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NESLAB FTC-350A
Flow Through Cooler

Thermo Manual P/N 002679
Rev. 11/08/00

Instruction and Operation Manual

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Thermo
ELECTRON CORPORATION

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FTC-350A Flow Through Cooler
Instruction and Operation Manual

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Preface

Compliance

Products tested and found to be in compliance with the requirements defined 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 label on the rear of the unit. The testing has demonstrated compliance with the following directives:

LVD, 73/23/EEC	Complies with UL 3101-1:93
EMC, 89/336/EEC	EN 55011, Class A Verification EN 50082-1:1992 IEC 1000-4-2:1995 IEC 1000-4-3:1994 IEC 1000-4-4:1995

For any additional information refer to the Letter of Compliance that shipped with the unit (Declaration of Conformity).

After-sale Support

Thermo Electron Corporation is committed to customer service both during and after the sale. If you have questions concerning the operation of your unit, contact our Sales Department. If your unit fails to operate properly, or if you have questions concerning spare parts or Service Contracts, contact our Customer Service Department. Before calling, *please* obtain the following information from the unit's serial number label:

- *BOM number* _____
- *Serial number* _____

Unpacking

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

Warranty

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

NES-care Extended Warranty Contract

- Extend parts and labor coverage for an additional year.
- Worry-free operation.
- Control service costs.
- Eliminate the need to generate repair orders.
- No unexpected repair costs.

Other contract options are available. Please contact Thermo.

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Section I Safety

Warnings

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, contact our Sales Department for assistance.

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.

Transport the unit with care. Sudden jolts or drops can damage the refrigeration lines.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

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

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 unit, significant property damage, or personal injury or death.

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Section II General Information

Description

The NESLAB FTC-350A Flow Through Cooler is a mechanical refrigeration unit designed to allow a NESLAB EXACAL bath/circulator to operate at temperatures from +40°C to -20°C. The FTC-350A can also be used in conjunction with an EXACAL bath/circulator to maintain or cool the temperature of a closed loop external system.

The unit consists of an air-cooled refrigeration system and a stainless steel heat exchanger.

The unit incorporates design features to prevent damage to the unit in the event that the circulating fluid freezes. If temperatures below 8°C are desired, a non-freezing fluid should be used.

Specifications

Cooling Capacity[1]	450 Watts @ 20°C 180 Watts @ 0°C
Unit Dimensions (HxWxD) *Inches* *Centimeters*	 14 x 8¾ x 12 35.8 x 22.2 x 30.5
Compressor	¼ h p
Heat Exchanger	Stainless Steel

1. Cooling capacity at +25°C ambient, fluid temperature 20°C.
   Specific heat of cooling fluid is 0.5.

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Section III Installation

Site

The unit should be placed on a sturdy bench or table. Ambient temperatures should be in the range of +50°F to +90°F (+10°C to +32°C). Never locate the unit where excessive heat, moisture, or corrosive materials are present.

The unit has an air-cooled refrigeration system. Air is drawn through the top of the unit and discharged through the sides and the rear of the unit. The unit should be positioned so the intake and discharge are not impeded. A minimum clearance of 1.5 feet (0.5 meters) on all four sides is necessary for adequate ventilation.

Excessively dusty areas should be avoided and a periodic cleaning schedule should be instituted (see Section VI, Maintenance).

The unit will retain its full rated cooling capacity in ambient temperatures up to approximately +75°F (+24°C). Reduce the cooling capacity 1% for every 1°F above +75°F, up to a maximum ambient temperature of +90°F. In terms of Celsius, reduce the cooling capacity 1% for every 0.5°C above +24°C, up to a maximum ambient temperature of +32°C.

Air Intake

The approximate air intake through the condenser is 200 cubic feet/minute (1 cubic foot = 28.35 liters).

Electrical Requirements

Refer to the table below for the specific electrical requirements of your unit.

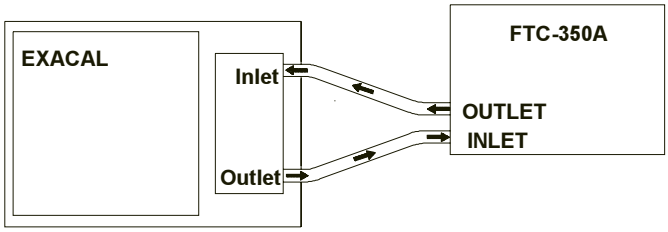
Volts	115	220/240
Hertz	60	50
Amps	4.5	2.3

Make sure the voltage the power source meets the specified voltage of the unit, ±10%.

