

Thermo Scientific System II Heat Exchanger

Thermo Scientific Manual P/N 002179
Rev. 09/16/2015

Installation Operation Basic Maintenance



Visit our Web site at:

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Product Service Information, Applications
Notes, MSDS Forms, e-mail.

Voice Info: (800) 258-0830

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Table of Contents

PREFACE	Compliance.....	3
	WEEE/RoHS.....	3
	After-sale Support.....	4
	Warranty	4
	Unpacking.....	4
	Out of Box Failure.....	4
	Feedback.....	4
SECTION I		
Safety	Warnings.....	5
SECTION II		
General Information	Description.....	6
	Specifications	6
SECTION III		
Installation	Site.....	7
	Facility Water Requirements.....	7
	Electrical Requirements.....	8
	Plumbing Requirements	8
	Fluids	9
	Filling Requirements	9
	Water Quality Standards and Recommendations.....	10
SECTION IV		
Operation	Start Up.....	11
	Temperature Adjustment.....	11
SECTION V		
Special Features	INTERLOCK Contacts	12
	Low Fluid Level Monitor.....	12
	High Temperature Monitor	12
	Pressure Relief Valve	13
SECTION VI		
Maintenance	Service Contracts	14
	Cleaning	14
	Algae.....	14
	Pump Strainer	14
	Facility Water Strainer	15
	Flow Diagrams.....	16
	Exchanger Dimensions.....	18
SECTION VII		
Troubleshooting	Checklist	19
	Service Assistance	19
Warranty		

System II Quick Reference Operating Procedures

Installation

The System II has a heat exchanger, recirculation pump, stainless steel reservoir and a temperature controller. The exchanger should be located in an area with easy access to a cooling water source and a drain.

Cooling capacity is based the temperature of the cooling water supply and the cooling fluid supplied to your application.

Make sure the voltage of the power source meets the specified voltage, $\pm 10\%$.

The plumbing connections are located on the rear of the exchanger and are labelled COOLING WATER and PROCESS WATER. The COOLING WATER connections are $\frac{3}{4}$ inch FPT. The PROCESS WATER connections are $\frac{1}{2}$ inch MPT. Connect the COOLING WATER connections to the cooling water supply. Connect the PROCESS WATER connections to your application.

To fill the reservoir remove the reservoir access cover and fill the reservoir with clean cooling fluid to within 1 inch of the top.

Thermo Scientific recommends using distilled/deionized water with a 0.05 to 0.1 megohm-cm reading.

If you do not have access to distilled/deionized water we recommend using filtered tap water.

Operation

Before starting, double check all electrical and plumbing connections. Make sure the circulating system has been filled with cooling fluid.

Ensure that the facility water is turned on.

To start the exchanger, place the OFF/ON/START Switch to the START position. The recirculation pump starts and the POWER ON lamp illuminates.

The TEMPERATURE gauge on the front of the exchanger indicates the temperature of the fluid in the reservoir. The temperature of the process fluid to your application is adjusted by turning the recessed valve screw located on top of the exchanger.

Periodic Maintenance

Periodically inspect the reservoir fluid. If cleaning is necessary, flush the reservoir with a cleaning fluid compatible with the circulating system and the cooling fluid.

Exchangers are equipped with pump strainers. If debris is in the system, the strainer will prevent the material from being drawn into the pump and damaging the pump vanes.

After initial installation, the strainer may become clogged. The strainer must be cleaned after the first week of installation. After this first cleaning, a monthly visual inspection is recommended. After several months, the frequency of cleaning will be established.

Before cleaning, disconnect the power cord from the power source and drain the reservoir.

Preface

Compliance

50 Hertz products tested and found to be in compliance with the requirements defined in the EMC standards defined by 89/336/EEC as well as Low Voltage Directive (LVD) 73/23/EEC can be identified by the CE Mark on the rear of the exchanger. The testing has demonstrated compliance with the following directives:

LVD, 73/23/EEC Complies with IEC/EN61010-1

EMC, 89/336/EEC IEC/EN61326-1

For any additional information, refer to the Declaration of Conformity that shipped with the exchanger.

WEEE/RoHS

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:



Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at:

www.thermofisher.com/WEEERoHS

After-sale Support

Thermo Fisher Scientific is committed to customer service both during and after the sale. If you have questions concerning the operation of your exchanger, contact our Sales Department. If your exchanger fails to operate properly, or if you have questions concerning spare parts, contact our Customer Service Department. Before calling, *please* obtain the following information:

- *BOM number*
- *Serial number*

The BOM and serial number are on a label on the rear of the exchanger.

Unpacking

Retain all cartons and packing material until the exchanger is operated and found to be in good condition. If the exchanger shows external or internal damage contact the transportation company and file a damage claim. Under ICC regulations, this is your responsibility.

