor use. Unless the unit was specifically ordered with NEMA 4 construction for outdoor duty, it should not be installed or stored in an outdoor location.

## **Section 6 – Installation**

### **6.1 Heat Exchanger Location**

The OPTI TEMP units that utilize air-cooled systems must be placed in well ventilated areas only. Air is drawn and/or discharged through the front, rear, side and top panels of the unit. The unit must be located so the intake and discharge air is not restricted. A minimum clearance of “one width” of the unit is suggested on all vented sides. Failure to provide adequate ventilation may cause a reduction in cooling capacity, excessively high temperatures, and/or pre-mature failure.

Never place the unit in a location where excessive heat, moisture, airborne oils, or corrosive materials are present. The unit should be periodically cleaned to insure optimum performance. A regular maintenance schedule based on operating conditions is recommended. Please reference Section 8 of this manual for more information. Please note that oil, dust, and/or other airborne agents can build up on air-cooled condensers resulting in a decrease in performance or system failure.

NOTE: Serviceability was a primary concern when designing your portable heat exchanger. Removable panels permit easy access for periodic maintenance or repair. Do not compromise this feature by locating the heat exchanger in an inaccessible area.

NOTE: The air inlet temperature should be maintained above 32°F (0°C) in order to avoid possible freezing. If it is necessary to store the heat exchanger in an unheated area when not in use, be sure that all water is drained or that an adequate amount of antifreeze is added to prevent freeze-up of the unit.

### **6.2 House Water Fluid Requirements**

The house water temperature should be 10°C colder than the desired process temperature for optimum performance. See below table for flow and pressure requirements according to Heat Exchanger size.

MODEL	OTI-5W OTI-10W	OTI-15W OTI-20W	OTI-30W	OTI-40W	OTI-60W	OTI-100W
Flow (GPM)	4	5.5	12	15	25	40
Pressure(PSIG)	Between 10 and 100 PSIG					

### **6.3 Process Fluid Connection**

Connect “TO PROCESS” and “FROM PROCESS” connections on rear of heat exchanger to your process lines. Standard process connections provided on OTI Series heat exchangers are stainless steel male pipe fittings. See specifications table in Section 5.2 for connection sizes on specific heat exchanger models. It is suggested that valves be installed on the “TO PROCESS” line and “FROM PROCESS” line at the OPTI TEMP unit to be used as balancing valves and to isolate the heat exchanger should maintenance be required on the unit.



**Recommended Hose Selection Table**

Standard Model OTI	Standard Flow Rating	Minimum Hose Size	Hose Length from Machine
1W, 5W, 10W, 15W, 1A, 2A, 5A, 10A, 15A	4 GPM @ 65 PSI 5.5 GPM @ 65 PSI	$\geq \frac{3}{4}$ " ID $\geq 1$ " ID	< 10' > 10'
20W, 30W 20A, 30A	12 GPM @ 53 PSI	$\geq 1\text{-}1/4$ " ID $\geq 1\text{-}1/2$ " ID	< 10' > 10'
40W, 60W	15 GPM @ 54 PSI 25 GPM @ 59 PSI	$\geq 1\text{-}1/2$ " ID $\geq 2$ " ID	< 10' > 10'
100W	40 GPM @ 56 PSI	$\geq 2$ " ID $\geq 2\text{-}1/2$ " ID	< 10' > 10'



CAUTION: Under-sizing the process hose will result in greater than typical pressure drop and may cause inadequate process pressure to be delivered. This may harm your process equipment and/or cause unnecessary wear on the heat exchanger motor and pump.



CAUTION: The fittings are connected to a manifold plate attached to the unit. Do not over tighten fittings or failure may occur.



CAUTION: Never connect the fittings to your building water supply or any pressurized water source.

#### **6.4 Chilled Water Lines**

All chilled water piping should be adequately insulated to prevent condensation. If water is allowed to condense on the piping, the state change of the water from gas to liquid will result in a substantial heat load which becomes an additional burden for the heat exchanger.

Standard portable heat exchangers have been designed for a nominal flow of 2.4 GPM per ton at nominal conditions. The nominal flow rate for each heat exchanger is shown above in the Recommended Hose Selection Table. This table also provides the maximum flow rate for each heat exchanger. The maximum flow rate should not be exceeded unless the heat exchanger was specifically ordered to handle high flow conditions. If the process cannot handle the full nominal flow from the heat exchanger, the excess water flow will simply bypass the process through the bypass line inside the heat exchanger.

The importance of properly sized piping between the heat exchanger and process cannot be overemphasized. 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 heat exchanger performance is poorly designed piping. Avoid unnecessarily long lengths of hoses or quick disconnect fittings which offer high resistance to water flow.

When manifolds are required for water distribution, they should be installed as close to the use point as possible. Provide flow balancing valves at each machine to assure adequate water distribution in the entire system.

### Suggested Overhead Pipe Sizing Table

Pipe Size	Max. Flow Rate (GPM)
1/2"	2
3/4"	5
1"	10
1 1/4"	20
1 1/2"	30
2"	50
2 1/2"	90
3"	160

\*Based on standard weight schedule 40 black iron or PVC schedule 80 pipes.

NOTE: It is recommended that good piping practices are followed and that the information in this manual is adhered to. We cannot be held responsible for liabilities created by substandard piping methods and installation practices external to the heat exchanger.

#### 6.5 Overhead Piping and Drain Back Prevention

Depending on the length of hoses/piping and therefore the amount of fluid contained in the system, fluid may drain back causing the reservoir to overflow when the unit is turned off during shut down periods. This problem can be eliminated by locating the unit so the reservoir is at the same level or above the system; or a check valve can be installed in the process supply line and a solenoid valve installed in the process return line to prevent drain back. Contact OPTI TEMP for further information at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).



CAUTION: The OPTI TEMP system is designed as an "open system" with the top of the reservoir at atmospheric pressure. Do not connect any fittings to the cover of the reservoir or pressurize the reservoir in any way or damage to the system and/or personal injury could result. The reservoir is designed to be filled manually.

#### 6.6 Electrical Connection

Refer to the serial number tag for the specific electrical requirements of your unit. Ensure the voltage of the intended power source meets the specified voltage requirement. See reference electrical requirement table below. Power must be provided through a circuit breaker or a switch-able "fused disconnect" in close proximity to the unit and within easy reach of the operator.

If the nominal supply voltage does not fall within the range specified in the table below a transformer will be required. Transformers are provided in certain OPTI TEMP models depending on voltage configuration selected. For more information contact OPTI TEMP sales or engineering at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).

NOTE: Check pump rotation on 3 phase units at this time. Follow the instructions on the tag attached to the power cord.

NOTE: All electrical service installation should be performed by a qualified electrician in accordance with all applicable code.

NOTE: Due to variation in required plug configurations OPTI TEMP units are shipped without a plug on the power cord.

**Electrical Voltage Range Table**

<u>Nominal</u>	<u>Operating Range</u>	
100V, 1 $\phi$ , 50 HZ	95 -110V	116
115V, 1 $\phi$ , 60 HZ	109-126V	
110V, 1 $\phi$ , 50 HZ	105 -121V	115
127V, 1 $\phi$ , 60 HZ	120-139V	
200V, 1 $\phi$ , 50 HZ	190 -220V	216
230V, 1 $\phi$ , 60 HZ	198-253V	
220V, 1 $\phi$ , 50 HZ	209 -264V	215
253V, 1 $\phi$ , 60 HZ	217-278V	
200-220V, 3 $\phi$ , 50 HZ	180-242V	236
208-230V, 3 $\phi$ , 60 HZ	198-253V	
380-420V, 3 $\phi$ , 50 HZ	361-462V	436
460V, 3 $\phi$ , 60 HZ	368-506V	

## Section 7 – Operation and Start Up

### 7.1 General Start Up Information

All heat exchangers are fully tested prior to shipping. Readings of voltage, amperage, water inlet and outlet temperatures, water flow rates, etc., are recorded to make sure that all system components are performing up to their specifications. Every unit is factory set to deliver chilled water in accordance with the standard operating specifications for that particular heat exchanger. Due to variables involved with different applications and different installations, minor adjustments may be required during the initial start-up to ensure proper and satisfactory operation. If trouble is encountered when putting a heat exchanger in operation, the fault can usually be traced to one of the control or safety devices. The following should be used as a checklist for the initial start up and for subsequent start ups if the heat exchanger is taken out of service for a prolonged period of time.