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Plumbing Requirements

The inlet and outlet connections are located at the rear of the unit and labelled INLET and OUTLET. These connections are 3/8 inch OD stainless steel serrated tubing. These connections will accept 3/8 or 5/16 inch ID flexible tubing.

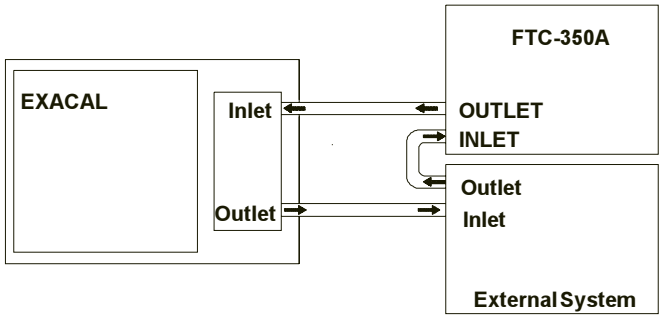


Connect the FTC-350A INLET to the outlet of the EXACAL circulating pump.

Connect the FTC-350A OUTLET to the inlet of the EXACAL circulating pump.

Keep all tubing as short as possible and free of kinks. All tubing should be insulated to prevent the loss of cooling capacity. Tubing and insulation are available from Thermo. Contact our Sales Department for more information.

The FTC-350A can be used in conjunction with an EXACAL bath/circulator to maintain or cool temperatures in a closed loop external system. In this case, connect the EXACAL circulation pump to the external system inlet. Connect the external system outlet to the INLET of the FTC-350A.



Use of tubing less than 3/8 inch ID is not recommended and will cause a significant deration of flow. If it is necessary to make a reduction in the tubing size to fit external equipment, the reduction should be made at the inlet of the external equipment, not at the pump outlet. The tubing connecting the external equipment and the FTC-350A should be increased to 3/8 inch ID tubing at the outlet of the external equipment.

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Fluids

Filtered tap water is the recommended fluid for operation above +8°C.

Below +8°C, a non-freezing fluid must be used. A 50/50 mixture, by volume, of water and laboratory grade ethylene glycol is recommended.



Do not use automobile anti-freeze. Commercial anti-freeze contains silicates that can damage the equipment.

The selected fluid must have a viscosity of 50 centistokes or less at the lowest operating temperature. Never use flammable or corrosive fluids with this unit.

Filling Requirements

Refer to the filling requirements in the EXACAL bath/circulator manual for complete instructions.

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Section IV Operation

Start Up

Never operate the FTC-350A when the EXACAL bath/circulator operating temperature is above +40°C. Excessively hot fluid can damage the heat exchanger in the FTC-350A. Allow the EXACAL bath/circulator to cool below +40°C before starting the unit.



The EXACAL bath/circulator must be operating and pumping fluid through the FTC-350A before the FTC-350A can be turned on. If the FTC-350A is turned on before flow is established, the heat exchanger may be permanently damaged.

Make sure the electrical and plumbing connections are correct (see Section II, Electrical Requirements and Plumbing Requirements) and the unit has been properly filled (see Section II, Fluids and Filling Requirements).

Place the POWER switch in the ON position. The POWER switch will light and the refrigeration system will start.



When shutting down the system, turn off the FTC-350A first and allow 15 minutes before turning off the Exacal bath/circulator. Again, this is to prevent damage to the heat exchanger.

When the FTC-350A is shut off, allow about five minutes before restarting the unit. This allows time for the refrigeration pressures to equalize. If the pressures do not equalize, the refrigeration compressor will short cycle (clicking sound) and no cooling will occur.

Flow Control Switch (Optional)

The flow control switch is designed to protect the unit's heat exchanger from freezing in the event flow from the external bath is stopped. Should the flow rate drop below 2.5 liters per minute the unit will shut down and the FAULT light will illuminate. The unit will restart once the flow rate is restored.

The unit will not start unless the flow rate is higher than 2.5 liters per minute. If sufficient flow is supplied and the unit still will not start, the flow switch may be dirty. Contact our Customer Service Department for instructions on flow switch removal and cleaning.