Out of Box Failure

An Out of Box Failure is defined as any product that fails to operate in conformance with sellers published specifications at initial power up. The exchanger must be installed in accordance with manufacturer's recommended operating conditions within 30 days of shipment from the seller.

Any Temperature Control product meeting the definition of an Out of Box Failure must be packed and shipped back in the original packaging to Thermo Scientific for replacement with a new exchanger; Seller to pay the cost of shipping. Customer must receive a Return Material Authorization (RMA) from Thermo Scientific prior to shipping the exchanger.

Warranty

Exchangers have a warranty against defective parts and workmanship for one full year from date of shipment. See back page for more details.

Feedback

We appreciate any feedback you can give us on this manual. Please e-mail us at tcmanuals@thermofisher.com. Be sure to include the manual part number and the revision date listed on the front cover.

Section I Safety

Warnings

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your exchanger. If you have any questions concerning the operation of your exchanger or the information in this manual, contact our Sales Department (see After-sale Support).

Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

Never operate the exchanger without cooling fluid in the reservoir.

Always turn off the exchanger and disconnect the line cord from the power source before performing any service or maintenance procedures, or before moving it.

Always empty the reservoir before moving it.

Never operate equipment with damaged line cords.

Refer service and repairs to a qualified technician.



In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle with text highlighted in bold print. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the exchanger, significant property damage, or personal injury or death.

Section II General Information

Description

The Thermo Scientific System II Heat Exchanger uses building recirculating or tap water as the secondary cooling medium to remove heat from the cooling fluid in the closed circulation loop. Each consists of a heat exchanger, dual recirculation pumps, stainless steel reservoir, and a temperature controller.

Dual circulation loop exchangers have two Positive Displacement (PD) pumps, each plumbed to a separate inlet and outlet, switches and gauges (A and B).

Temperature Range	+5°C to +35°C
Temperature Stability	±1.0°C
Cooling Capacity 50 Hz or 60 Hz at +20°C	34 kW/116008 BTU
Heat Removal	
Pumping Capacity 60 Hz 50 Hz	6.0 gpm @ 60 psi (22.7 lpm @ 4.1 bar) 5.0 gpm @ 42.6 psi (18.8 lpm @ 2.9 bar)
Reservoir Volume Gallons/Liters	1.8/6.6
Dimensions (H x W x D) Inches Centimeters	30 ¹ / ₈ x 16 ¹ / ₂ x 20 ¹ / ₈ 76.5 x 41.9 x 51.1
Weight Pounds/Kilograms	186/84.3

Specifications obtained using water as the recirculating fluid and using water as a coolant on secondary loop, at nominal operating voltage. Other fluids, process temperatures, ambient temperatures, altitude, or operating voltages will affect performance. Specifications subject to change. Heat load removal is based on a 10°C difference between the temperature of the cooling water supply (house water) and the cooling fluid as it leaves the System II.

*Pressure drop indicates the minimum pressure differential pressure between the facility water inlet and outlet to achieve the corresponding facility water flow rate
(Pressure_{inlet} - Pressure_{outlet} = Pressure_{drop}).

Section III Installation

Site

The exchanger should be placed in a location with easy access to a cooling water source and a drain.



Never place the exchanger in a location where excessive heat, moisture, or corrosive materials are present.

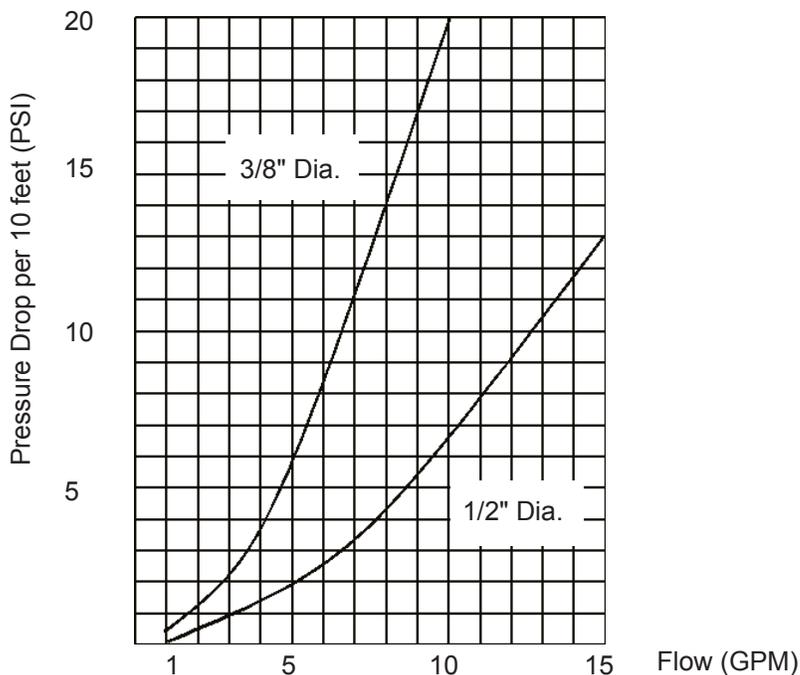
Facility Water Requirements



To prevent damage to the exchanger's inlet and outlet valves, maximum static facility water pressure should not exceed 150 psig and available supply-to-return differential pressure must not exceed 35 psid across the rated flow range.