1. Assure the main power source is connected properly and that it matches the voltage shown on the nameplate of the unit. Once proper power connection and grounding have been confirmed, turn the main power on.
2. Check to make sure that all process water piping connections are secure. Remove the top panel from the heat exchanger and the screw cap from the top of the reservoir. Fill the reservoir with the proper water or water/glycol solution as described in section 7.2 below.

## 7.2 Operating Temperature Range Limits

OPTI TEMP systems are designed to operate at fluid temperatures within a certain specified temperature range. All systems are not designed to operate over the same range. It is important that you do not operate the system outside of this intended range. Please refer to the specifications in section 5.2 Specifications and Available Options for details on the operating temperature limits.



**CAUTION:** Do not operate units outside recommended temperature range. System damage and/or personal injury may result.

## 7.3 Fluid Selection, Water Quality and Corrosion Protection

Generally, OPTI TEMP recommends the use of distilled or de-ionized water instead of tap water because tap water often has high level of total ionized solids which can accelerate corrosion. These contaminants function as electrolytes which increase the potential for galvanic corrosion. Tap water in the US averages 175 ppm sodium chloride (NaCl). The recommended level for NaCl is between 0.5 to 5 ppm.

Normally OPTI TEMP recommends that systems, which require a fluid conductivity below 240 microsiemens/cm, utilize stainless steel construction. Systems where conductivities are permitted to be above 240 microsiemens/cm may use a corrosion inhibitor such as OPTISHIELD® to control corrosion and extend system life. Visit [www.optishield.net](http://www.optishield.net) for more information regarding OPTISHIELD®.

There are a wide variety of alternative heat transfer fluids are available for use in re-circulating systems. However not all fluids are compatible with all materials of construction. Contact OPTI TEMP to insure fluid compatibility before utilizing heat transfer fluids other than water, distilled water, de-ionized water, Ethylene Glycol, or Propylene Glycol to insure warranty terms are not violated.

## 7.4 Control Interface Layout

Please take a few minutes to familiarize yourself with the controls before starting your heat exchanger unit.

### Electrical Box Layout



## 7.5 Fluid Fill

Fill the reservoir to within 2" (50 mm) from the top of the reservoir or fill port (or as noted with the sight glass on certain models) with the proper heat transfer fluid.

It is recommended that the unit be allowed to run for a few minutes before the reservoir is completely filled. This allows the air to bleed from the lines more easily. Vent the air out of the system. It is helpful to open a valve or a fitting at the system high point (while the system is running) and bleed the air until fluid starts to flow, then close the valve or retighten the fitting.

## 7.6 Starting the Unit

Turn on the unit; flip the toggle switch to "ON" position. The unit will initialize and conduct a self test. If there is adequate fluid in the system it will then start. There is a float switch in the reservoir that will turn on the "PUMP ALARM" light and stop the unit if the fluid level falls below a float level. This is likely to happen the first time you fill the system. If this happens, flip the toggle switch to the "OFF" position, fill the unit again with the heat transfer fluid and repeat this procedure until the system is filled.



**CAUTION:** Check pump rotation on 3 phase units at this time. Follow the instructions on the power cord tag if the pump rotation is not correct. Incorrect pump rotation will eventually cause internal component damage!

## 7.7 Temperature Setting and Adjustment

OPTI TEMP systems are designed to operate within a certain specified temperature range. All systems are not designed to operate under or over the range. It is important that you do not operate the system outside of this intended fluid operating range. Please refer to Section 5.2 for the operating range of your system.



**CAUTION:** System damage and/or personal injury may result if you fail to operate in the specified temperature range.

### Love Controller



This will discuss the basic control operation and the basic settings. For more complete instruction on the operation of the temperature controller and available options, please refer to the Instruction Manual for the temperature controller included with this manual.




There are two digital display windows on the temperature controller. The upper window displays the actual temperature of the fluid going to the process or the "PROCESS VALUE". The lower window displays the "SET VALUE" of the controller.

There are several lights under the "SETPOINT VALUE" window on the controller.

From left to right, the lights are:

- The "AT" light. This will light to indicate the control is in auto tune mode. For more information on the auto tune mode please consult the temperature controller manual.
- The next light is "OUT1" that will light if the unit is in the cooling mode.
- The next light is "OUT2" that will light if the unit is in the (optional) heating mode.
- The last light is the "ALM" light. This is the "OUT OF TOLERANCE" alarm for the unit. This has been set at the factory to light if the process temperature is too low or too high ( $\pm 3^{\circ}\text{C}$  ( $5^{\circ}\text{F}$ ), see Control Parameter Settings Sheet in the Appendix). The pump will remain in operation. It will sound the audible alarm (optional).

### **Set Point #1**

To change the primary temperature set-point, use the "UP ARROW" () to raise the set point or "DOWN ARROW" () to lower the set point to the desired temperature. When the desired temperature appears in the upper window, press "ENTER" () to store the new temperature.

### **Setting the PID Parameters**

This temperature controller is arranged to provide PID temperature control. Under PID control, the temperature controller anticipates cooling and heating requirements and will institute these control activities in anticipation of the load requirements to give more stable temperature control to the process. This temperature controller's PID constants are preset at the factory.

For more information on these features, please see the temperature controller manual.

## **7.8 Fluid Bypass Valve Setting and Adjustment**

The heat exchanger is equipped with a mechanical pressure-activated internal bypass valve. The bypass valve comes factory set. If you do not want to operate at the factory set pressure, or do not know what your operation pressure should be, start at a lower operation pressure. Reduce the pressure by loosening the lock ring and turning the bypass valve counterclockwise (unscrew outward) before starting the heat exchanger. It may be necessary to remove an access cap on the bypass valve.

With the heat exchanger fully connected and running, read a pressure gage attached to your process fluid line and turn the bypass adjustment knob clockwise to reach your desired pressure. Tighten the lock ring when finished.

**Bypass Set-Point Table**

Standard Model OTI	Standard Pump	Pump ID	Factory Set-point
1W, 5W, 10W, 15W 1A, 2A, 5A, 10A, 15A	1/3 HP and ½ HP motor and positive displacement pump	P1, P3	65 PSI
20W, 30W 20A, 30A	1 HP motor and centrifugal pump	C2	45 PSI
40W	1.5 HP motor and centrifugal pump	C3	55 PSI
60W	2 HP motor and centrifugal pump	C4	65 PSI
100W	3 HP motor and centrifugal pump	C5	65 PSI

NOTE: Couplings and clamps are preferred to quick connect fittings because they have the potential for restricting the flow rate.



CAUTION: Please contact OPTI TEMP if your process is equipped with a valve, which may periodically interrupt flow to the process. Bypass settings may be critical to protect the system from damage!

It is recommended that the valve in the supply line to the process be throttled (closed slowly) until the bypass valve just starts to feed. By putting your hand on the valve and bypass line you will be able to feel when the valve starts to open. This allows the air to be cleared from the bypass line.

### 7.9 System Fluid Drainage

1. Remove power from the unit.
2. Using the system drain connection (if applicable) open the petcock drain, located on the unit and drain as much fluid as possible.
3. After the fluid system drain has been opened and fluid has left the unit, disconnect the process connections from the chiller.
4. Drain any additional fluid out of the process connections.
5. Unscrew the filtration housings (if applicable) from their top and empty the fluid trapped inside the filter housing. Screw back on the emptied filter housings.
6. Close the system drain, screw a cap on the process fluid connections and the system is now ready for transport in warm climates.

Additional procedures for cold climate conditions:

1. Apply power back to the unit.
2. Add enough propylene glycol into the fluid reservoir to ensure the fluid tank level float is met. Typically this requires > 25% of the fluid reservoir to be filled.
3. Connect a short-circuit loop hose to the process supply and process return connections.
4. Turn the unit on for approximately 30 seconds to ensure the propylene glycol has had a chance to contact all of the wetted internal components.
5. Turn off the chiller and remove power from the unit.
6. Open the system drain connection (if applicable). Drain as much fluid as possible.
7. Disconnect the process connections and allow any additional fluid to leave the unit.
8. Close the system drain and screw a cap on the process fluid connections. The unit is now ready for transport in cold climates.