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Section V Maintenance & Troubleshooting

Cleaning

The unit pulls a substantial amount of air through a finned condenser. This condenser, located on top of the unit (air intake), is covered with a filter. A buildup of dust or debris on this filter will impede air flow and may result in a loss of cooling capacity.

Periodic vacuuming of the filter is necessary. The vacuuming frequency depends on the operating environment. We recommend a monthly visual after initial installation. After several months, the cleaning frequency of required should be established.

The filter may be removed and cleaned as follows. Place the edge of the unit over the edge of the bench and remove two screws from either side of the unit. Slide the cover off. Remove the filter, rinse in water, allow it to dry, then replace in the unit.

Checklist

Unit will not start.
Check house circuit breaker.

Check power source for correct voltage output. Power source must be specified voltage, ±10%. Refer to the serial number label on the rear of your unit for the specific electrical requirements.

Loss of cooling capacity.
Check the condenser. A build up of dust or debris can cause a loss of cooling capacity. If dust or debris has accumulated, vacuum the condenser filter (see Section V, Cleaning).

Make sure the heat load has not overcome the cooling capacity of the FTC-350A (see Section I, Specifications).

After the FTC-350A has been shut off, allow five minutes before restarting. The refrigeration compressor will short cycle (clicking sound) if time is not allowed for refrigeration pressures to equalize (see Section IV, Start Up).

The FTC-350A requires proper ventilation for heat removal. If ventilation is poor, the refrigeration compressor will shut down due to heat build up. Ensure the air intake and discharge are not impeded (see Section III, Site).

Check the ambient temperature where the unit is being operated. The ambient range of the unit is +50°F to +90°F (+16°C to +32°C). The unit will retain its full rated capacity in ambient temperatures up to approximately +75°F. Reduce the cooling capacity 1% for every 1°F above +75°F, up to a maximum ambient temperature of +90°F. In terms of Celsius, reduce the cooling capacity 1% for every 0.5°C above +24°C, up to a maximum ambient temperature of +32°C.

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Ensure the fluid is suitable for the temperature range (see Section III, Fluids).

Ice build up on the cooling coil in the EXACAL bath/circulator can act as insulation and lower the cooling capacity of the unit. Raise the operating temperature of the EXACAL bath/circulator to de-ice the cooling coil.

Ensure the HEATER light on the pump box of the EXACAL bath/circulator is cycling and not staying on continuously.

No flow through FTC-350

If water is being used as the fluid at temperatures close to freezing, it is possible to freeze the water in the exchanger which will block flow. Shut off the FTC-350 and allow the exchanger to thaw out.

A non-freezing fluid must be used for operation below +8°C.

Service Assistance

If, after following these troubleshooting steps, your unit fails to operate properly, contact our Service Department for assistance. Phone numbers and addresses for all our Thermo Sales and Service Centers are located on the back cover of this manual. Before calling, *please* obtain the following:

BOM Number

Serial Number

Voltage

Ambient temperature where the unit is being operated

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WARRANTY

Thermo Electron Corporation warrants for 12 months from date of shipment any Thermo unit according to the following terms.

Any part of the unit manufactured or supplied by Thermo and found in the reasonable judgment of Thermo to be defective in material or workmanship will be repaired at an authorized Thermo Repair Depot without charge for parts or labor. The unit, including any defective part must be returned to an authorized Thermo Repair Depot within the warranty period. The expense of returning the unit to the authorized Thermo Repair Depot for warranty service will be paid for by the buyer. Thermo's 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 recision of the contract of sales of any unit. With respect to units that qualify for field service repairs, Thermo'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 product.

This warranty does not cover any unit that has been subject to misuse, neglect, or accident. This warranty does not apply to any damage to the unit that is the result of improper installation or maintenance, or to any unit that has been operated or maintained in any way contrary to the operating or maintenance instructions specified in Thermo's Instruction and Operation Manual. This warranty does not cover any unit 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 unit or adversely affect its operation, performance, or durability.

Thermo reserves the right to change or improve the design of any unit without assuming any obligation to modify any unit 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.

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

Thermo 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.

This warranty applies to units sold in the United States. Any units sold elsewhere are warranted by the affiliated marketing company of Thermo. 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.

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