AMADA MIYACHI AMERICA, INC.

OptiTemp

OTC Series Air-Cooled Chiller

Operation and Instruction Manual

Applies to all OptiTemp Water Chillers sold by Amada Miyachi America

Based on OptiTemp Manual O002809 (11/07/2018, v 1.4) Rev 11/30/18

OTC Series Air-Cooled Chiller - Operation and Installation Manual Index

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. 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 chiller 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 chillers, 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 Warning and Safety Symbols

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

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.

- 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.
- When used with an Amada Miyachi Laser Welder, only use water and an Amada Miyachi approved corrosion inhibitor. Any additive other than water will cause the cooling water solenoid to prematurely fail in the Laser and 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 fluid in the reservoir.
- Always disconnect power to the unit before opening the control box.
- Always empty the reservoir before moving or storing the unit.
- Never operate equipment with damaged power cords.
- Refer service and repairs to a qualified technician.

CAUTION:

Our refrigerated chilling equipment uses chemical refrigerants for heat transfer purposes. This chemical is tested and sealed in a pressurized system containing ASME coded vessels; however, refrigerant gas can be released if there is a system failure.

Refrigerant gas can cause toxic fumes if it is exposed to flame. These units must be placed in a well ventilated area, especially if open flames are present. Failure to follow these instructions could result in a hazardous condition.

Models OTC-.25A through OTC-3.0A utilize a Hydro-fluorocarbon refrigerant (HFC) trade name R-134A.

Models OTC-5.0A through OTC-10A utilize a Hydro-chloro-fluorocarbon (HCFC) trade named R-407c.

Customers are advised to immediately implement a refrigerant management program including a survey of all equipment to document the type and quantity of refrigerant in each machine. All refrigeration service technicians must be certified by an EPA approved organization.

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.
	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

All OPTI TEMP Chillers sold by Amada Miyachi America can be serviced through Amada Miyachi America. In the event we are unable to perform the service, we will coordinate a field service representative from OPTI TEMP to repair the unit. Service to an OPTI TEMP water-chiller is covered under the original Laser Welder warranty. If your Laser Welder is covered under warranty, please contact Amada Miyachi America first. If you decide to contact OPTI TEMP directly and the Laser Welder is under the Amada Miyachi America warranty, Amada Miyachi America will not reimburse for repair charges.

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 the service department by telephone or by e-mail:

Amada Miyachi America Service: 626-303-5676 or service@amadamiyachi.com
OptiTemp Service Department: 231-946-2931 or 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. 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.

NOTE: Any sign of damage should be recorded and a claim filed immediately with the shipping company. Amada Miyachi America 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 chiller system when it arrives. During the winter months (between October 1st and April 30th) a small amount of nonhazardous 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 Amada Miyachi America 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 chiller. Use pads where abrasive surface contact is anticipated. The skid supporting the chiller 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

- OTC Series Water Chiller
- 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 Chillers

The OPTI TEMP refrigerated heat exchanger (chiller) 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 refrigeration system, fluid pump, fluid reservoir, and is controlled by a Proportional Integral Derivative (PID) controller.

The OPTI TEMP OTC Series chillers feature a patented refrigeration circuitry. This innovative circuitry allows the unit to provide excellent temperature control whether operating at "Zero load or Full Load". It also allows the chiller to provide very tight temperature stability over the industries widest (actively cooled) operating temperature range. See operating temperature range limits in section "5.2 Specifications" for more information about available operating ranges of OPTI TEMP systems.

5.2 Specifications and Available Options – 11/01/2018 to present

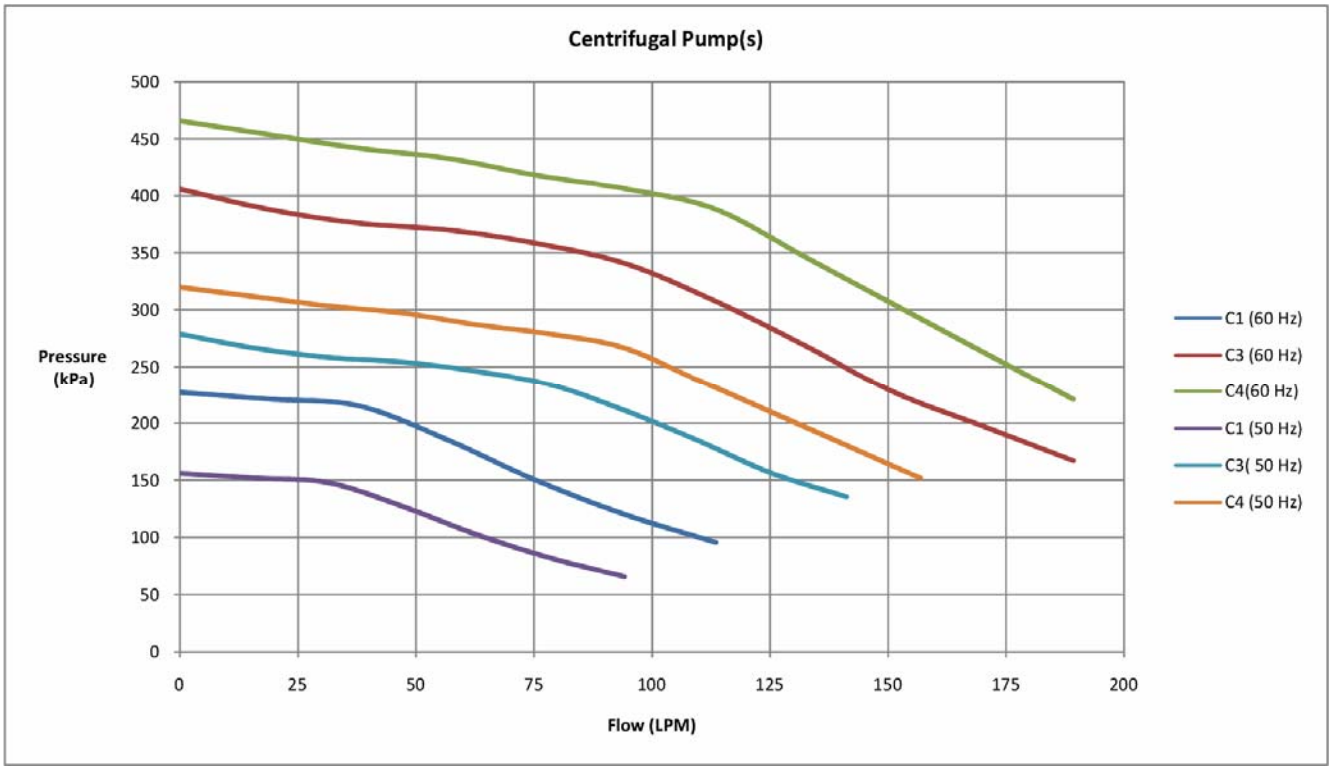
The Water Chillers shown in the table below contain the "*Test Chillers* PLC PID Controller".

Laser Welder Cooling Requirements					
Laser Model		LW50A/70A	LW150A	LW300A(H)/400A	LW500A/600A
Coolant Temp Required	(°C)	5 - 32°C	5 - 32°C	5 - 35°C	5 - 35°C
Min. Heat Removal Required	(BTU/HR)	8,526	18,758	40,252	79,948
	(kW)	2.50	5.50	11.80	23.43
	(kcal/hr)	2,150	4,730	10,150	20,160
Max. Water Pressure	(PSI/kPA)	42.6 / 294	42.6 / 294	42.6 / 294	42.6 / 294
Min. Flow required		4 LPM @ 25°C 18 LPM @ 32°C	9 LPM @ 25°C 25 LPM @ 32°C	16 LPM @ 30°C 25 LPM @ 35°C	25 LPM @ 25°C 55 LPM @ 32°C
Water Inlet Diameter	(mm/inches)	15 / 0.591	15 / 0.591	15 / 0.591	19 / 0.748

OptiTemp Chiller Specifications (*subject to change without notice or liability*)					
OptiTemp Model Number		OTC-1.0A	OTC-2.0A	OTC-5.0A	OTC-7.5A
Chiller Capacity:	(BTU/HR)	11,460	24,840	65,280	98,400
	(kW)	3.4	7.3	15.9	28.8
	(Tons)	0.96	2.1	5.4	8.2
Compressor:	(hP)	1.0 (scroll)	2.0 (hermetic)	5.0 (scroll)	8.0 (scroll)
Refrigerant	(type)	R-134a	R-134a	R-407c	R-407c
Pump:	(hP)	0.50 (C1)	0.50 (C1)	1.50 (C3)	2.00 (C4)
Standard Flow Rate @ 60Hz	(LPM @ kPa)	20 @ 220	40 @ 207	40 @ 379	60 @ 430
	(GPM @ PSI)	5.3 @ 31.9	10.6 @ 30.0	10.6 @ 55.0	15.9 @ 62.4
Internal Reservoir capacity	(gallons)	2.5	2.5	20	20
Temperature Stability	(°C)	± 0.2	± 0.2	± 0.5	± 0.5
Weight	(pounds/kg)	250 / 113.4	395 / 179.2	550 / 249.5	690 / 313.0
Dimensions: H × W × D	(inches)	27.5 × 28 × 25	26.5 × 36 × 36	34.5 × 31 × 46	45 × 34.5 × 46
	(mm)	700 x 711 x 635	673 x 914 x 914	876 x 787 x 1168	1143 x 876 x 1168
Connection (male pipe thread)	(MPT)	1.0	1.0	1.0	1.25
Full Load Amps: (216) 230V, 1Ø, 60Hz		15A	29A	48A	N/A
(236) 230V, 3Ø, 60Hz		12A	17A	36A	57A
(436) 460V, 3Ø, 60Hz		6A	10A	19A	23A

1. "Standard Flow Rating" measured at discharge.
2. "Chiller Capacity" based on 68°F (20°C) LWT and 95°F (35°C) ambient air temperature. Capacities may be ± 5% as reserved by compressor manufacturer.
3. "Full Load Amps" must be used for sizing disconnects and supply wiring.
4. "Dimensions" are approximate and do not include filters or castors
5. Lasers self-regulate internal temperature via flow. Pressure actuated Bypass Valves are required for proper operation.
6. Automatic adjustable pressure actuated Bypass Valve standard on all OptiTemp models (-CUS option) sold by Amada Miyachi America.
7. Other options available; Outdoor Operation (OD1) & Remote Controls (RC1). Consult Amada Miyachi America for details.
8. All standard controls are NEMA 1 (indoor use) and are non-ferrous wetted construction.