## Section 8 – Maintenance

Once your portable heat exchanger has been placed into service, the following maintenance procedures should be adhered to 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 heat exchanger. Any monetary costs of implementing these procedures will almost always more than pay for it. To make this as simple as possible, a checklist should be prepared which lists the recommended service operations and the times at which they are to be performed. At the end of this section we have included a checklist that can be used for this purpose. Notice that there are locations for voltage readings, amperages, etc. so that they can be monitored over time. With this information, maintenance personnel may be able to correct a potential problem before it causes any downtime. For best results, these readings should be taken with a full heat load from process, preferably with similar operating conditions each time. The following is a list of suggested periodic maintenance:

**Preventative Maintenance Table**

**Model #:** \_\_\_\_\_ **Serial #:** \_\_\_\_\_

Maintenance Activity	Week Number												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Date													
Check Fluid Level													
Check for Leaks													
Clean Heat Exchanger (Air Cooled Units)													
Check Particle Filter													
Check DI Filter (optional)													
Check Fan Blades													
Check Fluid Bypass													
Oil Process Pump													
Change Process Fluid													
Check Amp Draw													
Change Particle Filter													



## Section 9 – Troubleshooting



**CAUTION:** Risk of electrical shock! Disconnect switch required to de-energize the equipment before servicing.

The following troubleshooting guide is based on standard OPTI TEMP units. For custom units, please refer to the Appendix for additional instruction sheets.

Problem	Possible Cause	Remedy
Pump will not start	No incoming power	Check incoming power and disconnect
	Fuses	Check fuse, replace if faulty
	Fluid level drops below critical level	Check for leaks and fill fluid reservoir
	Pump failure	Replace if faulty
	Pump contactor	Replace if faulty
	Pump overload	Check voltage, amperage, pump contactor, wiring and overload set-point
Low water discharge pressure	Pump running backwards	Switch 2 legs of incoming power
	Bypass opening too easily	Adjust bypass valve
	Pump failure	Replace if faulty
	Excessive flow thru bypass valve	Adjust bypass valve
High water discharge pressure	Bypass tightened too much	Adjust bypass valve
	Closed valves in process piping	Open valves
	Obstruction in piping or process	Remove obstruction
Deviating temperature controller	Low coolant flow through the heat exchanger	Adjust bypass valve
	Intermittent overloading of heat exchanger capacity	Check to make sure the heat exchanger is properly sized for the process load
	Temperature controller failure	Replace if faulty
	Thermocouple	Replace if faulty
Insufficient cooling (temp rises above set-point)	Process load too high	Check to make sure the heat exchanger is properly sized for the process load
	Coolant flow through heat exchanger too high or too low	Adjust bypass valve
	Temperature controller failure	Replace if faulty
	Thermocouple	Replace if faulty

## Section 10 – Replacement Parts

OPTI TEMP recommends that our customers running critical applications have a stock of replacement parts available, in case of malfunction due to regular wear and tear of the heat exchanger. The following list has been compiled to assist the customer to differentiate which items are desired when considering replacement parts.

**Recommended Spare Parts Table**

Part Name
Motor
Pump Head
Bypass Valve
Temperature Controller
Fuse
Thermocouple and Fittings
Float Switch
Optional Heater

## Section 11 – Warranty and Service

OPTI TEMP is committed to customer service both during and after the sale. If you have questions concerning the unit operation, please contact our customer service department at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).

OPTI TEMP systems are built to provide years of trouble free service. All systems are tested prior to shipping to insure you receive the highest quality product. In the unlikely event you experience problems, rest assured our technical service staff will be available to assist you resolve any problems quickly. If your unit fails to operate properly, or if you have questions concerning spare parts or Service, contact our customer service department at 231-946-2931 or [information@optitemp.com](mailto:information@optitemp.com).

Before calling, please refer to the serial number tag to obtain the serial number:

**Unit Serial Number** \_\_\_\_\_

### **OPTI TEMP's Standard Limited Warranty**

OPTI TEMP INC. warrants all equipment manufactured by it to be free from defects in workmanship and material when properly installed, operated, and maintained, in accordance with OPTI TEMP installation and operating guidelines, for a period of one year from the date of shipment to the original purchaser. The manufacturer's obligation is strictly limited to the repair or replacement, at its option, any parts thereof which are returned to the factory, freight prepaid, during the warranty period and which upon inspection shall disclose to manufacturers satisfaction, to be defective. OPTI TEMP's liability does not include any labor charges for replacement of parts, adjustments, repairs, or any other work done outside its authorized repair facilities. OPTI TEMP's obligation to repair or replace shall not apply to any products which have been repaired or altered outside an OPTI TEMP authorized repair facility in any way, or which has been subject to negligence or misuse. OPTI TEMP's liability does not include any resulting damage to persons, property, equipment, goods or merchandise arising out of any defect in, or failure of, its product, or by delays in shipment or delivery. The purchaser's rights under this agreement may not be assigned to any other person or entity, expressly or by implication, without manufacturer's prior written approval. The Warranty shall be deemed void if buyer fails to perform any of its obligations to seller. No claim of "breach of warranty" shall be cause for cancellation or rescission of the "contract of sale" for any system. The Company shall not be liable for failure to perform any obligation with respect to buyer resulting directly or indirectly from, or contributed to, by Acts of GOD; Acts of Buyer; Civil or Military Authority; Fires; Strikes or other Labor Disputes; Accidents; Floods; Epidemics; War; Riots; Delays in Transportation; Inability to Obtain Raw Materials, Components, Labor, Fuel or Supplies; Or Any Other Circumstance beyond the seller's reasonable control whether similar or dissimilar to the foregoing.

THE FOREGOING EXPRESS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. OPTI TEMP'S OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE COMPONENT PARTS AND OPTI TEMP INC. DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION. OPTI TEMP ASSUMES NO RESPONSIBILITY FOR INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO LOSS OR DAMAGE TO PROPERTY, LOSS OF PROFITS OR REVENUE, LOSS OF THE UNIT, LOSS OF TIME, OR INCONVENIENCE.

### **OPTI TEMP Service Policy**

OPTI TEMP's heat transfer equipment is designed to provide years of trouble free operation and is backed by a one year warranty. However, occasionally system repairs may be needed. To ensure timely resolution, OPTI TEMP has implemented the following service policy.

Technical service and support assistance for OPTI TEMP re-circulating heat transfer systems is available free of charge by contacting the OPTI TEMP service department (located in the United States) by telephone at **231-946-2931** or by email at [customerservice@optitemp.com](mailto:customerservice@optitemp.com). Emergency service/support is available *24 hours a day*. Non-emergency calls or and email requests will generally be handled during normal business hours (*8:00am to 5:00 pm eastern time*).

Telephone and or email diagnosis and troubleshooting can be difficult and may require a trial and error process. Please understand that OPTI TEMP can not assume any liability for misdiagnosis over the telephone.

OPTI TEMP strongly encourages customers to take advantage of telephone support prior to returning a chiller to OPTI TEMP for evaluation. Often a problem with a chiller can be identified over the telephone and fixed quickly on site or may be an application or installation problem. By working with OPTI TEMP's service department to troubleshoot the system, you may be able to reduce downtime and expense associated with returning the equipment to our factory.

### **Warranty and Non-Warranty Returns**

To return a product a "Return Material Authorization" (RMA) number must be obtained from OPTI TEMP. Our service department can be reached by emailing us at [customerservice@optitemp.com](mailto:customerservice@optitemp.com) or by calling 231-946-2931 during the hours of 8:00 am to 5:00 pm Eastern time.

OPTI TEMP will require a model number, serial number, and a detailed description of the problem prior to assigning an RMA number. The RMA number should be clearly provided on the outside of the returned product packaging. Heat transfer systems must be returned clean, dry, and free from chemicals to OPTI TEMP's factory. Shipping costs must be prepaid. OPTI TEMP can not be responsible for any damage occurring during shipment to the factory. OPTI TEMP ordinarily will evaluate the unit within 3 to 5 business days of receipt and will use reasonable effort to repair the unit promptly, in most cases within one week of receiving all the required parts.