Refer to the Cooling Capacity chart in Section II, Specifications. The flow rate of the cooling water supply must meet or exceed these requirements for the exchanger to operate at its full rated capacity. If the cooling water does not meet these standards, the cooling capacity will derate. The chart is based on a 10°C difference between the temperature of the cooling water supply (house water) and the cooling fluid supplied to the instrument being cooled.

As the heat load increases, the required flow rate of the cooling water supply increases. For example, if the heat load is 15 kilowatts, only 4 gallons per minute is required to remove the heat. However, if the heat load is 30 kilowatts, approximately 8.5 gallons per minute is required.



Approximate pressure drop through copper or plastic tubing at given flow rates.

Electrical Requirements



The exchanger construction provides protection against the risk of electric shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is your responsibility to assure a proper ground is provided.

Refer to the serial number label on the rear of the exchanger to identify the specific electrical requirements.

Ensure the voltage of the power source meets the specified voltage, $\pm 10\%$.

Voltage	Frequency	Amperage	Line Cord Plug
115	60	11.4	N5-15
220	50	8	Euro

Plumbing Requirements

Before installing the exchanger to an instrument that previously used tap water as a cooling fluid, flush the instrument several times to remove any rust or scale that has built up. The manufacturer of the instrument should be able to recommend a cleaning fluid for their equipment.

The plumbing connections are located on the rear of the exchanger and are labelled COOLING WATER and PROCESS WATER. The COOLING WATER connections are $\frac{1}{2}$ inch FPT. The PROCESS WATER connections are $\frac{3}{4}$ inch MPT.

Connect the COOLING WATER connections to the cooling water supply.

Connect the PROCESS WATER connections to the instrument being cooled.



Flexible tubing, if used, should be of heavy wall or reinforced construction. All tubing should be rated to withstand 80 psi at $+35^{\circ}\text{C}$. Make sure all tubing connections are securely clamped. Avoid running tubing near radiators, hot water pipes, etc. If substantial lengths of tubing are necessary, insulation may be required to prevent loss of cooling capacity.

Tubing and insulation are available from Thermo Scientific. Contact our Sales Department for more information (see Preface, After-sale Support).

It is important to keep the distance between the exchanger and the instrument being cooled as short as possible, and to use the largest diameter tubing practical. Tubing should be straight and without bends. If diameter reductions must be made, they should be made at the inlet and outlet of the instrument being cooled, not at the exchanger.

If substantial lengths of cooling lines are required, they should be pre-filled with cooling fluid before connecting them to the exchanger.

Fluids



Never use flammable or corrosive fluids. Do not use automotive anti-freeze. Commercial anti-freeze contains silicates that can damage the pump seals. Use of automotive anti-freeze will void the manufacturer's warranty.

We recommend using distilled/deionized water with a 0.05 to 0.1 MOhmcm reading.



Highly distilled/deionized water, above the 3 MOhmcm region, may become aggressive and is not recommended for use with exchangers with wetted parts other than stainless steel. Distilled/deionized water in the 15 MOhmcm region is definitely aggressive and should not be used. Exchangers operating in these regions should be closely monitored. See Water Quality Standards and Recommendations on the next page.

If you do not have access to distilled/deionized water we recommend using filtered tap water. We cannot recommend any custom fluids, these fluids are too dependent on your particular application.

Below +8°C, a non-freezing solution is required. The selected cooling fluid must have a viscosity of 50 centistokes or less. A 50/50 mixture, by volume, of distilled/deionized water and laboratory grade ethylene glycol is suggested.

Filling Requirements

The reservoir access cover is located on top of the exchanger. Fill the reservoir to within 1 inch of the top. Keep extra cooling fluid on hand until the entire system (the System II, the instrument being cooled and the tubing that connects them) is filled.