Pump Curves:



Recommended Chiller (based on Laser Welder Model) - U.S. shipping addresses					
Nominal Voltage	**Operating Voltage**	**LW50A/70A**	**LW150A**	**LW300A(H)/400A**	**LW500A/600A**
200V, 1Ø, 50Hz 208-230V, 1Ø, 60Hz	190 – 220 VAC 198 – 253 VAC	**AMYA # 4-66736-01** OTC-1.0AL-C1-216	**AMYA # 4-66736-04** OTC-2.0AL-C1-216	N/A	N/A
200-220V, 3Ø, 50Hz 208-230V, 3Ø, 60Hz	180 – 242 VAC 187 – 253 VAC	**AMYA # 4-66736-02** OTC-1.0AL-C1-236	**AMYA # 4-66736-05** OTC-2.0AL-C1-236	**AMYA # 4-66736-07** OTC-5.0AL-C3-236	**AMYA # 4-66736-09** OTC-7.5AL-C4-236
380-420V, 3Ø, 50Hz 460V, 3Ø, 60Hz	361 – 462 VAC 415 – 506 VAC	**AMYA # 4-66736-03** OTC-1.0AL-C1-436	**AMYA # 4-66736-06** OTC-2.0AL-C1-436	**AMYA # 4-66736-08** OTC-5.0AL-C3-436	**AMYA # 4-66736-10** OTC-7.5AL-C4-436

Recommended Chiller (based on Laser Welder Model) - CE Compliant - E.U. shipping addresses					
Nominal Voltage	**Operating Voltage**	**LW50A/70A**	**LW150A**	**LW300A(H)/400A**	**LW500A/600A**
200V, 1Ø, 50Hz 208-230V, 1Ø, 60Hz	190 – 220 VAC 198 – 253 VAC	**AMYA # 4-66736-21** OTC-1.0AL-C1-216	**AMYA # 4-66736-24** OTC-2.0AL-C1-216	N/A	N/A
200-220V, 3Ø, 50Hz 208-230V, 3Ø, 60Hz	180 – 242 VAC 187 – 253 VAC	**AMYA # 4-66736-22** OTC-1.0AL-C1-236	**AMYA # 4-66736-25** OTC-2.0AL-C1-236	**AMYA # 4-66736-27** OTC-5.0AL-C3-236	**AMYA # 4-66736-29** OTC-7.5AL-C4-236
380-420V, 3Ø, 50Hz 460V, 3Ø, 60Hz	361 – 462 VAC 415 – 506 VAC	**AMYA # 4-66736-23** OTC-1.0AL-C1-436	**AMYA # 4-66736-26** OTC-2.0AL-C1-436	**AMYA # 4-66736-28** OTC-5.0AL-C3-436	**AMYA # 4-66736-30** OTC-7.5AL-C4-436

Note: For International shipping destinations, the CTX "International Rated" shipping crate must also be ordered separately.

Spare Parts / Optional Accessories	**AMYA Part Numbers (OptiTemp Filter Option)**			
	OTC-1.0A	**OTC-2.0A**	**OTC-5.0A**	**OTC-7.5A**
Replacement Particle Filter	318-037 (M1T)	318-037 (M1T)	318-038 (M12)	318-039 (M20)
Water Connection Kits (includes all fittings)	4-69984-01	4-69984-01	4-69984-01	4-69985-01

5.2 Specifications and Available Options (continued) – 06/15/2015 to 11/01/2018

The Water Chillers shown in the table below were sold by Amada Miyachi America between 06/15/2015 and 11/01/2018. These chillers contained the "Love PID Controller". The information below is provided as a reference.

Laser Welder Cooling Requirements					
Laser Model		LW50A/70A	LW150A	LW300A(H)/400A	LW500A/600A
Coolant Temp Required	(°C)	5 - 32°C	5 - 32°C	5 - 35°C	5 - 35°C
Min. Heat Removal Required	(BTU/HR)	8,526	18,758	40,252	79,948
	(kW)	2.50	5.50	11.80	23.43
	(kcal/hr)	2,150	4,730	10,150	20,160
Max. Water Pressure	(PSI/kPA)	42.6 / 294	42.6 / 294	42.6 / 294	42.6 / 294
Min. Flow required		4 LPM @ 25°C 18 LPM @ 32°C	9 LPM @ 25°C 25 LPM @ 32°C	16 LPM @ 30°C 25 LPM @ 35°C	25 LPM @ 25°C 55 LPM @ 32°C
Water Inlet Diameter	(mm/inches)	15 / 0.591	15 / 0.591	15 / 0.591	19 / 0.748

OptiTemp Chiller Specifications					
OptiTemp Model Number		OTC-1.0A	OTC-2.0A	OTC-5.0A	OTC-7.5A
Chiller Capacity:	(BTU/HR)	9,550	20,700	54,400	82,000
	(kW)	2.8	6.0	16.0	24.0
	(TONS @ 60Hz)	0.8	1.7	4.5	6.8
Compressor:	(hP)	1.0	2.0	5.0	7.5
	(type)	Hermetic	Hermetic	Scroll	Scroll
Refrigerant	(type)	R-134a	R-134a	R-407c	R-407c
Pump:	(hP)	0.33	0.50	1.50	2.00
Standard Flow Rate @ 60Hz	(GPM)	4.0	5.5	12.0	18.0
Standard Pressure Rating	(PSIG)	65	65	53	61
Internal Reservoir capacity	(gallons)	2.5	2.5	15	20
Temperature Stability	(°C)	± 0.2	± 0.2	± 0.5	± 0.5
Weight	(pounds/kg)	205 / 92.9	350 / 158.8	525 / 238.1	800 / 362.9
Dimensions: H × W × D	(inches)	27.5 × 28 × 25	26.5 × 36 × 36	34.5 × 32 × 54.5	55 × 38 × 62
Connection (male pipe thread)	(MNPT)	0.5	1	1	1.25
Full Load Amps: (216)	230V, 1Ø, 60Hz	15A	29A	48A	N/A
(236)	230V, 3Ø, 60Hz	12A	17A	36A	57A
(436)	460V, 3Ø, 60Hz	6A	10A	19A	23A

Recommended Chiller (based on Laser Welder Model)					
Nominal Voltage	**Operating Voltage**	**LW50A/70A**	**LW150A**	**LW300A(H)/400A**	**LW500A/600A**
200V, 1Ø, 50Hz 208-230V, 1Ø, 60Hz	190 – 220 VAC 198 – 253 VAC	OTC-1.0AL-C1-216	OTC-2.0AL-C1-216	N/A	N/A
200-220V, 3Ø, 50Hz 208-230V, 3Ø, 60Hz	180 – 242 VAC 187 – 253 VAC	OTC-1.0AL-C1-236	OTC-2.0AL-C1-236	OTC-5.0AL-C3-236	OTC-7.5AL-C4-236
380-420V, 3Ø, 50Hz 460V, 3Ø, 60Hz	361 – 462 VAC 415 – 506 VAC	OTC-1.0AL-C1-436	OTC-2.0AL-C1-436	OTC-5.0AL-C3-436	OTC-7.5AL-C4-436

Note: For International shipping destinations, the CTX "International Rated" shipping crate must also be ordered separately.

Spare Parts / Optional Accessories	AMYA Part Numbers (OptiTemp Filter Option)			
	OTC-1.0A	**OTC-2.0A**	**OTC-5.0A**	**OTC-7.5A**
Replacement Particle Filter	318-037 (M1T)	318-037 (M1T)	318-038 (M12)	318-039 (M20)
Water Connection Kits (includes all fittings)	4-69984-01	4-69984-01	4-69984-01	4-69985-01

5.2 Specifications and Available Options (continued) – 01/01/2010 to 06/15/15

The Water Chillers shown in the table below were sold by Amada Miyachi America between 01/01/2010 and 06/15/2015. These chillers contained the "Love PID Controller". The information below is provided as a reference.

Laser Welder Cooling Requirements					
Laser Model		LW50A/70A	LW150A	LW300A(H)/400A	LW500A/600A
Coolant Temp Required	(°C)	5 - 32°C	5 - 32°C	5 - 35°C	5 - 35°C
Min. Heat Removal Required	(BTU/HR)	8,526	18,758	40,252	79,948
	(kW)	2.50	5.50	11.80	23.43
	(kcal/hr)	2,150	4,730	10,150	20,160
Max. Water Pressure	(PSI/kPA)	42.6 / 294	42.6 / 294	42.6 / 294	42.6 / 294
Min. Flow required		4 LPM @ 25°C 18 LPM @ 32°C	9 LPM @ 25°C 25 LPM @ 32°C	16 LPM @ 30°C 25 LPM @ 35°C	25 LPM @ 25°C 55 LPM @ 32°C