If upon examination, it is determined that the problem is not due to a defect in materials or workmanship as defined by terms of the warranty, an evaluation fee will be charged according to the following schedule and a quotation provided for repair costs.

1. \$375 for Models OTC-.25A through OTC-7.5A.
2. \$575 for models OTC-7.5A through OTC-15A.
3. \$775 for models OTC-20A and larger.

The evaluation fee will be charged regardless of disposition (i.e.: scrap). If a non-warranty condition is known in advance of the return, a purchase order for the evaluation fee and return freight must be placed before the return is authorized. The chiller must be returned to OPTI TEMP with freight charges prepaid. OPTI TEMP will provide an estimate of the required repairs. After the repair OPTI TEMP will ship the chiller back freight collect.

Debit memos should not be issued for warranty and non-warranty repairs unless the unit is returned as a result of an out-of-box (new) failure. OPTI TEMP will warranty the repair for

one year from the repair date under the terms of our standard warranty or for the balance of the original warranty, whichever is longer.

#### **Field Service/Installation Charges**

The terms of OPTI TEMP's standard warranty DO NOT provide for "in the field" or "on-site" repair service under any circumstances. However, OPTI TEMP can arrange "on-site" service, at customer expense, for chiller installation or repair in most areas. Service is generally available throughout the continental US, Canada, and parts of Mexico, Europe, Israel, Asia, Africa, South America, and mainland China. Service may be provided by OPTI TEMP factory personnel and/or a local authorized service affiliate(s).

All on-site service must be arranged through OPTI TEMP's service department. To expedite service requests please have the following information available when contacting the Service Department.

1. Serial Number(provided on the unit)
2. Voltage Configuration (provided on unit)
3. Model Number (provided on unit and O&I Manual)
4. Physical Location (address)
5. Description of problem (or installation)
6. Ambient Temperature
7. Application being controlled and fluid type
8. Problem Description (if applicable) and other relevant information
9. Service Contract Number (if applicable)

NOTE: Personnel servicing systems which utilize refrigerants are required by law to be trained in the use and recovery of refrigerants and must be certified. All service must be performed by qualified/certified service technicians.

In all cases minimum service charges shall apply. Service charges can be influenced substantially by the type of work to be performed, geographical location & conditions, site accessibility, governmental restrictions, cultural and language barriers, etc.. Please contact the OPTI TEMP service department at 231-946-2931 for more information on service rates applicable to a specific installation. Note: Standard charges do not cover replacement parts and a purchase order must be issued before the work is scheduled.

When using OPTI TEMP-arranged, on-site service, OPTI TEMP warranties the replacement parts and repair labor for 30 days from the repair date or for the balance of the original warranty whichever is longer. If non-authorized labor repairs the chiller or installs replacement parts, OPTI TEMP does not warranty the parts or work and this action may void any remaining warranty.

Note: When OPTI TEMP equipment is integrated with systems such as x-ray equipment, lasers, semi conductor, medical or other sophisticated equipment which may require specific expertise to operate and/or troubleshoot in connection with an OPTI TEMP heat transfer system, it is may be necessary for personnel from the OEM, system integrator, or sub system supplier be present in addition to OPTI TEMP service personnel (or affiliates) to insure proper diagnosis, installation, and/or service of the system as a whole. Such costs are the responsibility of the end user or system integrator and are not included in OPTI TEMP standard service charges.

**Replacement Parts**

Replacement parts can be ordered at list price using a purchase order. Old parts should be returned using an OPTI TEMP issued RMA number. If the parts are found to be defective and the claim is within the warranty period, your account will be credited for the price of the parts and one-way ground shipping charges. If the parts are not defective or indicate customer damage, no credit will be issued. OPTI TEMP will not cover the incremental cost of air shipment of replacement parts, regardless of warranty status. In-stock parts normally will be shipped the next business day; non-stocked parts will be shipped as quickly as reasonably possible. This policy is subject to change. Please check with OPTI TEMP's service department for the current policy.

**Instructions for Returning product to OPTI TEMP**

All returns must be authorized by OPTI TEMP prior to shipment. To return a product to OPTI TEMP, please have the following information available prior to contacting the Customer Service Department:

- Your Company name
- Billing address
- Shipping address
- Contact person
- Phone /fax number
- E-mail address
- Part/model number of item to be returned
- Serial/lot number of item to be returned
- Purchase order number / billing information
- Specific requirements such as quality codes, source inspection etc. must be clearly defined in advance

Please call 231-946-2931 to request an RMA number or an RMA form and fax to 231-946-0128.

All items returned to OPTI TEMP must be clean and dry. All liquids must be drained from the system. Systems returned with coolant present are subject to a minimum hazardous material disposal fee. OPTI TEMP requires that all coolants / chemicals used in or on returned parts be identified. Failure to disclose materials used in conjunction with returned items will result in shipments to OPTI TEMP being refused and returned to the customer site; freight collect.

All shipments must be prepaid. We recommend all items be returned in the original packaging. Shipments should be insured for the full replacement value. OPTI TEMP is not responsible for shipping damage.

After the RMA is issued by OPTI TEMP, the package must be clearly marked with the RMA number on the attention line of the address.

Please mark the package in the following manner:

OPTI TEMP INC.  
1500 International Dr.  
Traverse City, MI 49686  
Attn: RMA \_\_\_\_\_

## Section 12 – Appendix

### 12.1 Dew Point / Temperature Chart

Outside Temp Degrees		Outside Relative Humidity		Dewpoint Temp Degrees		Temperature to Process Degrees	
°F	°C	°F	°C	°F	°C	°F	°C
70	21	70	21	59	15	61	16
		80	27	63	17	65	18
		90	32	67	19	69	21
75	24	60	16	61	16	63	17
		70	21	64	18	66	19
		80	27	69	21	71	22
		90	32	72	22	74	23
		50	10	59	15	61	16
		60	16	65	18	67	19
80	27	70	21	69	21	71	22
		80	27	73	23	75	24
		90	32	77	25	79	26
85	29	50	10	65	18	67	19
		60	16	69	21	71	22
		70	21	75	24	77	25
		80	27	79	26	81	27
		90	32	81	27	83	28
90	32	40	4	63	17	65	18
		50	10	68	20	70	21
		60	16	74	23	76	24
		70	21	79	26	81	27
		30	-1	59	15	61	16
		40	4	67	19	69	21
95	35	50	10	71	22	73	23
		60	16	79	26	81	27
		70	21	83	28	85	29
100	38	30	-1	63	17	65	18
		40	4	72	22	74	23
		50	10	78	26	80	27
		60	16	83	28	85	29
		70	21	89	32	91	33

## Options

Product Path: Standard Date Modified: 1/0/1900

Serial Number(s): 11C15716 Customer Name: MIT Sales Agent: D. Curtice  
 Base Unit Model Number: OTI-40WL Customer PO#: 4501362169 Record Creator: B. King  
 Work Order #: 15716 Order Date: 3/31/2011 Ship Date: 5/12/2011