Reservoir Access Cover

Water Quality Standard and Recommendations

	Permissible (PPM)	Desirable (PPM)
Microbiologicals (algae, bacteria, fungi)	0	0
Inorganic Chemicals		
Calcium	<40	<0.6
Chloride	<250	<25
Copper	<1.3	<1.0
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*

* MOhmcm (Compensated to 25°C)

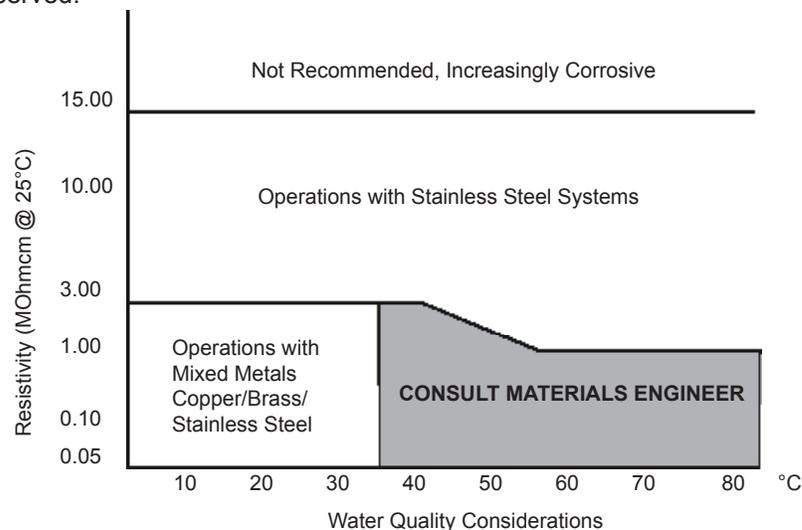
Unfavorably high total ionized solids (TIS) can accelerate the rate of galvanic corrosion. These contaminants can function as electrolytes which increase the potential for galvanic cell corrosion and lead to localized corrosion such as pitting. Eventually, the pitting could become so extensive that leaking will occur between the process water and facility water diminishing the System's heat transfer capability.

High water hardness (Calcium and Manganese) can also produce scaling. Scaling will inhibit heat transfer between the process and facility side by building up a deposit layer on metal surfaces. As an example, raw water in the United States 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.

The desired level for long time usage is 1 to 3 MOhmcm (compensated to 25°C).

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



Section IV Operation

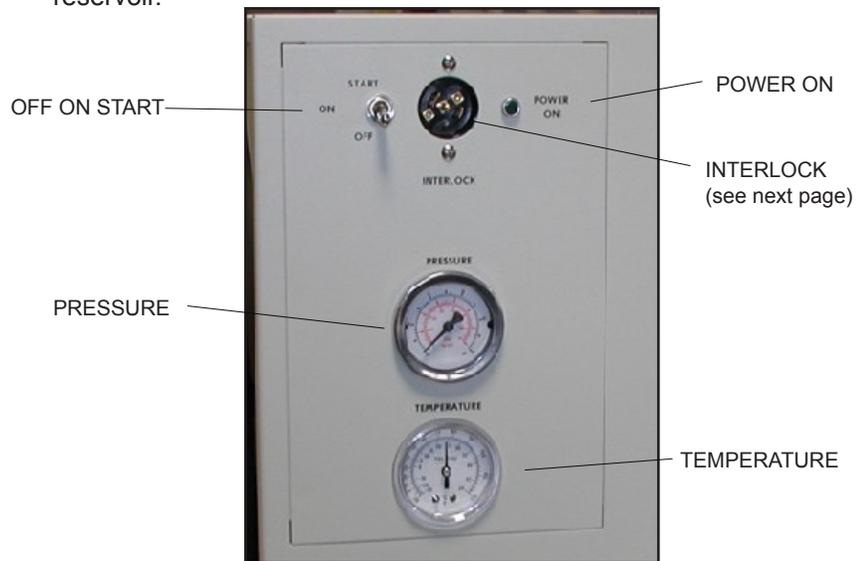
Start Up

Before starting, check all electrical and plumbing connections and make sure the circulating system has been properly filled with cooling fluid.

Ensure the facility water is turned on.

To start, momentarily place the OFF/ON/START switch in the START position. The recirculation pump will start and the POWER ON lamp will light.

If the exchanger does not continue to run when the OFF/ON/START switch is released, check the fluid level in the reservoir. The float switch in the reservoir prevents the exchanger from operating if the fluid level in the reservoir is below the operating level. If the fluid level is low, "top off" the reservoir.



Temperature Adjustment

A control valve, located in the COOLING WATER INLET line, regulates the flow rate of the cooling water supply as it enters the exchanger. The valve regulates the flow rate based on the heat load. Double loop exchangers have two valves.

The temperature of the process fluid to your application is adjusted by turning the recessed valve screw located on top of the exchanger. Adjust the screw by inserting a screwdriver through the hole in the top. Turn the screw counterclockwise to increase the temperature of the cooling fluid, clockwise to decrease the temperature.



The TEMPERATURE gauge on the front of the exchanger indicates the temperature of the fluid going to your application.

When selecting an operating temperature, remember that the lowest achievable temperature is a function of the available flow rate, the temperature of the cooling water supply, the heat load and the cooling fluid.