OptiTemp Chiller Specifications					
OptiTemp Model Number		OTC-1.0A	OTC-2.0A	OTC-5.0A	OTC-7.5A
Chiller Capacity:	(BTU/HR)	10,560	20,700	54,400	82,000
	(kW)	3.2	6.0	15.9	24.0
	(TONS @ 60Hz)	0.88	1.73	4.53	6.83
Compressor:	(hP)	1.0	2.0	5.0	7.5
Refrigerant	(type)	R-134a	R-134a	R-407c	R-407c
Pump:	(type)	Centrifugal	Centrifugal	Centrifugal	Centrifugal
	(hP)	0.5 HP G&L	0.5 HP G&L	1.5 HP G&L	2.0 HP G&L
Standard Flow Rate @ 60Hz		20 @ 220	40 @ 207	40 @ 379	60 @ 430
Internal Reservoir capacity	(gallons)	2.5	2.5	2.5	9.0
Temperature Stability	(°C)	± 0.2	± 0.2	± 0.5	± 0.5
Weight	(pounds/kg)	250 / 113.4	395 / 179.0	550 / 249.5	690 / 313.0
Dimensions: H × W × D	(inches)	27.5 × 28 × 25	26.5 × 36 × 36	34.5 × 31 × 46	45 × 34.5 × 46
Full Load Amps:	230V, 1Ø, 60Hz	15A	29A	48A	N/A
	230V, 1Ø, 50Hz	14A	26A	44A	N/A
	230V, 3Ø, 60Hz	12A	17A	36A	57A
	460V, 3Ø, 50Hz	6A	10A	14A	23A

Recommended Chiller (based on Laser Welder Model)					
Nominal Voltage	**Operating Voltage**	**LW50A/70A**	**LW150A**	**LW300A(H)/400A**	**LW500A/600A**
200V, 1Ø, 50Hz 230V, 1Ø, 60Hz	190 – 220 VAC 198 – 253 VAC	OTC-1.0AL-C1-216-M	OTC-2.0AL-C1-216-M	N/A	N/A
200-220V, 3Ø, 50Hz 208-230V, 3Ø, 60Hz	180 – 242 VAC 198 – 253 VAC	OTC-1.0AL-C1-236-M	OTC-2.0AL-C1-236-M	OTC-5.0AL-C3-236-M	OTC-7.5AL-C4-236-M
380-420V, 3Ø, 50Hz 460V, 3Ø, 60Hz	361 – 462 VAC 368 – 506 VAC	OTC-1.0AL-C1-436-M	OTC-2.0AL-C1-436-M	OTC-5.0AL-C3-436-M	OTC-7.5AL-C4-436-M

Note: For International shipping destinations, the CTX "International Rated" shipping crate must also be ordered separately.

Spare Parts / Optional Accessories	AMYA Part Numbers (OptiTemp Filter Option)			
	OTC-1.0A	**OTC-1.5A**	**OTC-4.0A**	**OTC-7.5A**
Replacement Filter Cartridge	318-037 (M1T)	318-037 (M1T)	318-038 (M12)	318-039 (M20)

5.2 Specifications and Available Options (continued) – Prior to 01/01/2010

The Water Chillers shown in the table below are no longer sold by Amada Miyachi America. As of 01/01/2010 the R-22 refrigerant is no longer used. These chillers contained the "Love PID Controller". The information below is provided as a reference.

Laser Welder Cooling Requirements					
Laser Model		LW50A/70A	LW150A	LW300A(H)/400A	LW500A/600A
Coolant Temp Required	(°C)	5 - 32°C	5 - 32°C	5 - 35°C	5 - 35°C
Min. Heat Removal Required	(BTU/HR)	8,526	18,758	40,252	79,948
	(kW)	2.50	5.50	11.80	23.43
	(kcal/hr)	2,150	4,730	10,150	20,160
Max. Water Pressure	(PSI/kPA)	42.6 / 294	42.6 / 294	42.6 / 294	42.6 / 294
Min. Flow required		4 LPM @ 25°C 18 LPM @ 32°C	9 LPM @ 25°C 25 LPM @ 32°C	16 LPM @ 30°C 25 LPM @ 35°C	25 LPM @ 25°C 55 LPM @ 32°C

OptiTemp Chiller Specifications					
OptiTemp Model Number		OTC-1.0A	OTC-1.5A	OTC-4.0A	OTC-7.5A
Chiller Capacity:	(BTU/HR)	10,560	21,720	50,160	93,360
	(kW)	3.2	6.3	14.7	27.4
	(TONS @ 60Hz)	0.88	1.81	4.18	7.78
Compressor:	(hP)	1.0	2.0	4.0	7.5
Refrigerant	(type)	R-134a	R-22	R-22	R-22
Pump:	(type)	Centrifugal	Centrifugal	Centrifugal	Centrifugal
	(hP)	0.5 HP G&L	0.5 HP G&L	1.5 HP G&L	2.0 HP G&L
Standard Flow Rate @ 60Hz		20 @ 220	40 @ 207	40 @ 379	60 @ 430
Internal Reservoir capacity	(gallons)	2.5	2.5	2.5	9.0
Temperature Stability	(°C)	± 0.2	± 0.2	± 0.5	± 0.5
Weight	(pounds/kg)	250 / 113.4	395 / 179.0	550 / 249.5	750 / 340.2
Dimensions: H × W × D	(inches)	27.5 × 28 × 25	26.5 × 36 × 36	34.5 × 31 × 46	45 × 34.5 × 46
Full Load Amps:	230V, 1Ø, 60Hz	15A	29A	48A	N/A
	230V, 1Ø, 50Hz	14A	26A	44A	N/A
	230V, 3Ø, 60Hz	12A	17A	36A	57A
	460V, 3Ø, 50Hz	6A	10A	14A	23A

Recommended Chiller (based on Laser Welder Model)					
Nominal Voltage	**Operating Voltage**	**LW50A/70A**	**LW150A**	**LW300A(H)/400A**	**LW500A/600A**
200V, 1Ø, 50Hz 230V, 1Ø, 60Hz	190 – 220 VAC 198 – 253 VAC	OTC-1.0AL-C1-216	OTC-1.5AL-C1-216	N/A	N/A
200-220V, 3Ø, 50Hz 208-230V, 3Ø, 60Hz	180 – 242 VAC 198 – 253 VAC	OTC-1.0AL-C1-236	OTC-1.5AL-C1-236	OTC-4.0AL-C3-236	OTC-7.5AL-C4-236
380-420V, 3Ø, 50Hz 460V, 3Ø, 60Hz	361 – 462 VAC 368 – 506 VAC	OTC-1.0AL-C1-436	OTC-1.5AL-C1-436	OTC-4.0AL-C3-436	OTC-7.5AL-C4-436

Note: For International shipping destinations, the CTX "International Rated" shipping crate must also be ordered separately.

Spare Parts / Optional Accessories	AMYA Part Numbers (OptiTemp Filter Option)			
	OTC-1.0A	**OTC-1.5A**	**OTC-4.0A**	**OTC-7.5A**
Replacement Filter Cartridge	318-037 (M1T)	318-037 (M1T)	318-038 (M12)	318-039 (M20)

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 evaporator. It is in the evaporator where the heat is transferred from the coolant to the refrigerant. Adjusting the amount of heat transferred in the evaporator controls the temperature of the coolant being delivered to the process. There is a freezestat sensor 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 chiller 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 chiller. The main purpose of the bypass line is to avoid deadheading of the pump and reduce the possibility of an evaporator freeze-up. See Section 7.8 for more information on adjusting the bypass valve.

Refrigerant Circuit - Advanced Refrigeration Control Circuitry (ARCC)

The OTC Series Chillers features our “Advanced Refrigeration Capacity Control” (ARCC) circuitry. This patented circuitry allows the unit to operate from “zero load to full load” (without cycling the compressor) while providing excellent temperature stability. Another benefit is the ability to operate over a very wide temperature range.

The patented refrigeration control circuitry adjusts and controls the flow of refrigerant in response to the process load. The circuitry provides only the needed cooling capacity. Because of this innovative circuitry, the refrigeration system compressor will operate when the unit is on regardless of whether or not the process calls for cooling. This is normal and is not a cause for concern. Continuous compressor operation reduces wear and tear associated with frequent cycling which can lead to premature compressor failure.

The heat that is transferred in the evaporator from the coolant to the refrigerant is used to change the state of the refrigerant from a liquid to a gas. After leaving the evaporator, the refrigerant passes to the compressor.

Compressor

The OTC Series Chillers are equipped with a hermetic reciprocating or hermetic scroll compressor, depending on model. Both the compressor and the motor are encased together and solidly mounted in the cabinet. The compressor is unidirectional and will only pump refrigerant when properly phased. The cool refrigerant suction gas cools the motor windings, and there is an internal thermal overload to protect the windings from overheating. The compressor is lubricated with oil that travels throughout the system with the refrigerant.

NOTE: The compressor on OPTI TEMP OTC Series chillers runs continuously regardless of load on the system. This is normal and not a cause for concern

Air Cooled Condenser

This component is only used in the air cooled chillers. The condenser is constructed of heavy gauge copper tubing and aluminum fins for maximum heat transfer capabilities. The condenser has been generously sized so the chiller 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 chiller will lose approximately 1% of its cooling capacity per 1°F (0.5°C) above 95°F (35°C). The chiller should be able to operate with ambient temperatures of up to 110°F (43°C). The fan(s) draw the air flow through the condenser and blows the warm discharge air through the chiller cabinet and out the other side. The fan(s) are designed to draw sufficient air flow through the chiller 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.

Evaporator

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

Thermostatic Expansion Valve

This valve (referred to as the TXV) separates the high pressure/high temperature side of the refrigeration circuit (the condenser side) from the low pressure/low temperature side of the refrigeration circuit (the evaporator side). The TXV maintains constant superheat at the evaporator outlet, regardless of process load, by precisely metering the amount of refrigerant into the evaporator. Superheat is the difference between the saturated evaporative temperature and the actual measured temperature at the TXV sensor bulb. The superheat is factory set for 10°F to 12°F (5°C to 6°C) and should never exceed 15°F (8°C). Only a trained refrigeration technician should adjust refrigeration system valves.

Refrigerant Sight Glass

The refrigerant sight glass is located in the liquid line ahead of the expansion valve. It allows the operator or service technician to observe the flow of liquid refrigerant. Prolonged periods of foaming in the sight glass may indicate a low refrigerant condition or a restriction in the liquid line. Occasional bubbling in the sight glass may occur at a time when load conditions are changing and the thermostatic expansion valve is adjusting to the new conditions. This momentary occurrence is a result of normal chiller operation. The sight glass can also be used to check if there is moisture in the refrigeration system. If there is moisture in the system, the green dot in the center of the sight glass will turn yellow. If this occurs, the chiller should be serviced immediately.