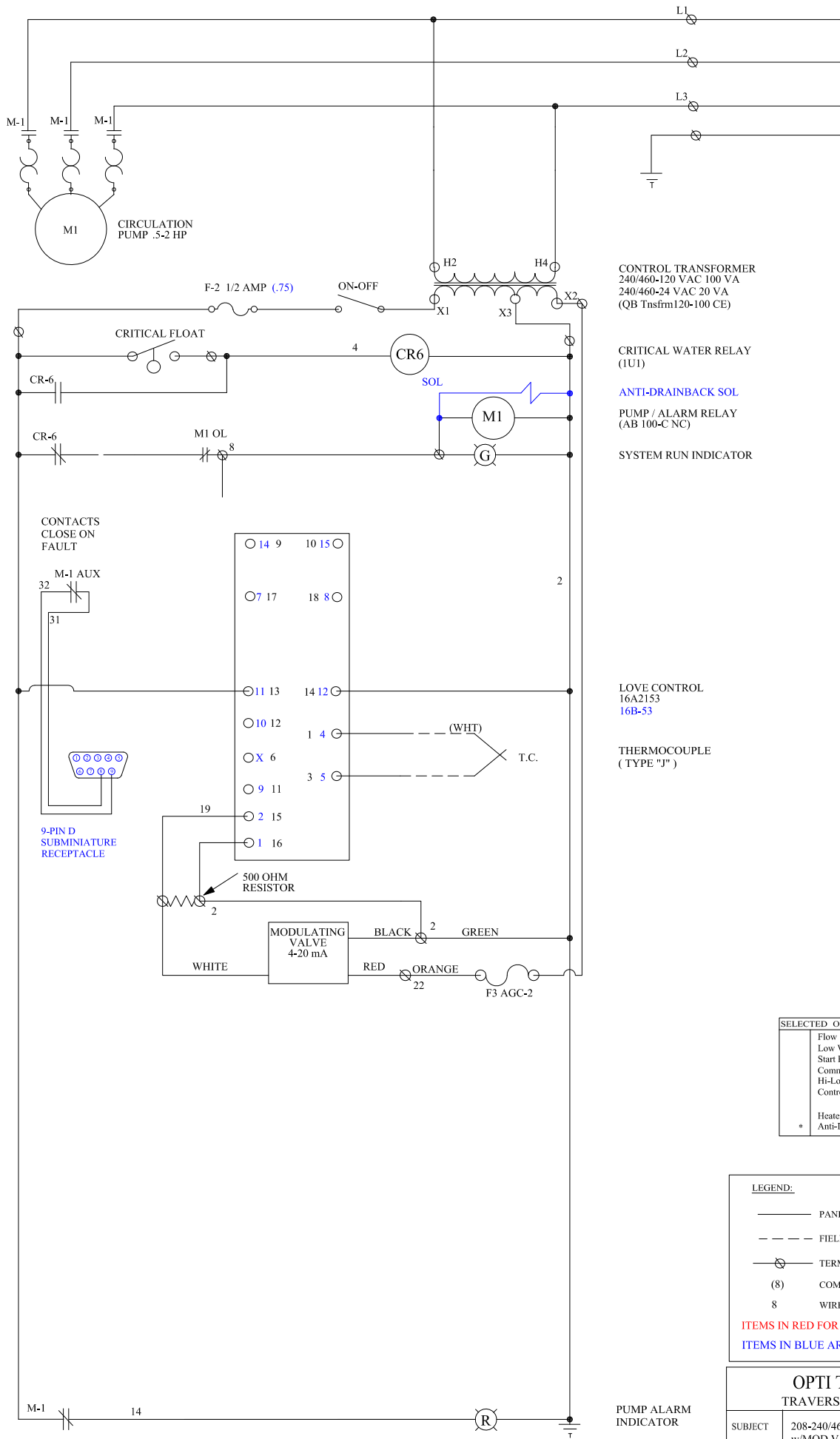
Complete Model #: OTI-40WL-CUS-236-SC1-AD1-M12-OTS

Manual Entry ☐ Auto Calculate ☐ Recommended Value ☐

Note: Items listed below are in addition to standard equipment

Option	Code	Qty + Extras	Model	Description	Location/Value
Pump	CUS	1	OTI-T41P-CS-AB-15D-236	Custom Pump	16GPM @ 90PSI
Controller	SC1	1	16B-53	Standard Controller	
Process Fluid Filter	M12	1	Model 12	30micron filter cartridge 155101-43	Return
Additional Filter			#N/A	#N/A	
Additional Filter			#N/A	#N/A	
Fluid/Cont. Options	AD2	1	DrainbackPrevent-1.25"	Anti Drainback Valve Package	
Fluid/Cont. Options				#N/A	
Fluid/Cont. Options				#N/A	
Fluid/Cont. Options				#N/A	
Fluid/Cont. Options				#N/A	
Other Options				#N/A	
Other Options				#N/A	
Other Options				#N/A	
Other Options				#N/A	
Other Options				#N/A	
Other Options				#N/A	
Other Options				#N/A	
				#N/A	
Formula	Qty.		Size	Description	Part Number
OptiShield	OTS	1	1 Gallon	Optishield Original Formula	400102





CONTROL TRANSFORMER  
240/460-120 VAC 100 VA  
240/460-24 VAC 20 VA  
(QB Tnsfrm120-100 CE)

CRITICAL WATER RELAY  
(1U1)

ANTI-DRAINBACK SOL

PUMP / ALARM RELAY  
(AB 100-C NC)

SYSTEM RUN INDICATOR

LOVE CONTROL  
16A2153  
16B-53

THERMOCOUPLE  
( TYPE "J" )

SELECTED OPTION:	
	Flow Switch - LF1
	Low Water - LW1
	Start Relay - RS1
	Communication - ECx
	Hi-Low Temp - TA1
	Controlled DI Pump - DO2
*	Heater - HT1
*	Anti-Drain Back - ADx

**LEGEND:**

————— PANEL WIRING

- - - - - FIELD WIRING

—○— TERMINAL IN PANEL

(8) COMPONENT TERMINAL

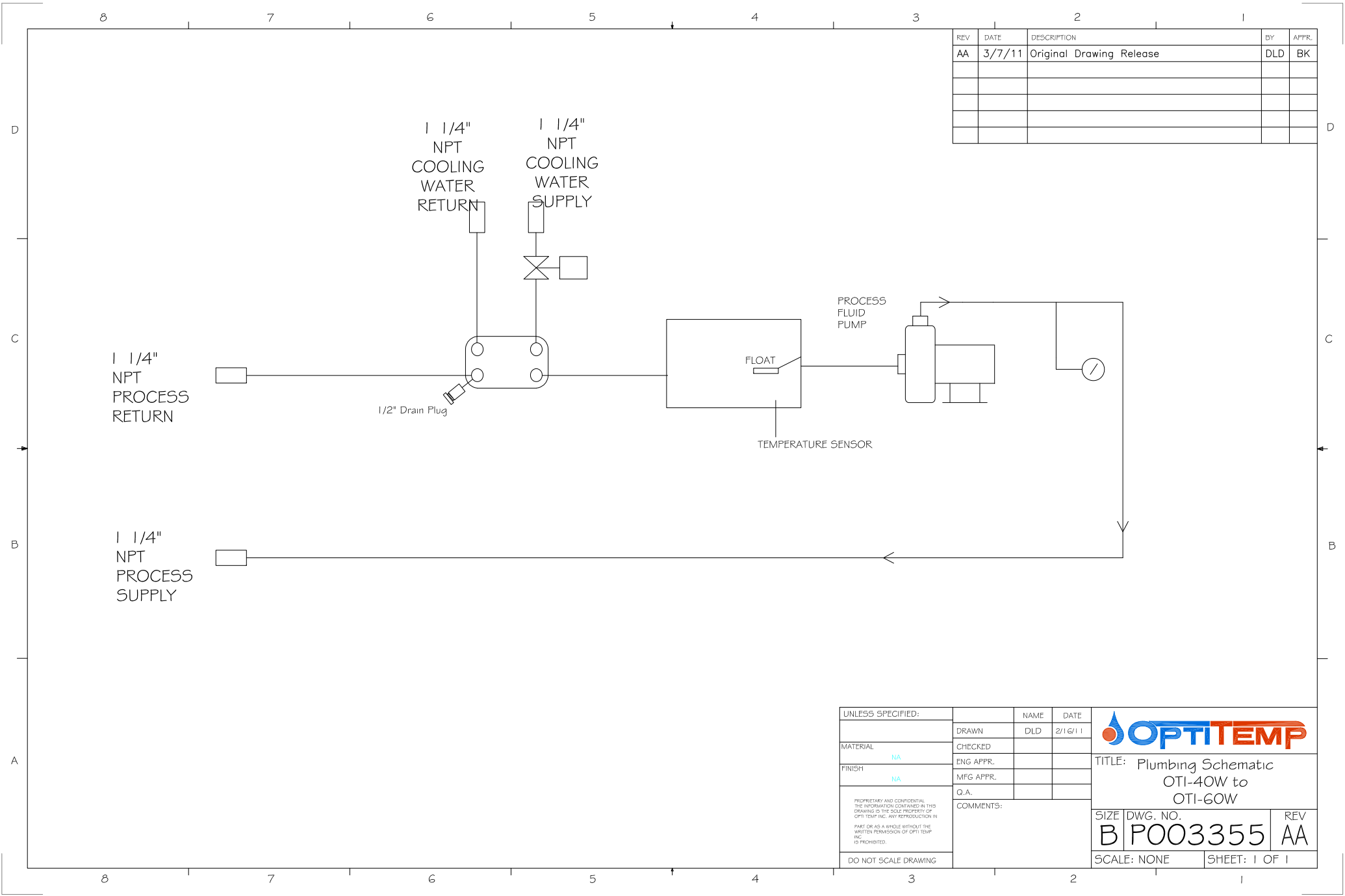
8 WIRE NUMBER

ITEMS IN RED FOR HEATED UNITS ONLY


ITEMS IN BLUE ARE OPTIONAL

OPTI TEMP INC. TRAVERSE CITY, MICHIGAN			
SUBJECT	208-240/460-3-50/60 HEAT X w/MOD VALVE		
FOR	STANDARD		
DRAWN BY	JAC	DATE	3-30-11
JOB NUMBER		DRAWING NUMBER	E002805AC

