

Integrated SpeedVac[®] System
SPD1010/SPD2010
INSTRUCTION MANUAL

Thermo
ELECTRON CORPORATION

Table of Contents

Section	Section Title — Introduction	<u>Page</u>
1.0	Introduction	3
Section	Section Title — Installation	
2.0	Installation	3
Section	Section Title — Operation	Page
3.0	Operation	4
	Description of Control Panel	5-6
	Manual Run	6-7
	Auto Run	7-8
3.1	Drying Rate	8
3.2	Other Topics	8
3.3	Simple System Integrity Test	9
Section	Section Title — Application	Page
4.0	Devising Protocols/Application	
4.1	Secondary Vapor Trapping	10
4.2	Accessories	11
Section	Section Title —	11
Specifications	Page	12
5.0	Specifications	Section Section Title — Warranty & Liability Page
6.0	Warranty and Liability	13
	Section	
	Section Title — Trouble Shooting	Page
7.0	Appendix 1 - Trouble Shooting Guide	14-15

1.0 INTRODUCTION

Thermo Electron Integrated SpeedVac® Systems are complete systems for solvent evaporation, sample concentration and drying. SPD systems use a patented technique that combines centrifugal force, vacuum and applied heat to eliminate sample bumping and foaming. Application of thermal energy to the sample during concentration counteracts the natural evaporative cooling effect that slows the drying rate.

SPD1010 and SPD2010 systems integrate a SpeedVac® concentrator, an oil-free vacuum pump and a refrigerated vapor trap into a single compact package. The SPD2010 is a high capacity system for processing up to four 500 ml samples. The SPD1010 features a smaller chamber capable of processing up to four 100 ml samples. Both units feature an advanced front panel with dual timer for automatic or manual control of run conditions.

2.0 INSTALLATION

Unpacking. Open the shipping cartons. Carefully remove the instrument and accessories. **Lift and carry with two people, holding securely underneath with both hands. Use proper lifting technique (lift with the legs, not the back) to avoid personal injury.** Compare the contents with the packing list. If there is a discrepancy, call Thermo Electron at 1-508-634-2112 or (Fax) 508-634-2118.

Inspection. Inspect the unit and accessories for damage that may have occurred during shipment. Should there be any damage, report it to the carrier and contact Thermo Electron immediately. Make sure the carrier inspects the damage and leaves an inspection report. Register any claims for shipping damage against the carrier or his agent. Save the shipping carton in the event a return is necessary. Call Thermo Electron at 1-508-634-2112 or (Fax) 508-634-2118.

Site preparation. The SPD1010/SPD2010 requires a stable, level surface for proper operation. The SPD1010 units configured for 115VAC, 60 Hz, should be plugged into a circuit rated for at least 12 amps. The SPD1010 units configured for 230VAC, 50 Hz, should be plugged into a circuit rated for at least 8 amps. The SPD2010 units are configured for 220VAC, 60 Hz, or 230VAC, 50 Hz, operation. Both configurations require a circuit rated for at least 8 amps.

Important Information. Before operating the unit, read Section 3.0, Operation, and Section 4.0, Application Information, to determine your specific application requirements.

3.0 OPERATION

Turn on the main power switch located on the right side panel to energize the unit.

Start-of-day procedure. At the start of each day, ensure that the refrigerated trap contains a clean, dry, Glass Condensation Flask (GCF400) and that the supply of Thermo Electron CryoCool® Heat Transfer Fluid is sufficient.

The CryoCool® in the refrigerated trap must be cold before drying runs can begin. Turn unit on at least 45 minutes before starting the drying run.

For best results, maintain electrical power to the system (the main power switch on the right side is "ON" and the front display is lit) at all the times to keep the refrigerated trap cold and ready for use.

Rotor installation. Open the lid of the rotor chamber. Visually align the pin on the drive shaft with the groove on the bottom of the rotor. Carefully lower the rotor onto the drive shaft. Rotate the rotor by hand to ensure alignment of the pin with the groove. Secure the assembly by screwing the retaining knob into the drive shaft above the rotor. Tighten it firmly but not excessively. Load the rotor and close the lid. Always balance rotor loads. An imbalanced rotor causes vibration that will damage the system's bearings. Load the rotor symmetrically. There need not be a tube in each holder, but the load must be evenly distributed. When using a rotor with aluminum tube holders, insert all the tube holders.