Refrigerant Filter Drier

The filter drier is located in the liquid line between the condenser and the refrigerant sight glass. It is designed to remove any moisture and/or foreign matter that may have gotten into the refrigerant stream. Moisture and foreign matter can cause serious damage to the components of a refrigeration system. For this reason, it is important that the chiller be equipped with a clean filter drier. Replace the filter drier if any of the following conditions occur:

1. The refrigeration system is opened to the atmosphere for repairs or maintenance.
2. Moisture is indicated in the sight glass (the green dot has changed to yellow).
3. An excessive pressure drop develops across the filter drier. This is indicated by a significant temperature difference between the filter inlet and outlet.

Pressure Relief Valve / Blow Out Plug

The pressure relief valve is located in the liquid line after the condenser. It is designed to relieve refrigerant pressure under severe conditions in order to protect the refrigeration circuit components from damage.

Hot Gas Bypass Valve

This valve is located in the refrigerant line that runs from the compressor discharge to the evaporator inlet. It is designed to artificially load the chiller when the chiller is catering to a partial load from the process. This is accomplished by directing some of the hot compressor discharge gas directly back into the evaporator instead of going through the condenser. The microprocessor based PID temperature controller controls the amount of hot gas used.

Solenoid Valve

The solenoid valve is controlled by the microprocessor based PID temperature controller and supplies adequate amount of refrigerant necessary to cool the process fluid to the desired temperature.

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 chiller 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 chiller 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.

NOTE: The reservoir must not be pressurized. Modifications to the chiller 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.

High Refrigerant Pressure Switch

The High Refrigerant Pressure switch is designed to limit the compressor discharge pressure within the design parameters of the compressor. The switch is located on the discharge side of the compressor. Models OTC-1.0A and above typically utilize manual reset switches.

Low Refrigerant Pressure Switch

The Low Refrigerant Pressure switch is designed to limit the compressor suction pressure to within the designed parameters of the compressor. The switch is located in the suction side of the compressor. The low pressure refrigerant switch is an automatic reset switch.

Freezestat

The freezestat control is an electronic thermostat most commonly used that senses the coolant temperature separately from the microprocessor based PID temperature controller. The PID controller is sometimes used as the freezestat. This safety is designed to limit the temperature of the coolant leaving the evaporator and prevent a possible freeze up situation. This control should be set 10°F (5°C) below the minimum coolant supply temperature, and there should be a sufficient glycol concentration for 10°F (5°C) below the freezestat setting.

NOTE: It is critical that the freezestat is set properly and that there is sufficient glycol in the system to correspond with the freezestat setting. Freeze ups can cause extensive damage to several components in the chiller, and the warranty does not cover repairs required due to a freeze up.

5.4 System Construction Standards

OPTI TEMP standard chillers 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 Chiller Location

The OPTI TEMP units utilize air-cooled refrigeration systems and 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 refrigeration pressures, 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 chiller. Removable panels permit easy access for periodic maintenance or repair. Do not compromise this feature by locating the chiller in an inaccessible area.

NOTE: The condenser air inlet temperature should be maintained above 60°F (15°C) in order to avoid possible low refrigerant pressure safety trips during start-up. If it is necessary to store the chiller 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 Process Fluid Connection

Connect "TO PROCESS" and "FROM PROCESS" connections on rear of chiller to your process lines. Standard process connections provided on OTC Series chillers are stainless steel male pipe fittings. See specifications table in Section 5.2 for connection sizes on specific chiller 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 chiller should maintenance be required on the unit.

All chillers sold by Amada Miyachi America are equipped with a factory bypass circuit that allows for the connection of smaller diameter hoses than the recommended hose diameters noted in the table below without causing undue stress on the water chiller.

Recommended Hose Selection Table

Standard Model OTC	Standard Flow Rating	Minimum Hose Size	Hose Length from machine
1.0A, & 1.5A	5.3 GPM @ 32 PSI 20 LPM @ 220kPa	≥ ¾" ID ≥ 1" ID	≤ 10' (3m) > 10' (3m)
2.0A,	10.6 GPM @ 30 PSI 40 LPM @ 207kPa	≥ 1" ID ≥ 1-1/4" ID	≤ 10' (3m) > 10' (3m)
5.0A & 4.0A	10.6 GPM @ 55 PSI 40 LPM @ 379kPa	≥ 1-1/4" ID ≥ 1-1/2" ID	≤ 10' (3m) > 10' (3m)
7.5A	15.9 GPM @ 63 PSI 60 LPM @ 430kPa	≥ 1-1/2" ID ≥ 2" ID	≤ 10' (3m) > 10' (3m)

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 chiller 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.

CAUTION: The recommended Hose Selection table above lists the recommended inner hose diameter based on the flow rate and delivered pressure. Verify the pressure does not exceed 42.6 psi (294kPa). Refer to Section 5.2 for the water flow requirements of the Laser

6.3 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 chiller.

Standard portable chillers have been designed for a nominal flow of 2.4 GPM per ton at nominal conditions. During normal full-load operation with 55°F (10°C) coolant supplied to the process, this nominal flow rate will result in a 65°F (15°C) coolant returned from the process. The nominal flow rate for each chiller is shown above in the Recommended Hose Selection Table. This table also provides the maximum flow rate for each chiller. The maximum flow rate should not be exceeded unless the chiller was specifically ordered to handle high flow conditions. If the process cannot handle the full nominal flow from the chiller, the excess water flow will simply bypass the process through the bypass line inside the chiller.

The importance of properly sized piping between the chiller 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 chiller 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	Maximum Flow Rate (GPM)	Maximum Flow Rate (ℓpm)
1/2”	2	7.6
3/4”	5	18.9
1”	10	37.9
1-1/4”	20	75.7
1-1/2”	30	113.6
2”	50	189.3
2-1/2”	90	340.7
3”	160	605.7

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 chiller.

6.4 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

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.

6.5 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.

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 codes.

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

Nominal Voltage	Operating Range	OptiTemp option
200V, 1Ø, 50Hz 208-230V, 1Ø, 60Hz	190-220V 198-253V	216
200-220V, 3Ø, 50Hz 208-230V, 3Ø, 60Hz	180-242V 198-253V	236
380-420V, 3Ø, 50Hz 460V, 3Ø, 60Hz	361-462V 368-506V	436

Section 7 – Operation and Start Up

7.1 General Start Up Information

All chillers are fully tested prior to shipping. Readings of voltage, amperage, compressor suction and discharge pressures, 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 chiller. 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 chiller 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 chiller 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 chilled water piping connections are secure. Remove the top panel from the chiller and the screw cap from the top of the reservoir. Fill the reservoir with the proper water or water solution as described in section 7.3 below.

NOTE: The power must be on for 12 hours prior to starting the compressor to allow the crankcase heater to sufficiently vaporize any liquid refrigerant that may be present in the compressor.

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.

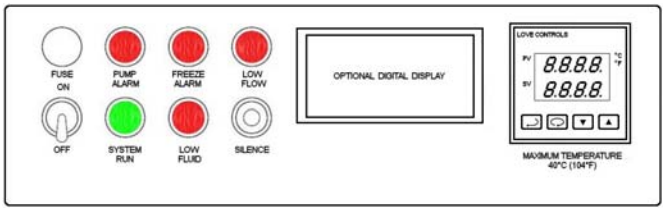
7.3 Fluid Selection, Water Quality and Corrosion Protection

Generally, steam-distilled water is used 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.

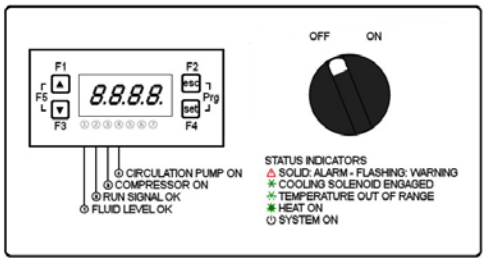
In cases where the OPTI TEMP chiller is not used with an Amada Miyachi Laser Welder and conductivities are permitted below 240 microsiemans/cm, a corrosion inhibitor such as OPTISHIELD® may be used to control corrosion and extend system life. Visit www.optishield.net for more information regarding OPTISHIELD®. In addition, there are a wide variety of alternative heat transfer fluids available for use in recirculating 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 chiller unit. Refer to the Operator Manual that was shipped with your Water Chiller.



Typical Control Panel with Love 16C-3 Controller



Typical Control Panel with Schneider M171 Controller

Actual Layout may vary by model

7.5 Fluid Fill

Fill the reservoir to within 2" (50mm) 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 16C-3 Controller

Schneider M171 Controller

Love 16C-3 Controller

If the Water Chiller contains a Love PID Controller, then this section will discuss the basic control operation and settings. For more complete instructions on the operation of the temperature controller and the available options, please refer to the Instruction Manual that was included with the Water Chiller.

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 to high (± 3°C (5°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.

Schneider M171 Controller

If the Water Chiller contains a Schneider M171 PID Controller, then please refer to the Instruction Manual (#O005759) included with the Water Chiller.

7.8 Fluid Bypass Valve Setting and Adjustment

The chiller 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 chiller. It may be necessary to remove an access cap on the bypass valve.