Section V Special Features

INTERLOCK Contacts

A set of relay contacts is connected to a receptacle on the front panel. The contacts are rated 10A, 250V. This is not a power inlet or outlet. The receptacle is isolated from the circuitry. Its ground pin is connected to the chassis. The contacts are normally open: they are closed during normal operation and open when the exchanger is turned off or when a fault occurs.

Low Fluid Level Monitor

The low fluid level monitor is connected to a float switch in the reservoir. A low fluid level fault occurs when the cooling fluid in the reservoir drops below the operating level.

In the event of a low fluid level fault, the exchanger will shut down, and the INTERLOCK contacts will open. For proper operation, the cause of the fault must be identified and corrected before the exchanger can be restarted, the fluid level must be returned to the proper operating level.

High Temperature Monitor

The high temperature monitor (HTC) is connected to a sensor that monitors the process fluid temperature as it exits the heat exchanger. The monitor protects your application from exposure to excessively hot cooling fluid. A temperature fault occurs when the cooling fluid temperature exceeds the set temperature limit.

In the event of a high temperature fault, the exchanger will shut down, and the INTERLOCK contacts will open. The cause of the fault must be identified and corrected before the exchanger can be restarted.

The monitor is not pre-set and must be adjusted during initial installation. The monitor is located on the rear of the exchanger.

A slotted adjustment screw is located in the center of the monitor. A temperature range scale surrounds the adjustment screw. The temperature scale is in °F.

To adjust the monitor, turn the adjustment screw until the pointer on the temperature scale corresponds to the desired temperature limit. We recommend a temperature limit approximately 50°F higher than the desired operating temperature.



Pressure Relief Valve

The pressure relief valve establishes the maximum operating pressure of the exchanger. If the pressure of the fluid leaving the pump exceeds the valve setting, the relief valve will bypass the fluid within the exchanger to relieve the pressure. The relief valve does not determine the actual operating pressure; the operating pressure of the system is determined by the back pressure of the connected equipment and the setting of the flow control.

If adjustment is necessary, contact our Customer Service Department.

For applications requiring maximum pressure less than 55 psi, an External Pressure Reducer (EPR) retrofit kit is available. An EPR allows operating pressures of 10 to 50 psi. Contact our Sales Department for more information (see Preface, After-sale Support). Before calling please obtain the following information:

Part number

Serial number

Section VI Maintenance

Service Contracts

Thermo Scientific offers on-site Service Contracts that are designed to provide extended life and minimal down-time for your exchanger. For more information, contact our Service Department (see Preface, After-sale Support).

Cleaning

Periodically inspect the reservoir. If cleaning is necessary, flush the reservoir with a cleaning fluid compatible with the circulating system and the cooling fluid.

Algae

To restrict the growth of algae in the reservoir, it is recommended that the reservoir cover be kept in place and that all circulation lines be opaque. This will eliminate the entrance of light which is required for the growth of most common algae.

Pump Strainer

If debris is in the system, the strainer will prevent the material from being drawn into the pump and damaging the pump vanes.

After initial installation, the strainer may become clogged with debris and scale. Therefore, the strainers must be cleaned after the first week of installation. Before cleaning, disconnect the line cord from the power source and drain the reservoir.

After this first cleaning, a monthly visual inspection is recommended. After several months, the frequency of cleaning will be established.

Remove the exchanger's wrapper. The strainer is located in each pump's suction line (under the hex nut). Unscrew the strainer and rinse it with water. Replace the strainer.



Facility Water Strainer (Optional)