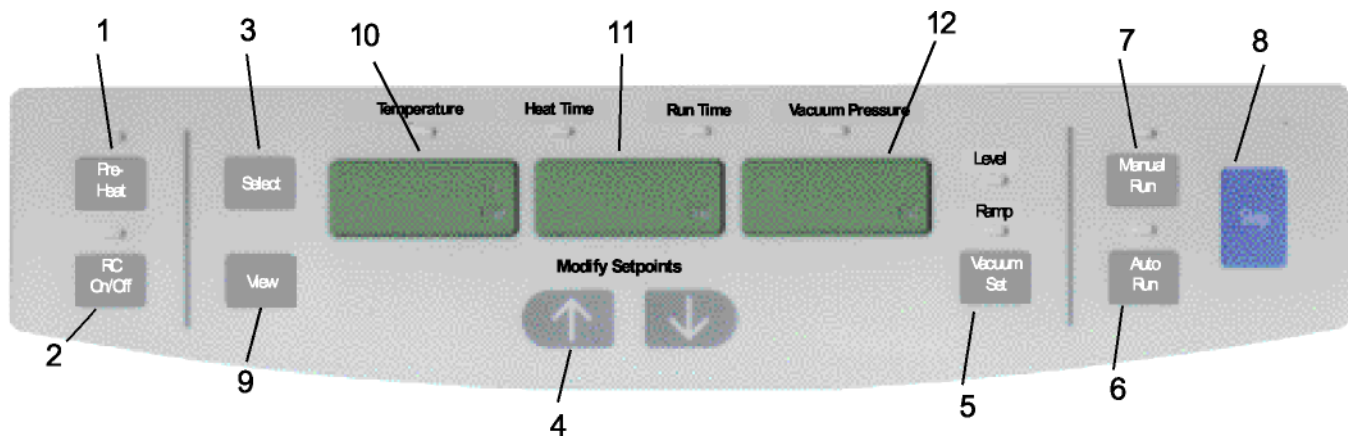
Glass Condensation Flask Installation. Prepare the refrigerated stainless steel trap chamber by adding approximately 800 ml of CryoCool Heat Transfer Fluid. A line scribed on the wall of the stainless steel trap indicates the minimum appropriate level. CryoCool conducts heat away from the Glass Condensation Flask, allowing vapors to condense on the flask walls. Gently put a clean Glass Condensation Flask into the refrigerated chamber. As you press the flask into the chamber, the CryoCool level rises. Verify that the final CryoCool level is 10 to 15 mm below the rubber seal. If low, carefully pour more CryoCool into the chamber while holding down the flask.

Immediately wipe clean any CryoCool that spills onto the rubber seal.

Fit the white insulating Flask Seal over the glass flask to secure the flask in the chamber. Its beveled side faces upward to admit the Flask Cap.

Snap the black rubber Flask Cap over the mouth of the glass flask. This provides easy tubing connection and a vacuum seal while also securing the Glass Condensation Flask and insulating Flask Seal in the refrigerated chamber.

Glass Condensation Flask Defrosting and Cleaning. Thermo Electron Glass Condensation Flasks should be defrosted and cleaned after each day's use, or more often if greater than one-fourth the rated volume has condensed on the walls. Failure to follow this procedure can prevent the system from achieving high vacuum levels and could cause flask breakage.



Description of Control Panel

1. **PRE-HEAT** - use to pre-heat chamber to 45 °C prior to beginning or between runs. Once run is initiated the pre-heat stops.
2. **RC ON/OFF** - Use to add radiant heat to chamber. Manually activate by pressing ON/OFF at any point during run. Will activate as long as there is time left on the heat timer. Will turn off when heat timer=0.00

CAUTION: Do not use radiant heat with microplates. Improper use may result in melting or deformation.

3. **SELECT** - Press this button to select the parameters to be modified. Selection is from left to right. GREEN light indicates the parameter to be modified.
4. **MODIFY SETPOINTS UP/DOWN** - Modifies selected parameter.
5. **VACUUM SET - (VACUUM CONTROLLER)** - Selects either “Level” or “Ramp” in the VAC display.
 - Level: Allows users to select a pre-set vacuum level. Once this level is obtained, the microprocessor will regulate and maintain this vacuum level.
 - Ramp: The rate at which vacuum is achieved can be set for preventing bumping. 5 adjustable levels can be set as required depending upon your solvent.