With the chiller 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	Standard Pump	Factory Set-Point	
		(models with Love Controller)	(models with Schneider Controller)
OTC1.0A, 1.5A, 2.0A	½ HP motor and G&L centrifugal pump	65 PSI	25PSI
OTC1.0A	⅓ HP motor and G&L centrifugal pump	65 PSI	---
OTC4.0A, 5.0A	1½ HP motor and G&L centrifugal pump	53 PSI	54PSI
OTC7.5A	2 HP motor and G&L centrifugal pump	61 PSI	64PSI

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 chiller 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 chiller. 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 Condenser													
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 Causes	Remedy
Compressor will not start but pump is running	Compressor Failure	Contact OPTI TEMP customer service
	Temperature Controller Failure	Replace if faulty
	Compressor Contactor	Replace if faulty
	Compressor Overload	Check voltage, amperage, compressor contactor, wiring and overload set-point
	Freeze Condition	Inspect the temperature control and replace if faulty Check pump flow and increase flow if necessary
	Hi or Low Refrigeration Pressure	See Hi or Low refrigeration pressure
Compressor and 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 will not start but compressor is running	Pump failure	Replace if faulty
	Pump contactor	Replace if faulty
	Pump overload	Check voltage, amperage, pump contactor, wiring and overload set-point
Low refrigerant pressure	Refrigeration pressure sensor	Check for proper range, replace if faulty
	Refrigerant leak	Contact refrigeration service technician
	Low refrigerant charge	Contact refrigeration service technician
High refrigerant pressure	Dirty air filters or condenser	Clean filter or condenser
	Air flow obstruction	Make sure chiller is installed in accordance with recommendations in this manual
	High ambient air temperature	Ambient air temperature must be reduced below 110°F
	Condenser fan motor	Replace if faulty
	Condenser fan cycling control	Confirm operation, replace if faulty
	Refrigerant circuit overcharge	Contact refrigeration service technician
	High refrigerant pressure sensor	Replace if faulty

Section 9 – Troubleshooting (continued)

Problem	Possible Causes	Remedy
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
Freezestat	Freeze condition	Inspect the temperature control and replace if faulty Check pump flow and increase flow if necessary
Deviating temperature controller	Low coolant flow through the evaporator	Adjust bypass valve
	Intermittent overloading of chiller capacity	Check to make sure the chiller is properly sized for the process load
	Hot gas bypass valve	Contact refrigeration service technician
	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 chiller is properly sized for the process load
	Coolant flow through evaporator too high or too low	Adjust bypass valve
	Insufficient condenser cooling	See High refrigerant pressure
	Hot gas bypass valve stuck open	Contact refrigeration service technician
	Refrigerant circuit problem	Contact refrigeration service technician
	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. Contact OptiTemp for the recommended parts.

Section 11 – Warranty and Service

All OPTI TEMP Chillers sold by Amada Miyachi America can be serviced through Amada Miyachi America. In the event we are unable to perform the service, we will coordinate a field service representative from OPTI TEMP to repair the unit. Service to an OPTI TEMP water-chiller is covered under the original Laser Welder warranty. If your Laser Welder is covered under warranty, please contact Amada Miyachi America first. If you decide to contact OPTI TEMP directly and the Laser Welder is under the Amada Miyachi America warranty, Amada Miyachi America will not reimburse for repair charges.

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 the service department:

Amada Miyachi America Service:	626-303-5676 or service@amadamiyachi.com
Amada Miaychi After Hours Support:	866-751-SERV (7378)
OptiTemp Service Department:	231-946-2931 or information@optitemp.com

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

Unit Serial Number _____

All information below is in regards to OptiTemp standard warranty and repair. If you elect to repair your unit through OptiTemp, please follow the instructions written below.

Amada Miyachi America's Limited Warranty

Please refer to the Operators Manual of the Amada Miyachi Equipment you are using for warranty details. Amada Miyachi America warranties the OptiTemp Chiller for the same length of time as the Amada Miyachi Equipment. If a customer elects to have OptiTemp repair the Water Chiller, please read OptiTemp's repair policy below.

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. 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 cannot 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 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 cannot 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.

> $595 for Models OTC-1.0A through OTC-7.5A.
> Note: Amada Miyachi America does not set this price, please contact OptiTemp for current pricing.

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 "onsite" repair service under any circumstances. However, OPTI TEMP can arrange "onsite" 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, semiconductor, 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 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:

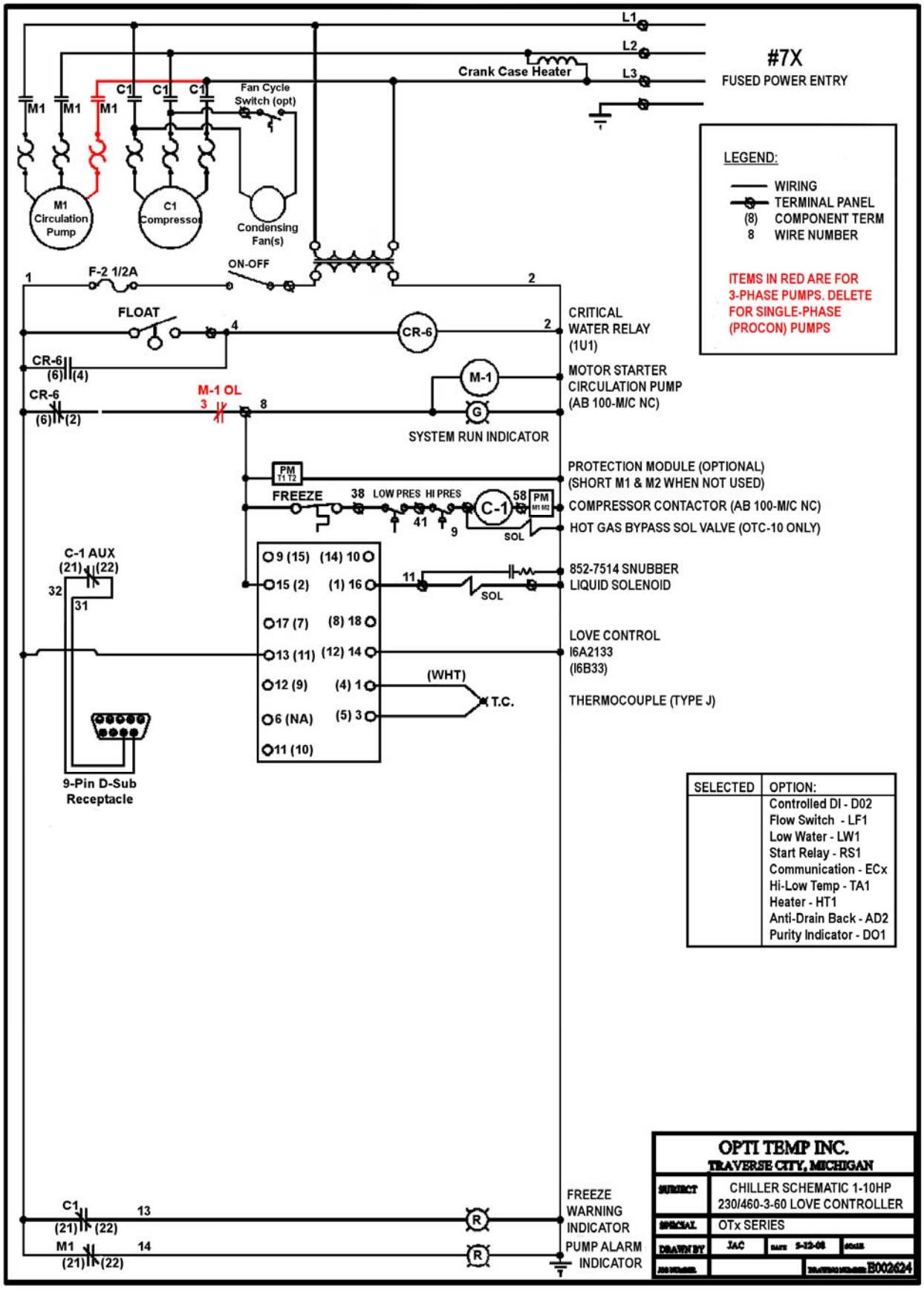
OPTI TEMP INC.
1500 International Dr.
Traverse City, MI 49686
Attn: RMA _____