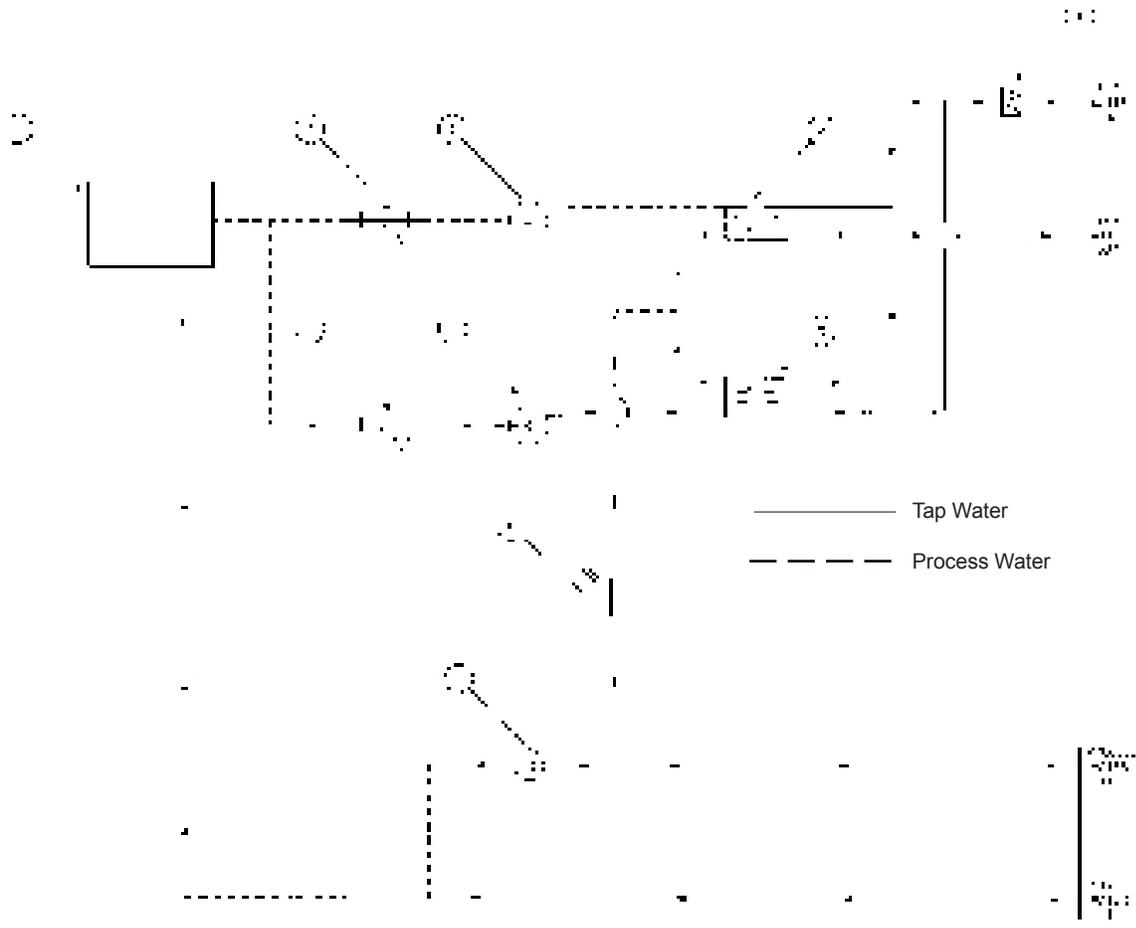
The facility water strainer is a user-installed basket strainer on the FACILITY WATER inlet. Clean the strainer when it becomes clogged or dirty.

Disconnect the power cord from the power source and turn off the facility water. Place a container under the strainer to collect any water spills out of the basket when it is removed.

Unscrew the clear plastic basket. Remove the screen and rinse it with water. Replace the screen and the basket.