Setting	Vacuum Rate (approximate)
5	70 torr/min (Maximum setting)
4	50 torr/min
3	40 torr/min
2	30 torr/min
1	5 torr/min

6. **AUTO RUN** - Starts an ‘Automated’ run.
7. **MANUAL RUN** - Starts a “Manual” run.
8. **STOP** - Terminates “Manual” or “Auto” run.
9. **VIEW** - Press to view. Displays preset parameters when pressed during a run.
10. **TEMPERATURE DISPLAY** - Indicates set temperature or actual temperature during a run in °C.
11. **TIME DISPLAYS** - Indicates heat timer or run timer set-points. In the process of a run it indicates elapsed time or time left.

12. **VACUUM PRESSURE DISPLAY** - Displays chamber vacuum in torrs or millitons by shifting a decimal point. "Hpr." represents atmospheric pressure. No decimal point indicates microns.

NOTE - The unit will sound an audible beep, every time a button is pressed.

MANUAL RUN

1. Connect the unit to its required voltage.
2. Turn the power switch located on the rear of the UNIT, to the ON position, (AMBER light on switch indicates ON). The cover lock, disengages, allowing the top cover to be opened.

The display lights up, showing the following default values:

Temperature: 45 °C in RED
Run Time: 2.00 HRS. in GREEN
Vacuum Pressure: 5.1 in AMBER

3. Using the "SELECT" button and the up/down keys, set TEMPERATURE between 45 °C and 80 °C, or "no", for no heat.
4. Using the "SELECT" button and the up/down keys select and modify "HEAT TIME" to between 0.01 and 9.59 hours or CCC (for continual heating). When the heat timer expires, the heater will shut off, no matter what the temperature setpoint reads (except if CCC).
5. Select Run Time: Since this a manual run no time adjustment is needed"
6. To select a VACUUM LEVEL, press "VACUUM SET" to illuminate LEVEL and up/down keys to set vacuum to desired level. To select a vacuum ramp rate, press "Vacuum Set" to illuminate RAMP and use the up/down keys to set a ramp rate (5=highest, 1=lowest).
7. Place sample tubes in rotor so load is balanced. Secure rotor with the supplied knob (hand tight). Close cover.
8. Pre-heat may be selected at this time, to warm chamber to 45 °C.
9. Press the "MANUAL RUN" button. The cover locks and rotor starts turning. The decimal point blinks and the "RUN TIME" display counts up. The temperature rises to the set temperature. The "HEAT TIME" will count down and vacuum will be applied to the chamber. The vacuum level begins falling.

NOTE: If the cover is not closed, the display will show "Lid" and the run will not start.

10. Press R/C for radiant chamber heat. Press at any time to turn OFF and ON. (As long as there is time left in the heat timer).
11. To end the manual run, press "STOP" button. The display will show "End", the valves will click, isolating the chamber from the vacuum pump and also allowing air to bleed into the chamber.
12. After the rotor stops spinning, the cover lock disengages and the display reverts to last set parameters, and the unit will sound several audible beeps.
13. Open the cover and remove samples.

GENERAL: During the run, display shows actual parameters. To check set parameters press "VIEW" button and "SELECT". The display will revert temporarily to set points.

AUTO RUN

1. Refer to the "MANUAL RUN" section for start up.
2. To execute an AUTO "TIMED" RUN, execute the following steps:
 - a) Use "SELECT" button and the up/down keys to select and modify "TEMPERATURE, "HEAT TIME, "RUN TIME" parameters. RUN and HEAT TIME can be set from 0.01 to 9.59 hours (HEAT TIME also has "CCC" for continuous use).
 - b) Select RUN TYPE. If select TIME, the vacuum level can NOT be set. The vacuum will pull down to maximum attainable vacuum
 - c) To select a VACUUM LEVEL, press "VACUUM SET" and to illuminate LEVEL up/down keys to set vacuum to desired level. To select a vacuum ramp rate, press "Vacuum Set" to illuminate RAMP and use the up/down keys to set a ramp rate (5=highest, 1=lowest).
3. Place the sample tubes in rotor so load is balanced. Secure rotor with supplied knob (hand tight). Close cover.
 - a) Press "AUTO RUN" button to start the run. The cover locks and the rotor starts spinning. The time display is counting down in 1 minute Intervals and the decimal point blinks. The heat time is counting down (use select button to view "HEAT TIME"). The temperature rises in 1 °C increments to set temperature. The vacuum pressure begins decrementing down from "HPr" (atmospheric pressure), after both SAV valves actuate, applying vacuum to the chamber.
 - b) The vacuum display will indicate vacuum pressure in the chamber.
NOTE: If the cover is not closed, the display will show "Lid" and the run will not start.