Section 12 – Appendix

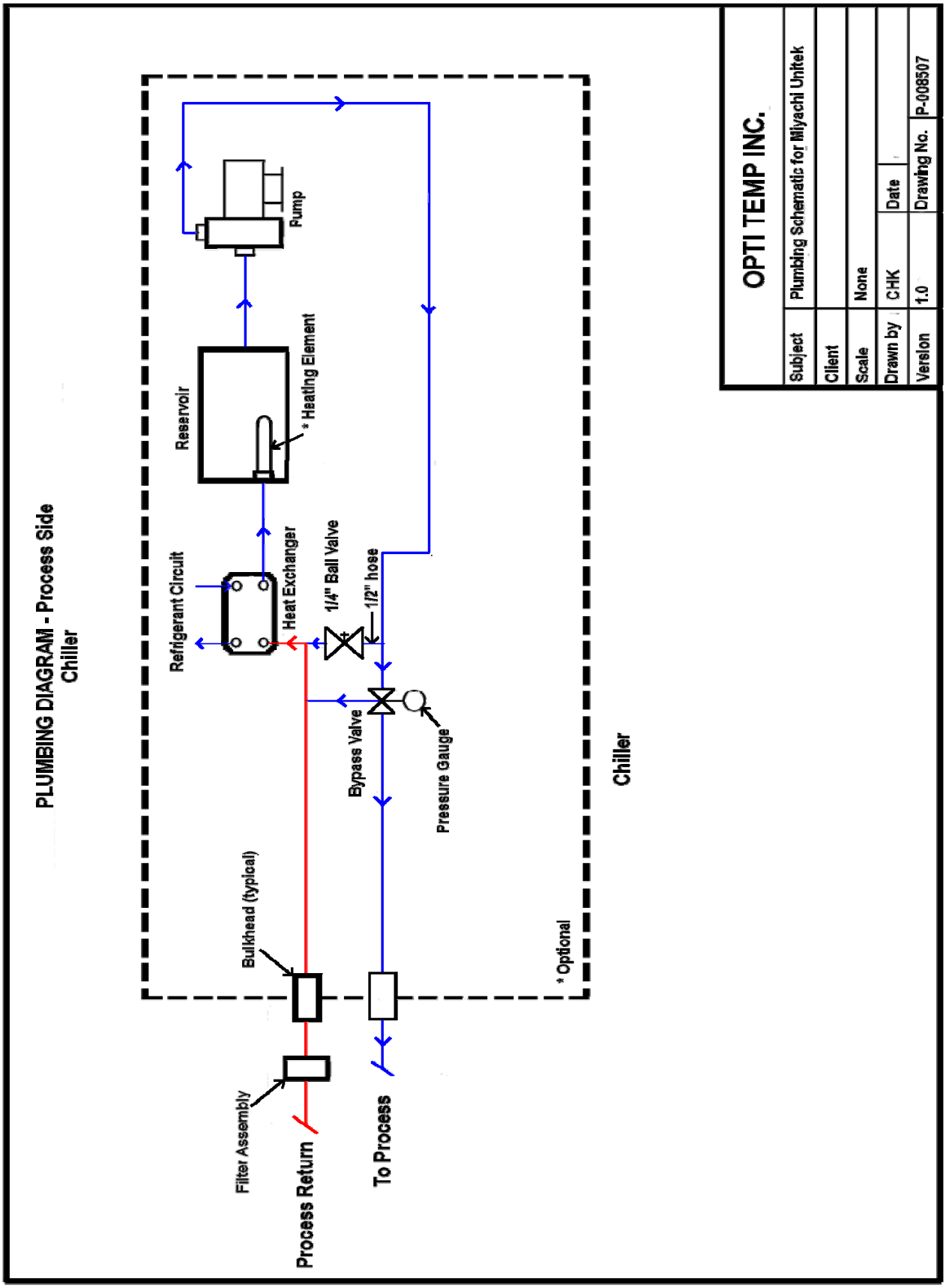
12.1 Dew Point / Temperature Chart

Outside Temp Degrees		Outside Relative Humidity		Dewpoint Temp Degrees		Temperature to Laser 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
80	27	50	10	59	15	61	16
		60	16	65	18	67	19
		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
95	35	30	-1	59	15	61	16
		40	4	67	19	69	21
		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

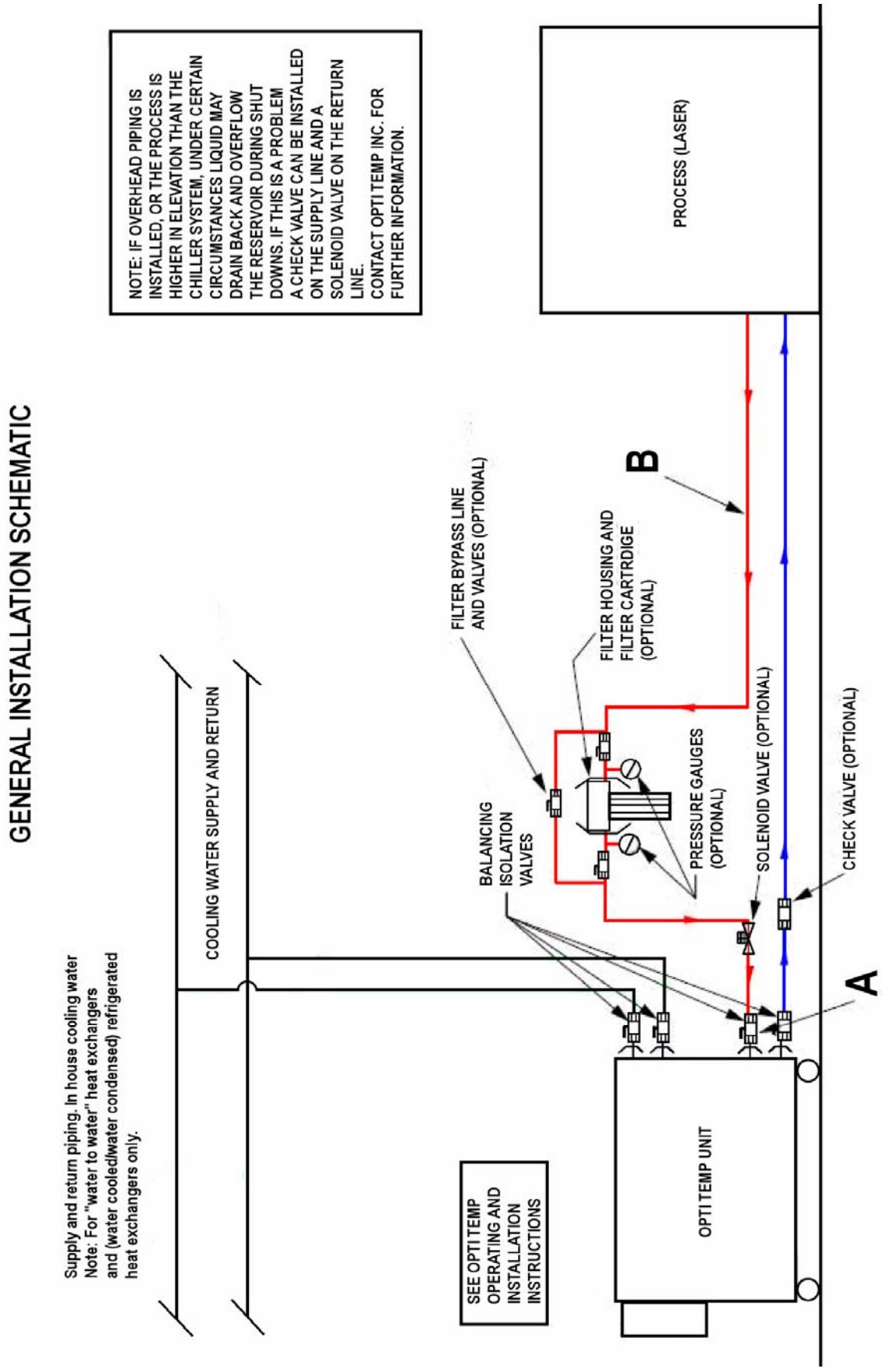
12.2 Electrical Schematic Example – Refer to Schematic that was shipped with Water Chiller



12.3 Plumbing Diagram



12.4 Installation Diagram



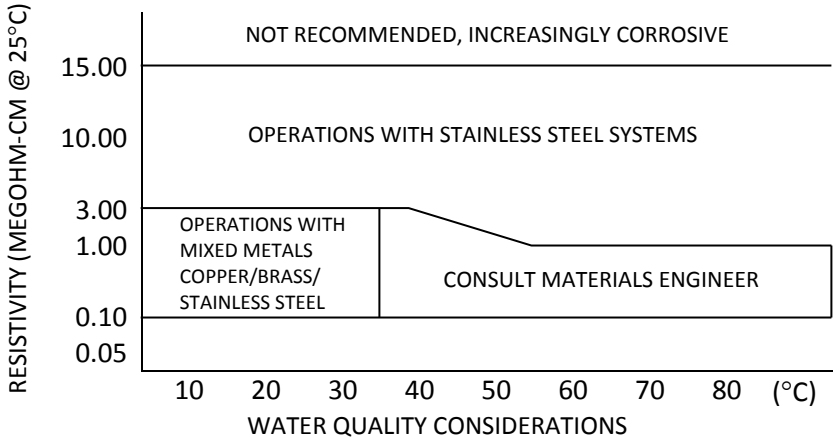
12.5 Water Quality Guidelines for OptiTemp Chiller

Microbiologicals	Permissible (PPM)	Desirable (PPM)
(algae, bacteria, fungi)	0	0
Inorganic Chemicals		
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
Other Parameters		
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).

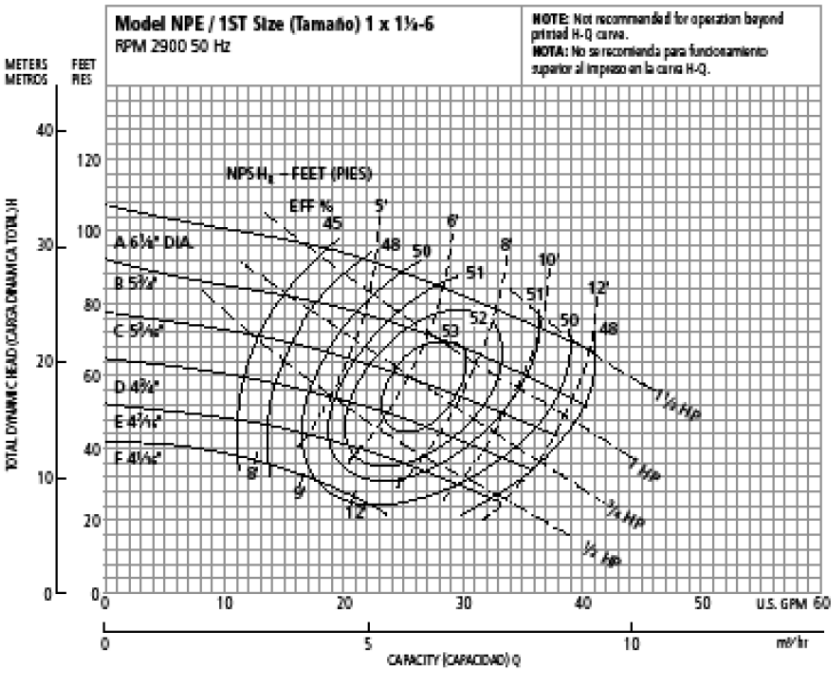
Recommendation: Initially fill the tank with distilled/deionized water. Do not use untreated tap water as the total ionized solids level may be too high. Maintain this water quality at a resistivity of between 1 to 10 megohm-cm (compensated to 25°C) by using a purification system. Although the initial 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.