PUMP ALARM INDICATOR

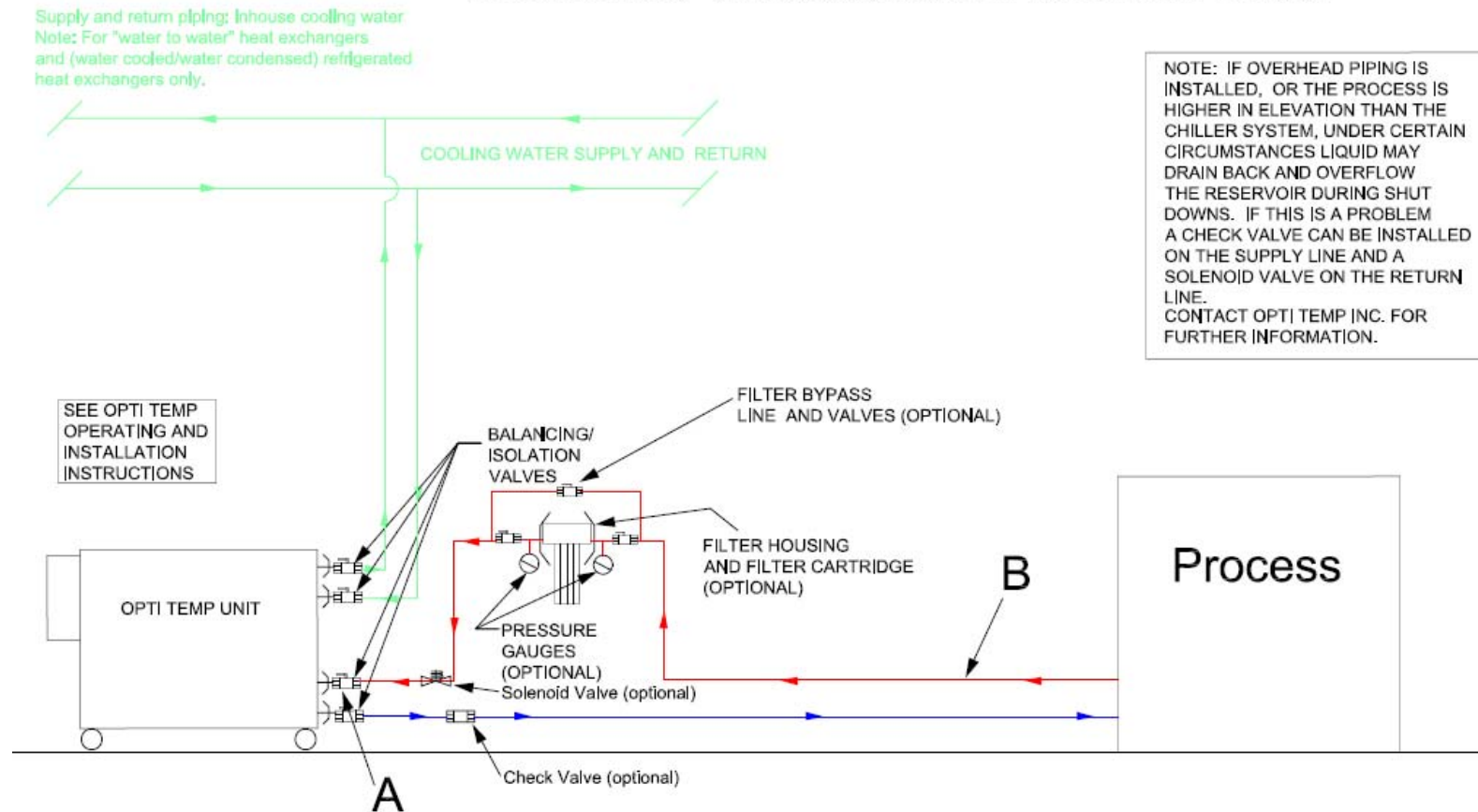


REV	DATE	DESCRIPTION	BY	APPR.
AA	3/7/11	Original Drawing Release	DLD	BK

UNLESS SPECIFIED:		NAME	DATE	 TITLE: Plumbing Schematic OTI-40W to OTI-60W
DRAWN		DLD	2/16/11	
MATERIAL		CHECKED		
FINISH		ENG APPR.		
		MFG APPR.		
		Q.A.		SIZE DWG. NO. REV B P003355 AA
		COMMENTS:		
DO NOT SCALE DRAWING				SCALE: NONE SHEET: 1 OF 1

## 12.5 Installation Diagram

# General Installation Schematic



## 12.6 Water Quality Guidelines

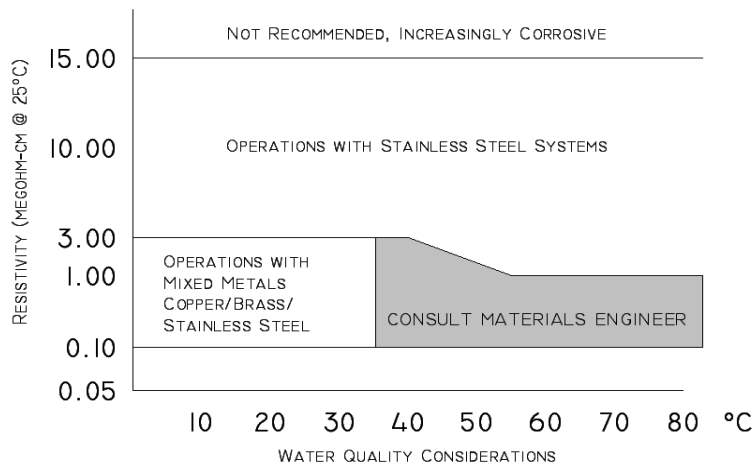
	Permissible (PPM)	Desirable (PPM)
<b>Microbiologicals</b>		
(algae, bacteria, fungi)	0	0
<b>Inorganic Chemicals</b>		
Calcium	<40	0.6
Chloride	250	<25
Copper	1.3	1
Iron	0.3	<0.1
Lead	0.015	0
Magnesium	<12	0.1
Manganese	0.05	<0.03
Nitrates/Nitrites	10 as N	0
Potassium	<20	0.3
Silicate	25	<1.0
Sodium	<20	0.3
Sulfate	250	<50
Hardness	17	<0.05
Total Dissolved Solids	50	10
<b>Other Parameters</b>		
pH	6.5 - 8.5	7 - 8
Resistivity	0.01*	0.05 - 0.1*
*Megohm-Cm (Compensated to 25°C)		

Unfavorably high total ionized solids (TIS) can accelerate the rate of galvanic corrosion. These contaminants can function as electrolytes which increase the potential for galvanic cell corrosion and lead to localized corrosion such as pitting which can be observed at the studs and on the outside surface of cooling coils. Eventually, the pitting will become so extensive that the coil will leak refrigerant into the water reservoir. For example, raw water in the U.S. averages 171 ppm (of NaCl). The recommended level for use in a water system is between 0.5 to 5.0 ppm (of NaCl).

Recommendation: Initially fill the tank with distilled/deionized water. Do not use untreated tap water as the total ionized solids level may be too high.