- c) Press R/C for radiant chamber heat. Press at any time to turn OFF and ON. (As long as there is time left in the heat timer).
- d) Once the time decrements to 0.00 HRS. the run will automatically stop, the display will show “End”, the SAV valves will click, also allowing air to bleed into the chamber.
- e) After the rotor stops spinning, the cover unlocks and the display reverts to last set parameters, and the UNIT will sound several audible beeps.
- f) Open the cover and remove samples.

GENERAL: During the run, display shows actual parameters. To check set parameters press “VIEW” button and “SELECT”. The display will revert temporarily to set points.

3.1 DRYING RATE

Thermal energy can be applied to the concentrator chamber to counteract the cooling effect of evaporation, maintain the samples in the liquid state, and accelerate the concentration run.

Select the highest drying rate if you desire accelerated drying. To ensure against over drying of samples, and possible denaturing, it is recommended that the Radiant Cover heat timer be set for only a portion of the total run time (e.g., 50%–75% of total run time).

3.2 OTHER TOPICS

Chamber cover. The cover must be closed before beginning a run. If you press “Manual Run” or “Auto Run” and the cover is open, the display shows “lid” to remind you to close the cover.

A user cannot open the cover during a run due to vacuum in the concentrator chamber. In addition, a cover lock is present on the SPD1010 (220– and 230–volt models only) and on all SPD2010 units. The cover is locked down at all times during a run and whenever power to the unit is interrupted.

The cover lock is an additional safety feature that reduces the risk of injury or damage from the spinning rotor. Do NOT bypass the cover lock to conduct a run with the cover open. If removal of samples from the concentrator chamber during a power failure is required, insert a firm, thin object into the vertical slot at the base of the front of the unit. Press the object gently into the slot until the lock releases. The cover can then be opened.

3.3 SIMPLE SYSTEM INTEGRITY TEST

You can use this simple system test to periodically verify the operational integrity of the vacuum pump and refrigerated vapor trap.

1. Install a clean dry Glass Condensation Trap.
2. Allow the refrigerated vapor trap to operate for 45 minutes.
3. Open the chamber lid and remove the rotor.
4. Fill a plastic beaker, that will fit in the chamber, with 50 ml of water and place it in the chamber. Close the lid.
5. Set the temperature to "OFF".
6. Set the RUN time for 15 minutes.
7. Press the "AUTO RUN" switch.
8. At the end of the run, immediately open the lid and measure the water sample temperature.

A properly functioning system will reduce the sample temperature to within the range of +3 °C to +7 °C (+37 °F to +45 °F).

4.0 DEVISING PROTOCOLS/APPLICATION

Test runs are necessary to determine the correct run times for given procedures.

To obtain data for concentration, reducing a large volume to a small volume, and drying, you will need to conduct manual test runs using containers, solvent and volumes that will be used for actual samples. Interrupt the run every 15 minutes to measure remaining sample volume and sample temperature. Continue the test until the samples are completely dry or concentrated to an acceptable level. Conduct additional runs at different drying rates with and without the Radiant Cover ON.

At the end of a run, another useful measurement can be determined. Remove and measure the volume of solvent captured in the Glass Condensation Flask, and express as a percentage of total test solvent added to the containers. This is your % solvent recovery for the run.

As solvent evaporates, samples remain cool due to the effects of evaporative cooling. When the samples are nearly dry, evaporative cooling ceases. If you continue to apply radiant energy, the sample temperature rises. Therefore, a sample drying operation using an expendable batch of sample should be run. Based on the results, determine an optimum time to shut OFF the Radiant Cover before the end of a run.

Drying rates vary depending on the solvent being evaporated. Temperature, sample volume, number and type of tubes, vacuum level, vacuum ramp rate and other factors can all influence drying rate. The following chart provides a guide for determining approximate drying rates.