12.6 Pump Curves

50Hz Pump – G&L Pump Curves

Performance Curves – 50 Hz, 2900 RPM
Curvas de Funcionamiento – 50 Hz, 2900 RPM



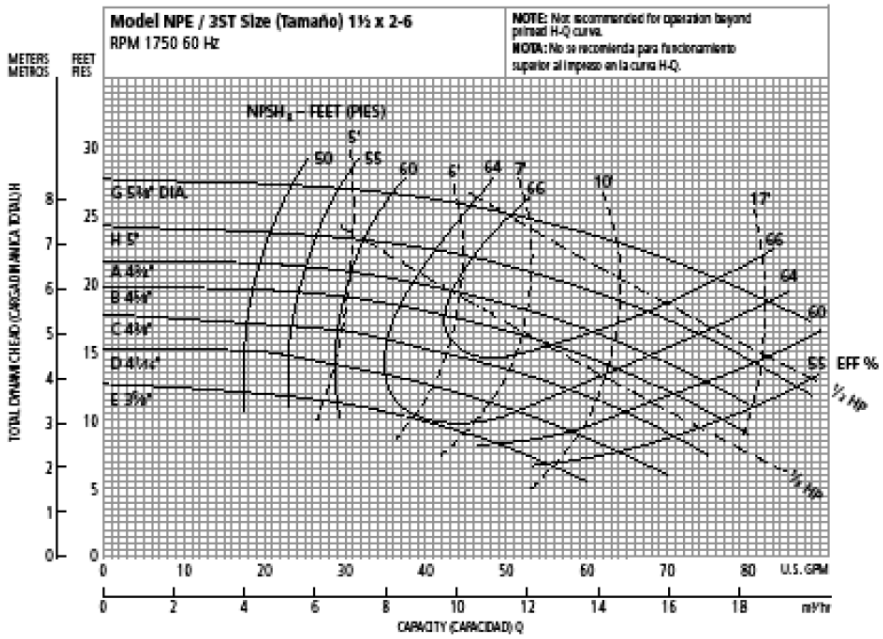
Optional Impeller, *Impulsor Opcional*	
Ordering Code, *Código de Pedido*	**Dia.**
A	6¼"
B	5¾
C	5⁹⁄₁₆
D	4¾
E	4⁷⁄₁₆
F	4⁷⁄₁₆

NOTE: Although not recommended, the pump may pass a ⁹⁄₁₆" sphere.

NOTA: *Si bien no se recomienda, la bomba puede pasar una esfera de ⁹⁄₁₆".*

60Hz Pump – G&L Pump Curves

Performance Curves – 60 Hz, 1750 RPM
Curvas de Funcionamiento – 60 Hz, 1750 RPM

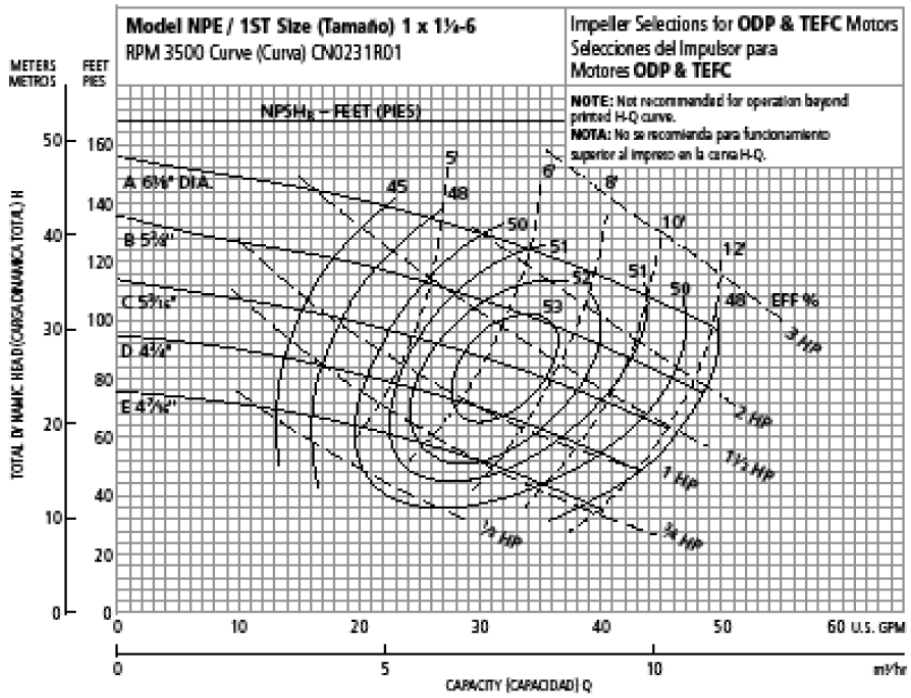


Optional Impeller, *Impulsor Opcional*	
Ordering Code, *Código de Pedido*	**Dia.**
G	5⅛"
H	5
A	4¾
B	4⅝
C	4⅜
D	4¼
E	3⅞

NOTE: Although not recommended, the pump may pass a ⁹⁄₃₂" sphere.

NOTA: *Si bien no se recomienda, la bomba puede pasar una esfera de ⁹⁄₃₂".*

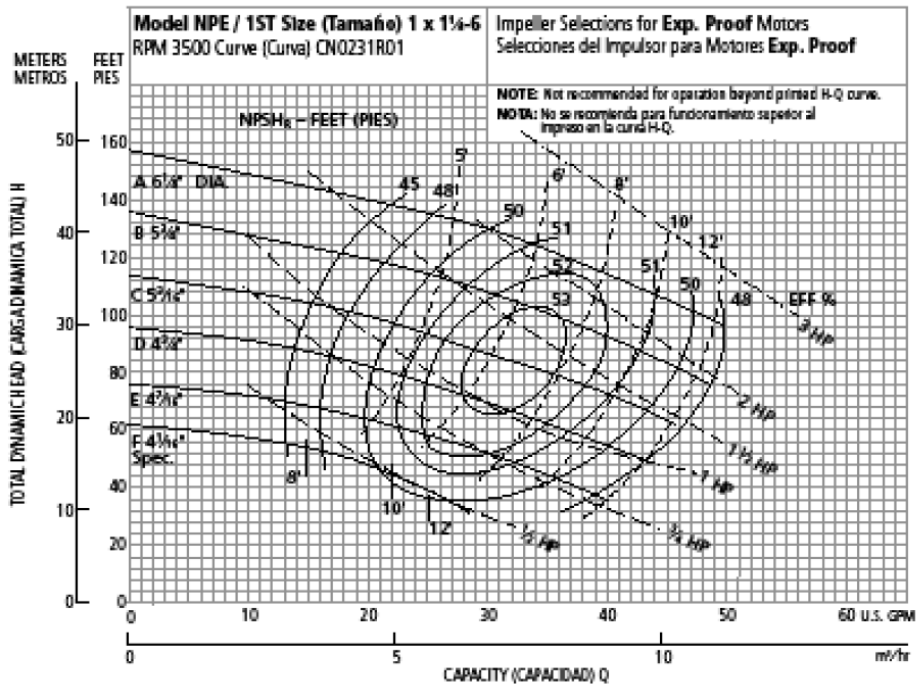
Performance Curves – 60 Hz, 3500 RPM
Curvas de Funcionamiento – 60 Hz, 3500 RPM



Ordering Code, Código de Pedido	Standard HP Rating, Estándar HP Potencia	Imp. Dia.
E	½	4⅜"
D	¾	4¾
C	1	5⅜
B	1½	5¾
A	2	6⅛

NOTE: Although not recommended, the pump may pass a ⅛" sphere.

NOTA: *Si bien no se recomienda, la bomba puede pasar una esfera de ⅛".*



Ordering Code, Código de Pedido	Standard HP Rating, Estándar HP Potencia	Imp. Dia.
F	½	4⅛" spec.
E	¾	4⅜
D	1	4¾
C	1½	5⅜
B	2	5¾
A	3	6⅛

NOTE: Although not recommended, the pump may pass a ⅛" sphere.

NOTA: *Si bien no se recomienda, la bomba puede pasar una esfera de ⅛".*

Notes: 1) Pump performance values are based on pump manufacturers published data.
2) Factors such as fluid temperature, fluid type, and external fluid circulating may impact pump performance values.
3) Reference "Specifications" for pump descriptions and horse power ratings.
4) Oversized pump selections may reduce chiller capacities. Consult applications for further details.

12.7 RoHS Material Table

OTC Series Material Compliance Summary Table – RoHS
Standard Model(s) Used for Analysis: OTC-1.0A, 1.5A, 2.0A, 4.0A, 5.0A and 7.5A
Date effective: 6/29/2007; Last Updated 10/1/2007