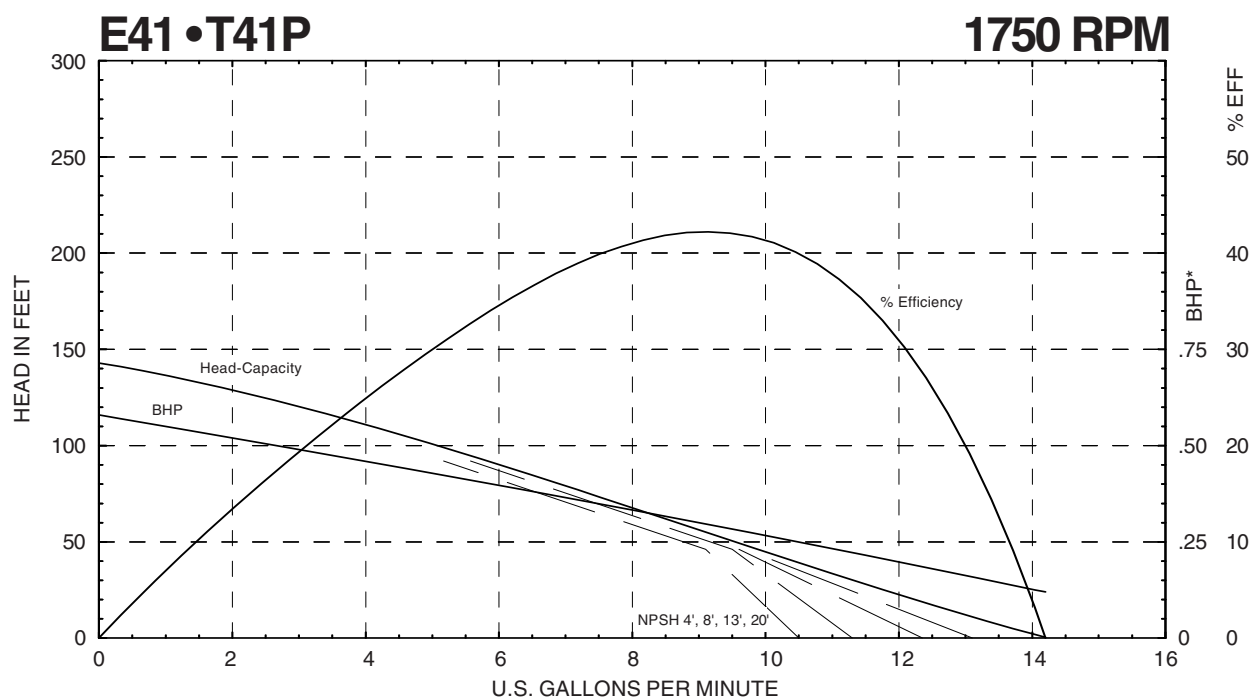
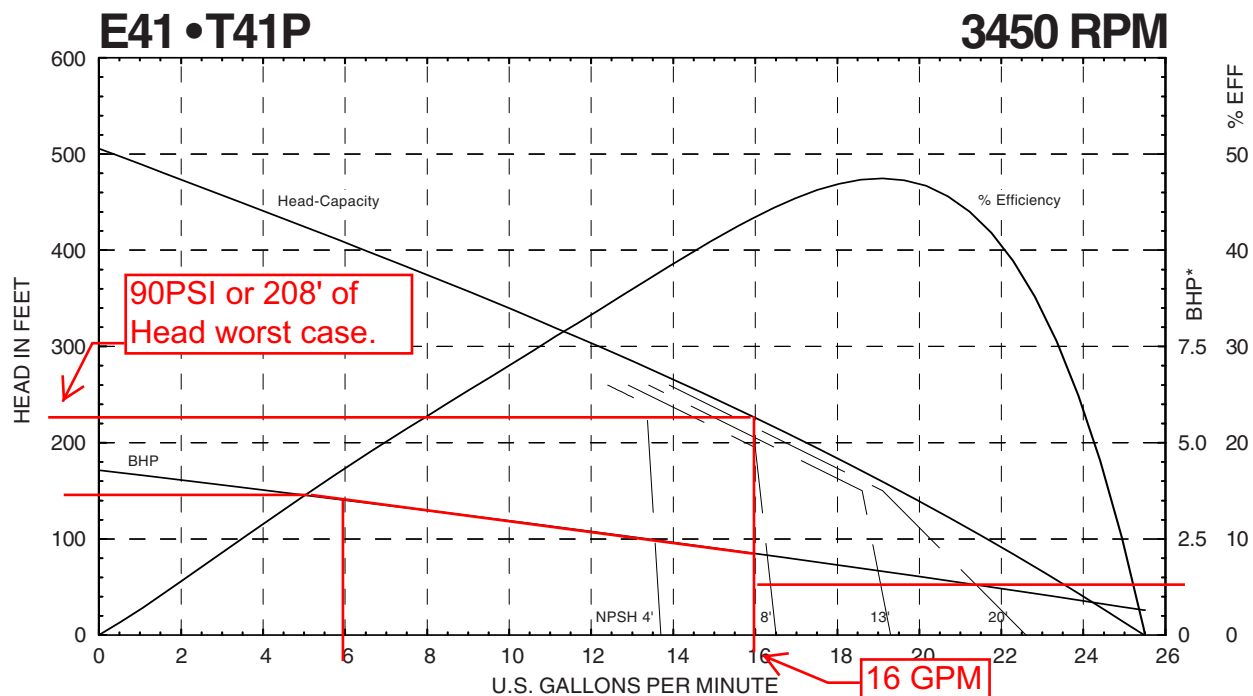
Maintain this water quality at a resistivity of between 1 to 10 megohm-cm (compensated to 25°C) by using a purification system. Although the initial fill may be as high as 10 megohm-cm (compensated to 25°C), the desired level for long time usage 1 to 3 megohm-cm (compensated to 25°C).

The above two recommendations will reduce the electrolytic potential of the water and prevent or reduce the galvanic corrosion observed.



SERIES E41 • T41

# Performance Curves



**MTH PUMPS**

401 West Main Street • Plano, IL 60545-1436  
Phone: 630-552-4115 • Fax: 630-552-3688  
URL: [MTHPUMPS.COM](http://MTHPUMPS.COM)  
Email: [SALES@MTHPUMPS.COM](mailto:SALES@MTHPUMPS.COM)

\* Horsepower data is valid for 1.0 specific gravity fluids only

## 12.8 RoHS Material Table

OPTI TEMP - PROPRIETARY  
**OTI Series Material Compliance Summary Table - ROHS**  
 Standard Models Used for Analysis:  
 OTI-1W, 5W, 10W, 15W, 20W, 30W, 40W, 60W, 100W, 1A, 2A, 5A, 10A, 15A, 20A, 30A  
 Date Created: 6/29/2007, Date Revised: 9/12/2007