HEAT SETTING		OFF		45 °C		65 °C	
INITIAL SAMPLE VOLUME		4 ml	20 ml	4 ml	20 ml	4 ml	20 ml
DRYING RATE (ml/hr/vessel)	WATER	0.35	2	0.5	2.5	1	5

4.1 SECONDARY VAPOR TRAPPING

When processing solvents with a lower freezing point of $-55\text{ }^{\circ}\text{C}$, it is recommended to install the Thermo Electron SCT120 Chemical Trap on the exhaust port to capture residual evaporated solvent vapors. This trap, installed in addition to the integral refrigerated trap, provides more complete solvent trapping. The SCT120 accepts a variety of disposable cartridges that are designed to adsorb vapors that may exhaust from the SpeedVac[®]. The Thermo Electron DTK120R Chemical Trap Kit, which includes the trap, a disposable cartridge (DC120R), tubing and fitting, has an activated-charcoal cartridge that traps radioactive vapors and is effective for containing residual quantities of organic solvent vapors. (This is the same medium commonly used in fume hoods). The DTK120A Chemical Trap Kit is recommended for low pH vapors from samples involving acid hydrolysis of peptides or other acidic samples. This kit contains trap, tubing, fitting, and DC120A cartridge to neutralize acids.

To install a trap on the SpeedVac[®] exhaust, remove the muffler and the rubber tubing from the SOLVENT VAPOR EXHAUST PORT. Attach a piece of vacuum tubing to this fitting. Attach the other end to the chemical trap.

Note:

Refer to the manual shipped with each Chemical Trap Kit for full details and installation instructions.

The chemical trap requires periodic checking and cartridge replacement to ensure its continued effectiveness.

4.2 ACCESSORIES

CC120/DX Deluxe Convenience Cart is a space-saving accessory for the laboratory. When used with an SPD SpeedVac, the system resides on the top shelf, while any additional trapping apparatus resides on the bottom shelf. Addition of the cart produces an easily portable concentration system.

DTK120R Chemical Trap. For drying samples containing radiolabeled biomolecules, the chemical trap with activated carbon cartridge is strongly recommended. Attach to the vacuum pump exhaust recovery vessel. This set-up traps volatile radioactivity, preventing its release to the laboratory environment.

ANT100 Ammonia Neutralizing Trap, for drying samples such as synthetic oligonucleotides in ammonium hydroxide. The ANT100 includes a cup mounting bracket which attaches to the left side of the SPD SpeedVac[®] at the exhaust port. The trap also includes four bottles of Ammonia Neutralizing Solution (ANS121/4). This trapping system effectively neutralizes ammonia gas, and eliminates exhaust of unpleasant odors.

CryoCool (SCC1 or SCC5) for use in SPD1010 and SPD2010.

5.0 SPECIFICATIONS

	SPD1010	SPD2010
Capacity:	Moderate	Large
Refrigerated trap:	-50 °C (approx) 4 liter CFC-free	-50 °C (approx) 4 liter CFC-free
Vacuum Pump:		
Displacement (50/60 Hz)	30/36 liters/min	30/36 liters/min
Maximum vacuum	7 Torr	7 Torr
Vacuum Level Control:	30 to 5.1 torr in 0.1 increments	
Vacuum Ramp Setting:	1 to 5	
Size (W X D X H):	25 in x 26 in x 15 in 62 cm x 65 cm x 37 cm	31 in x 27 in x 19 in 77 cm x 67 cm x 47 cm
Weight:	152 lbs 69 kg	182 lbs 83 kg
Operative Power:	115VAC; 60 Hz; 12 amps 230 VAC; 50 Hz; 6 amps	220 VAC; 60 Hz; 8 amps 230 VAC; 50 Hz 8 amps

*Dependent upon ambient temperature, line voltage fluctuation, and load capacity.

6.0 WARRANTY AND LIABILITY

All Thermo Electron products (excluding glassware) are warranted against defects in material and workmanship for one year after the date of delivery to the original purchaser. Thermo Electron's warranty is limited to defective materials and workmanship, and does not cover incidental or consequential damages.