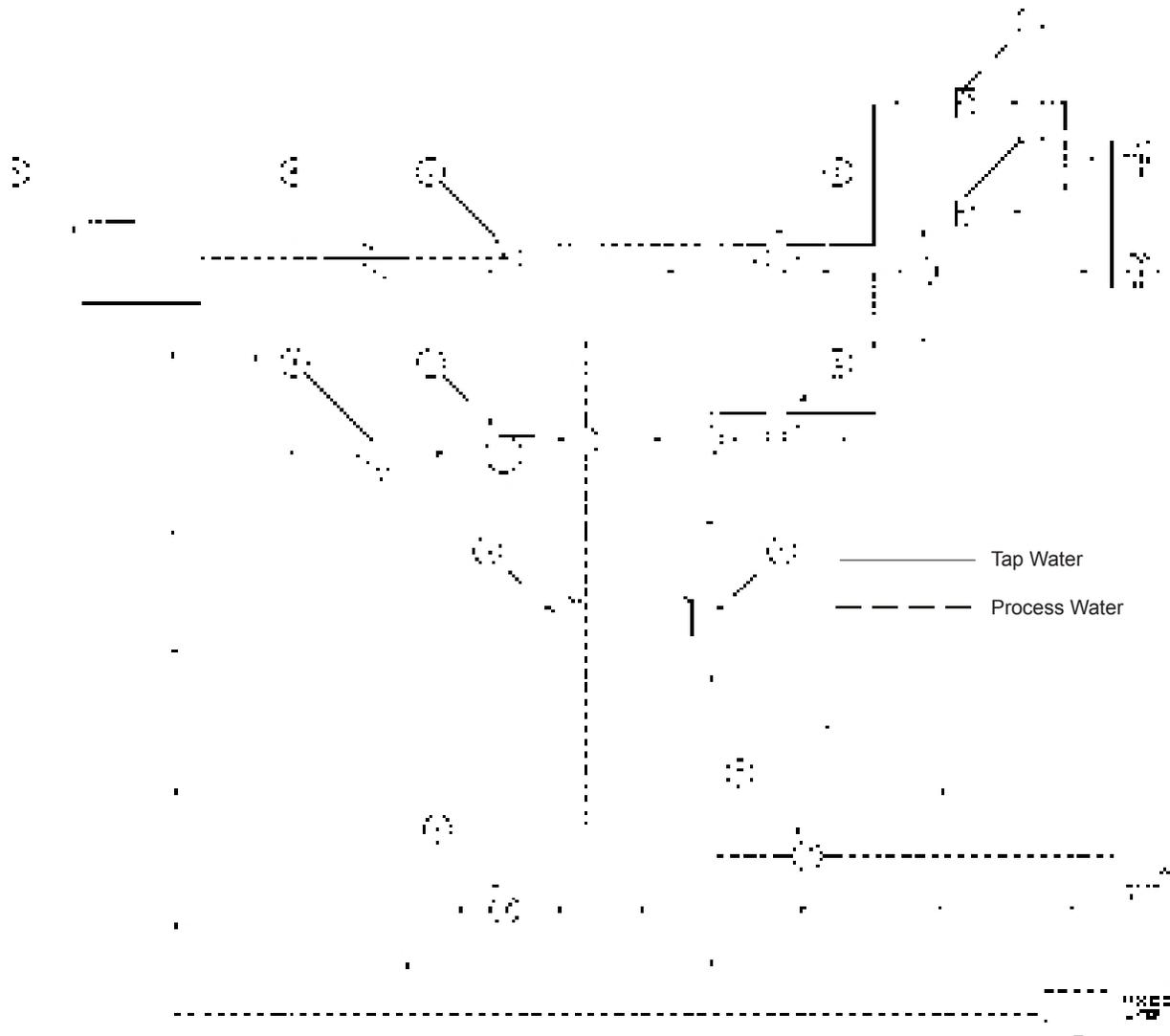
PD Pump Flow Diagrams

Single Loop



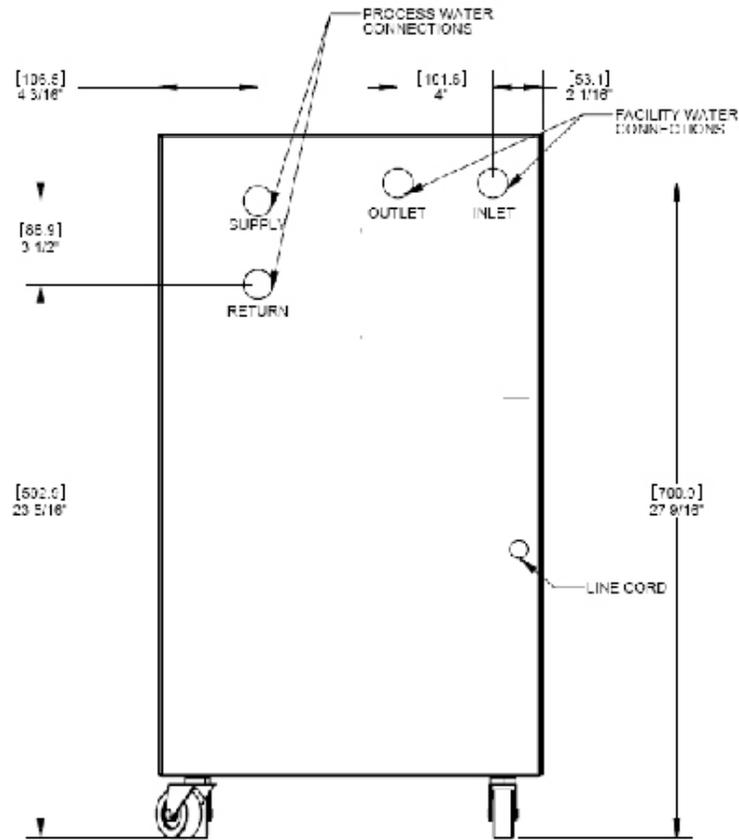
1. Temperature Regulating Valve
2. Plate Heat Exchanger
3. Pump
4. Strainer
5. Process Fluid Reservoir
6. Temperature Sensor
7. Relief Valve