Part Name	Toxic or Hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Allowable Limit:	0.10%	0.10%	0.01%	0.10%	0.10%	0.10%
<b>Mechanical</b>						
Solder						
-For Copper Tube	0	0	0	0	0	0
-For Wiring	0	0	0	0	0	0
Copper Tube	0	0	0	0	0	0
Cork Tape Insulation	0	0	0	0	0	0
Fabricated Components						
-Cabinet	0	0	0	0	0	0
-Brackets	0	0	0	0	0	0
-Side Panels	0	0	0	0	0	0
-Electrical Enclosure	0	0	0	0	0	0
Powder Coat	0	0	0	0	0	0
Low Temp Cut-off Thermostat	0	0	0	0	0	0
High Temp Cut-off Thermostat	0	0	0	0	0	0
Reservoir Cap	0	0	0	0	0	0
Reservoir	0	0	0	0	0	0
Motor	0	0	0	0	0	0
Pump						
-Positive Displacement	0	0	0	0	0	0
-Centrifugal	0	0	0	0	0	0
-Turbine	0	0	0	0	0	0
-Centrifugal Mag Drive	0	0	0	0	0	0
Fittings						
-Polypropylene	0	0	0	0	0	0
-Brass	0	0	0	0	0	0
-Stainless Steel	0	0	0	0	0	0
-CPC	0	0	0	0	0	0
-Push to Connect	0	0	0	0	0	0
Hose						
-Polybraid	0	0	0	0	0	0
-Black	0	0	0	0	0	0
-Silicone	0	0	0	0	0	0
Bulkhead	0	0	0	0	0	0
Pressure Gage	0	0	0	0	0	0
Ball Valve	0	0	0	0	0	0
Bypass Valve						
-Polypropylene	0	0	0	0	0	0
-Brass						
-Stainless Steel						
Pipe Dope	0	0	0	0	0	0
Teflon Tape	0	0	0	0	0	0
Fasteners						
-Sheet Metal Screws	0	0	0	0	0	0
-Rivots	0	0	0	0	0	0
-Bolts & Nuts	0	0	0	0	0	0
-Captive Screw Clips	0	0	0	0	0	0
Hose Clamps	0	0	0	0	0	0
Fluid Circuit Insulation	0	0	0	0	0	0
Grommets	0	0	0	0	0	0
Casters	0	0	0	0	0	0
<b>Electrical</b>						
Power Cord	0	0	0	0	0	0
Temperature Controller	0	0	0	0	0	0
Surge Suppressor	0	0	0	0	0	0
Sub D-9 Pin	0	0	0	0	0	0
Wire Sleeve	0	0	0	0	0	0
Transformer	0	0	0	0	0	0
On/off Switch	0	0	0	0	0	0
Red Light	0	0	0	0	0	0
Green Light	0	0	0	0	0	0
Push to Start / Silence	0	0	0	0	0	0
Relay	0	0	0	0	0	0
Slim Line Relay	0	0	0	0	0	0
Fuse Holder	0	0	0	0	0	0
Glass Fuse	0	0	0	0	0	0
Thermocouple	0	0	0	0	0	0
Float Switch	0	0	0	0	0	0
Disc Thermostat	0	0	0	0	0	0
Wire Connectors	0	0	0	0	0	0
Plastic Strain Relief	0	0	0	0	0	0
Marker Numbers	0	0	0	0	0	0
Terminal strip	0	0	0	0	0	0
Fuse Block	0	0	0	0	0	0
Wire	0	0	0	0	0	0
<b>Options</b>						
Particle Filter Housing	0	0	0	0	0	0
Particle Filter Cartridge	0	0	0	0	0	0
Filter Wrench	0	0	0	0	0	0
Filter Bracket	0	0	0	0	0	0
Shipping Crate	0	0	0	0	0	0

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

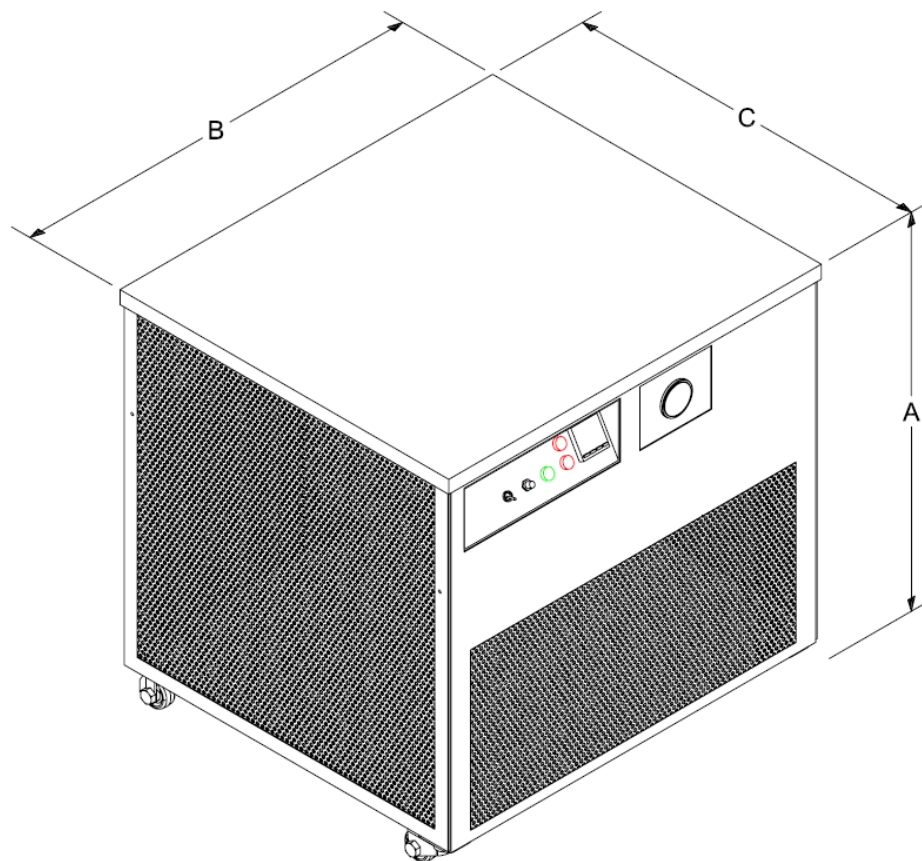
X: Indicates that this toxic or hazardous substance contained at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

## 12.9 Electrical Interfacing

## 12.10 Dimensional Drawings

Description Fluid Cooled	0Ti	1W	5W	10W	15W	20W	30W	40W	60W	100W
Dimensions (Inches)	A	22.5	22.5	22.5	22.5	27.5	27.5	45	45	45
	B	10	10	10	10	28	28	34.5	34.5	34.5
	C	32	32	32	32	25	25	26	26	26

Description Air Cooled	0Ti	1A	2A	5A	10A	15A	20A	30A
Dimensions (Inches)	A	22.5	22.5	48	48	48	48	48
	B	10	10	43	43	43	43	43
	C	32	32	39.75	39.75	49.75	49.75	89.75





Temperature Control		
Menu	Value °C	Value °F
<b>Operation Mode</b>		
SV	20.0	70
r-S	rUn	rUn
SP	1	1
AL1H	0	0
AL1L	-3	-3
AL2H	0	0
AL2L	-2	-2
AL3H	3	5
AL3L	3	5
LoC	Off	Off
OUT1	-	-
OUT2	-	-
<b>Regulation Mode</b>		
At	Off	Off
Pid0	0.0	0.0
SV0	0.0	0.0
P0	8	8
I0	24	24
d0	6	6
IoF0	55	55
CLPD	4	4
CoEF	1	1
dEAd	0.0	0.0
tPoF	0.0	0.0
<b>Initial Setting</b>		
InPt	J	J
tPUn	C	F
tP-H	40	104
tP-L	7.0	45.0
Ctrl	PiD	PiD
S-HC	COOL	COOL
ALA1	11	11
ALA2	11	11
ALA3	8	8
SALA	oFF	oFF
CoSH	oFF	oFF
C-SL	ASCII	ASCII
C-no	1	1
bPS	9600	9600
Len	7	7
Prty	EvEn	EvEn
StoP	1	1

## 12.12 Glycol Tables

**Table 1**  
**Increased Flow Requirements for 50% Glycol as Compared with Water**

Fluid Temp (°F)	Flow Increase Need for 50% Glycol as Compared with Water
40	1.22
100	1.16
140	1.15
180	1.14
220	1.14

Example: A water cooled condenser requires 11 GPM of 100°F water for condensing. If 50% glycol / water mixture is used the flow rate will increase by a factor of 1.16. (11 GPM x 1.16 = 12.76 GPM)

**Table 2**  
**Effect of Glycol on Pump Head**

Fluid Temp (°F)	Pressure Drop Correction Flow Rates	Combined Pressure Drop Correction; 50% Glycol Flow Increased
40	1.45	2.14
100	1.1	1.49
140	1.0	1.32
180	0.94	1.23
220	0.90	1.18

Example: A condenser requires 30 PSI of 100°F water for condensing. If 50% glycol / water mixture is used the pressure required will increase by a factor of 1.49. (30 PSI x 1.49 = 44.7 PSI)

**Table 3**  
**Effect of Glycol on Freezing Point and Specific Gravity**

% Ethylene Glycol by Volume	5	10	15	20	25	30	35	40	45	50
Freezing Point °F	30.02	28.04	24.98	19.94	15.98	8.96	3.02	-5.08	-16.06	-27.94
Freezing Point °C	-1.1	-2.2	-3.9	-6.7	-8.9	-12.8	-16.1	-20.6	-26.7	-33.3
Specific Gravity $d_{15.6}^{15.6}$	1.004	1.006	1.012	1.017	1.020	1.024	1.028	1.032	1.037	1.040

Table obtained from *Lange's Handbook of Chemistry*, 10th ed. Specific gravity is referenced to water at 15.6°C.

## 12.13 Notes