Thermo Electron will repair free of charge any apparatus covered by this warranty. If a new component fails to work, Thermo Electron will replace it, absorb all charges, and continue the one-year warranty period. Warranty work is subject to our inspection of the unit. No instrument, equipment or accessories will be accepted without a Return Material Authorization (RMA) number issued by Thermo Electron. Cost of shipping the unit are not covered under warranty. The warranty obliges you to follow the precautions in this manual.

When returning the apparatus that may contain hazardous materials, you must pack and label them following U.S. Department of Transportation (DOT) regulations applying to transportation of hazardous materials. Your shipping documents must also meet DOT regulations. All returned units must be decontaminated and free of radioactivity, chemical, and biological agents.

Use of this in manners other than those specified in this manual may jeopardize personal safety. Under no circumstances shall Thermo Electron be liable for damages due of the improper handling, abuse, or unauthorized repair of its products. Thermo Electron assumes no liability, express or implied, for your use of this equipment.

**APPENDIX 1
TROUBLESHOOTING GUIDE**

THERMO Electron SPD1010/SPD2010 SPEEDVAC® TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSES	SOLUTION/EXPLANATION
----------------	------------------------	-----------------------------

GENERAL

No Response.	No current to the equipment. Power failure at source.	Check line cord for proper connections. Check main circuit panel. Call Thermo Electron for assistance.
System trips circuit breaker or main line fuse.	Short circuit to ground in one of the components.	Remove blockage. Change to dry flask.
Sample does not dry or noticeable change in the drying rate.	Flask cap plugged with ice.	Remove blockage. Change to dry flask.
	Internal vacuum pump needs servicing.	Call Thermo Electron for assistance.
	Vacuum leak.	Check seal of cap on Glass Condensation Flask. Check cover gasket on sample chamber.
	Insufficient thermal energy applied to the sample chamber.	Evaporative cooling retards evaporation; additional chamber heat will counteract this effect.
	Refrigerated trap not reaching operating temperature.	Call Thermo Electron for assistance.
	Condensation flask full past 3/4 mark.	Change to new dry flask.

SPEEDVAC® CHAMBER

Rotor does not rotate or makes a grinding noise.	No current to the SpeedVac®	Check line cord.
	Badly corroded upper magnetic assembly.	Upper magnetic assembly requires replacement. Call Thermo Electron for service.
	Lower drive magnet bound up on the separation plate.	Call Thermo Electron for assistance.
Rotor makes a loud clattering noise on initial start up.	Hold-down knob has been over-tightened.	Tighten hold-down knob until it make contact with rotor, DO NOT OVER-TIGHTEN.
Chamber does not seal properly.	Cracked or fouled cover gasket.	Clean or replace cover gasket.
	Automatic bleeder valve malfunction.	Call Thermo Electron for assistance.
Chamber does not reach temperature.	Radiant lamp burned out.	Replace lamp, or call Thermo Electron for assistance.
	Heater control or element malfunction.	Call Thermo Electron for assistance.

SYMPTOM	POSSIBLE CAUSES	SOLUTION/EXPLANATION
REFRIGERATED CONDENSATION TRAP Refrigerated trap not cooling.	Insufficient air circulation. Compressor system has lost its charge.	Leave a minimum four-inch clearance on all sides. Clean the condenser of any accumulated dust or debris. Call Thermo Electron for assistance.
Noisy vibration and/or excessive heat on top of cabinet.	Cabinet housing has become loose or circulation fan is rubbing an internal component.	Call Thermo Electron for assistance.
Glass Condensation Flask breakage.	Large ice build-up that expands during thawing. Trap contents allowed to thaw and refreeze.	Change and clean Glass Condensation Flask daily. Leave the main power switch ON between runs and change the Glass Condensation Flask daily.
Glass Condensation Flask plugged with ice.	Excessive water/ice build up in thermal transfer fluid.	Use CryoCool [®] instead of ethanol. Remove the ice. CAUTION: Extreme cold may cause severe blistering.
Vacuum leak at flask cap.	Flask Cap seated improperly. Flask cap worn or fouled.	Verify that the cap is pressed securely over the mouth of the Glass Condensation Flask. Replace flask cap.

450 Fortune Blvd. Milford, MA 01757 USA
Tel: 508-482-7000 • Fax: 508-634-2118

www.thermo.com • [E-mail: customerservice@Thermo.com](mailto:customerservice@Thermo.com)