Double Loop

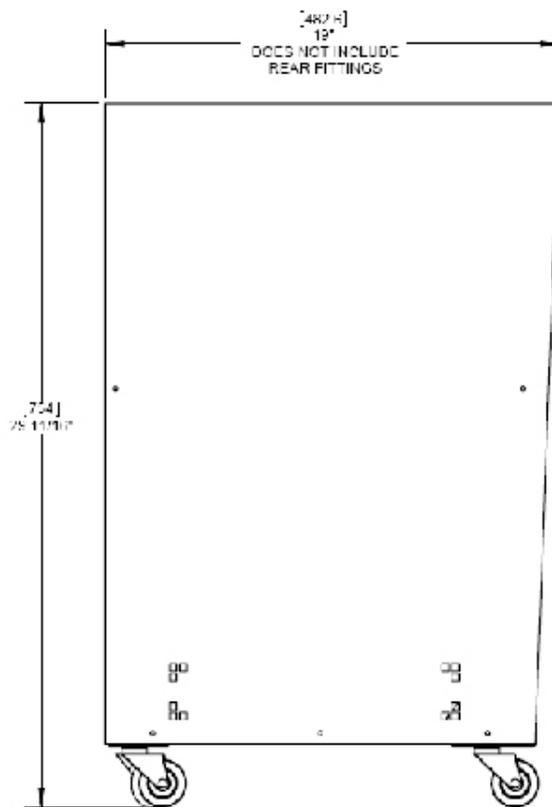


1. Temperature Regulating Valve
2. Plate Heat Exchanger
3. Pump
4. Strainer
5. Process Fluid Reservoir
6. Temperature Sensor
7. Relief Valve

Dimensions



REAR VIEW



SIDE VIEW

Section VII Troubleshooting

Checklist

Exchanger will not run

Make sure the voltage of the power source meets the specified voltage, $\pm 10\%$. Refer to the serial number on the rear of the exchanger for the specific electrical requirements.

On exchangers with a REMOTE/LOCAL switch, ensure the switch is in the correct position.

Exchanger runs when OFF/ON/START button is in START position, but stops when button is released.

Hold switch in START position for longer period of time.

Check for proper reservoir level. The float switch in the reservoir prevents the exchanger from operating if the fluid level in the reservoir is below the operating level. If the fluid level is low, "top off" the reservoir and restart the exchanger.

Make sure the high temperature monitor is set higher than the temperature of the cooling fluid.

Check the fuse on the circuit board inside the control box. The fuse is 0.5 Amp 250 V slow-blow.

Exchanger runs for a short period, then stops.

Check the fluid level in the reservoir. If it is low, check the system for leaks.

Make sure the heat load is not greater than the cooling capacity of the exchanger (see Section II, Cooling Capacity).

Make sure the cooling water supply meets the requirements outlined in Section III, Facility Water Requirements.

A possible power interruption has occurred, causing the "latch" relay to unlatch. Attempt to restart.

Service Assistance

If, after following these troubleshooting steps, your exchanger fails to operate properly, contact our Service Department for assistance (see Preface, After-sale Support). Before calling please obtain the following:

Part number

Serial number

Voltage of exchanger

Voltage of power source

Temperature at which the problem occurs

Temperature, pressure, and flow rate of cooling water supply

Our Service Department can provide you with a wiring diagram and a complete list of spare parts for your exchanger.

WARRANTY

Thermo Fisher Scientific warrants for 12 months from date of shipment any Thermo Scientific product according to the following terms.

Any part of the product manufactured or supplied by Thermo Fisher Scientific and found in the reasonable judgment of Thermo Fisher to be defective in material or workmanship will be repaired at an authorized Thermo Fisher Repair Depot without charge for parts or labor. The product, including any defective part must be returned to an authorized Thermo Fisher Repair Depot within the warranty period. The expense of returning the product to the authorized Thermo Fisher Repair Depot for warranty service will be paid for by the buyer. Our responsibility in respect to warranty claims is limited to performing the required repairs or replacements, and no claim of breach of warranty shall be cause for cancellation or rescission of the contract of sales of any product. With respect to products that qualify for field service repairs, Thermo Fisher Scientific's responsibility is limited to the component parts necessary for the repair and the labor that is required on site to perform the repair. Any travel labor or mileage charges are the financial responsibility of the buyer.

The buyer shall be responsible for any evaluation or warranty service call (including labor charges) if no defects are found with the Thermo Scientific product.

This warranty does not cover any product that has been subject to misuse, neglect, or accident. This warranty does not apply to any damage to the product that is the result of improper installation or maintenance, or to any product that has been operated or maintained in any way contrary to the operating or maintenance instructions specified in this Instruction and Operation Manual. This warranty does not cover any product that has been altered or modified so as to change its intended use.

In addition, this warranty does not extend to repairs made by the use of parts, accessories, or fluids which are either incompatible with the product or adversely affect its operation, performance, or durability.

Thermo Fisher Scientific reserves the right to change or improve the design of any product without assuming any obligation to modify any product previously manufactured.

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.

OUR OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE COMPONENT PARTS AND Thermo Fisher Scientific DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION.

Thermo Fisher Scientific 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 PRODUCT, LOSS OF TIME, OR INCONVENIENCE.

This warranty applies to products sold by Thermo Fisher Scientific. (Refer to the warranty for products sold by the affiliated marketing company of Thermo Fisher Scientific for any additional terms.) This warranty and all matters arising pursuant to it shall be governed by the law of the State of New Hampshire, United States. All legal actions brought in relation hereto shall be filed in the appropriate state or federal courts in New Hampshire, unless waived by Thermo Fisher Scientific.

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