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%	0.001%	0.10%	0.10%	0.10%
Refrigeration						
Condensing Unit	O	O	O	O	O	O
Receiver – Copper Spun	O	O	O	O	O	O
Brazed Plate Evaporator	O	O	O	O	O	O
Expansion Valve Body	O	O	O	O	O	O
Head Kit	O	O	O	O	O	O
Orifice	O	O	O	O	O	O
Filter Drier	O	O	O	O	O	O
Sight Glass	O	O	O	O	O	O
Hot Gas Bypass Valve	O	O	O	O	O	O
Solenoid Valve	O	O	O	O	O	O
Coil	O	O	O	O	O	O
Crankcase Regulating Valve	O	O	O	O	O	O
High Pressure Switch	O	O	O	O	O	O
Low Pressure Switch	O	O	O	O	O	O
Silver Solder	O	O	O	O	O	O
Brazing – Copper Solder	O	O	O	O	O	O
Copper Tube	O	O	O	O	O	O
Wrot Copper Fitting						
Cork Tape Insulation						
Tube Insulation	O	O	O	O	O	O
Refrigeration Clamps	O	O	X	O	O	O
Refrigerant	O	O	O	O	O	O
Mechanical						
Fabricated Components						
- Cabinet	O	O	O	O	O	O
- Brackets	O	O	O	O	O	O
- Side Panels	O	O	O	O	O	O
- Electrical Enclosure	O	O	O	O	O	O
Powder Coat	O	O	O	O	O	O
Low Temp Cut-Off Thermostat	O	O	O	O	O	O
High Temp Cut-Off Thermostat	O	O	O	O	O	O
Reservoir Cap	O	O	O	O	O	O
Reservoir	O	O	O	O	O	O
Motor	O	O	O	O	O	O
Pump						
- Positive Displacement	O	O	O	O	O	O
- Centrifugal						
- Turbine	O	O	O	O	O	O
- Centrifugal Mag Device	O	O	O	O	O	O
Fittings						
- Polypropylene	O	O	O	O	O	O
- Brass	O	O	O	O	O	O
- Stainless Steel	O	O	O	O	O	O
- CPC	O	O	O	O	O	O
- Push to Connect	O	O	O	O	O	O
Hose						
- Polybraid	O	O	O	O	O	O
- Black	O	O	O	O	O	O
- Silicone	O	O	O	O	O	O
- HDPE (pressure gage)	O	O	O	O	O	O
Bulkhead	O	O	O	O	O	O
Pressure Gage	X	O	O	O	O	O
Bal Valve	O	O	O	O	O	O
Bypass Valve						
- Polypropylene	O	O	O	O	O	O
- Brass	X	O	O	O	O	O
- Stainless Steel	X	O	O	O	O	O
Pipe Dope	O	O	O	O	O	O
Teflon Tape	O	O	O	O	O	O
Fasteners						
- Sheet Metal Screws	O	O	O	O	O	O
- Rivots	O	O	O	O	O	O
- Bolts & Nuts	O	O	O	O	O	O
- Captive Screw Clips	O	O	O	O	O	O
Hose Clamps	O	O	O	O	O	O
Fluid Circuit Insulation	O	O	O	O	O	O
Grommets	O	O	O	O	O	O
Decals – Labels	O	O	O	O	O	O
Casters	O	O	O	O	O	O
Electrical						
Power Cord	O	O	O	O	O	O
Temperature Controller	X	O	O	O	O	O
Surge Suppressor	O	O	O	O	O	O
Sub D-9 Pin	O	O	O	O	O	O
Wire Sleeve	O	O	O	O	O	O
Transformer	O	O	O	O	O	O
On/Off Switch	O	O	O	O	O	O
Red Light	O	O	O	O	O	O
Green Light	O	O	O	O	O	O
Push to Start / Silence	O	O	O	O	O	O
Relay	O	O	O	O	O	O
Slim Line Relay	O	O	O	O	O	O
Fuse Holder	O	O	O	O	O	O
Glass Fuse	O	O	O	O	O	O
Thermocouple	O	O	O	O	O	O
Float Switch	O	O	O	O	O	O
Disc Thermostat	O	O	O	O	O	O
Wire Connectors	O	O	O	O	O	O
Plastic Strain Relief	O	O	O	O	O	O
Marker Numbers	O	O	O	O	O	O
Terminal Strip	O	O	O	O	O	O
Fuse Block	O	O	O	O	O	O
Wire	O	O	O	O	O	O
Options						
Particle Filter Housing	O	O	O	O	O	O
Particle Filter Cartridge	O	O	O	O	O	O
Filter Wrench	O	O	O	O	O	O
Filter Bracket	O	O	O	O	O	O
Shipping Crate	O	O	O	O	O	O

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

12.8 Electrical Interfacing

Standard Electrical Interfacing / Controls Configuration for OTC Series Chillers

		Contacts	Description	Type	Pins	Connector
Standard	**Set 1:**	**Primary Contacts**	**Critical Chiller Faults**	**Change of State**	Pins (8&9)	9 Pin D-Sub
		Standard chiller protections placed in series on Primary circuit/contact set.		*Cummulative*		(male)
		Compressor & Pump shuts down on pump alarm/critical water level and provides contact closure.				
		Compressor shuts down on freeze condition and/or refrigerant pressure(s) and provides contact closure. Pump continues to run.				
		Panel indicator lamps are included for system run, temperature out-of-tolerance, pump & freeze condition faults.				
Optional	**Set 2:**	**Secondary Contacts**	**Non-critical user requested Faults**	**Change of State**	Pins (6&7)	9 Pin D-Sub
		Change of state options placed in parallel on secondary circuit.		*Cummulative*		(male)
		Output contacts close on any fault				
		Available Options: Low Flow Indicator (flow switch) with discrete Indicator Lamp Low Water (Add water condition) with discrete Indicator Lamp Temperature out of tolerance (hi temp or hi/lo temp) (Panel indicator standard)				
Optional	Set 3:	*Remote Start/Stop Contacts*	Remote Start / Stop	*Change of State*	Pins (1&4)	9 Pin D-Sub
		Remote start/stop via 24VDC		Discrete		(male)
Optional	Set 4:	Serial Comm. Contacts	RS-232 or RS-485	Serial Comm.	Pins (2,3&5)	9 Pin D-Sub
		Allows Read/Write of all temperature controller functions		Mod Bus Protocol		(male)
Optional	Set 5:	*Auxiliary Contacts*		Variable Output Analog	TBD	Aux Conn
		Variable Output Options				(female)
		Available Options include:	Flow Meter Pressure Transducer Resistivity Output Remote Temperature Sensing			

Notes:
1) "Normally Open" or "Normally Closed" contacts should be specified at time of order.
2) Consult OTM or OTC Series Chiller Configuration & Option Matrix for additional information regarding available options
3) Contact OPTI TMP applications engineering at 213-946-2931 for assistance.

12.9 Dimensional Drawings

Dimensions – SAE (inches)

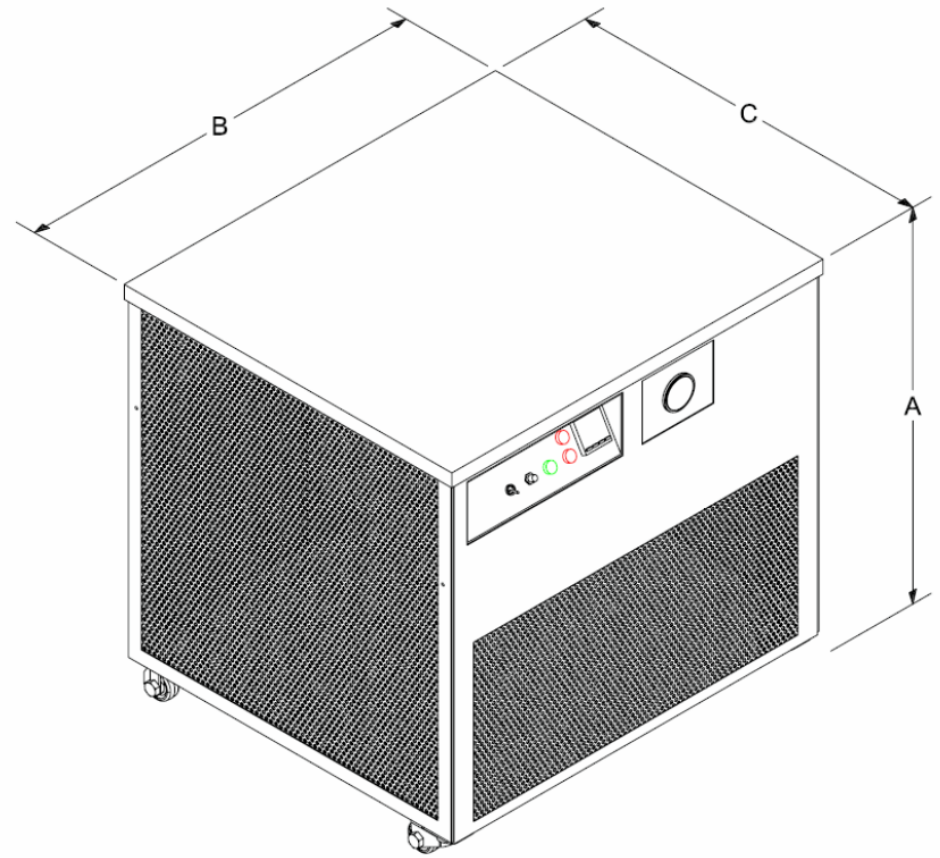
Description	OTC	1.0A	1.5A*	2.0A	4.0A*	5.0A	7.5A*	7.5A
Dimensions (inches)	A	27.5	26.5	26.5	34.5	34.5	45.0	55.0
	B	28.0	36.0	36.0	31.0	32.0	34.5	38.0
	C	25.0	36.0	36.0	46.0	54.5	46.0	62.0
Mass (weight) – lbs		205	395	350	550	525	750	800
Refrigerant		R-134a	R-22	R-134a	R-22	R-407c	R-22	R-407c

* Obsolete models

Dimensions – Metric (mm)

Description	OTC	1.0A	1.5A*	2.0A	4.0A*	5.0A	7.5A*	7.5A
Dimensions (inches)	A	698.5	673.1	673.1	876.3	876.3	1143	1397
	B	711.2	914.4	914.4	787.4	812.8	876.3	965.2
	C	635	914.4	914.4	1168.4	1384.3	1168.4	1574.8
Mass (weight) – kg		92.9	179.0	158.8	249.5	238.1	340.2	362.9
Refrigerant		R-134a	R-22	R-134a	R-22	R-407c	R-22	R-407c

* Obsolete models



12.10 Love PIC Temperature Controller Control Parameters *(only for Water Chillers with the Love Controller)*

Temperature Control		
Menu	**Value °C**	**Value °F**
Operation Mode		
SV	20.0	70
r-S	rUn	rUn
SP	1	1
AL1H	3.0	5.0
AL1L	3.0	5.0
LoC	Off	Off
OUT1	-	-
OUT2	-	-
Regulation Mode		
At	Off	Off
Pid0	20.0	20.0
SV0	20.0	20.0
P0	3.0	3.0
I0	9	9
d0	20.0	20.0
IoF0	0.0	0.0
CLPD	4	4
HLPD	40	40
CoEF	0.01	0.01
DEAd	0.0	0.0
tPoF	0.0	0.0
Initial Setting		
InPt	J	J
tPUn	C	C
tP-H	40.0	104
tP-L	7.0	45
CtrL	PiD	PiD
S-HC	H2C1	H2C1
ALA1	1	1
ALA2	0.0	0.0
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

12.11 Glycol Tables

The information listed below is the standard requirements when using the OTC Series Water Chiller with Glycol. When using this Water Chiller with a Laser, do not use a Glycol based additive. Use Steam-Distilled Water only.

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	1.10	1.49
140	1.00	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	-50.8	-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 $d^{15.6°}$	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.

End of Document