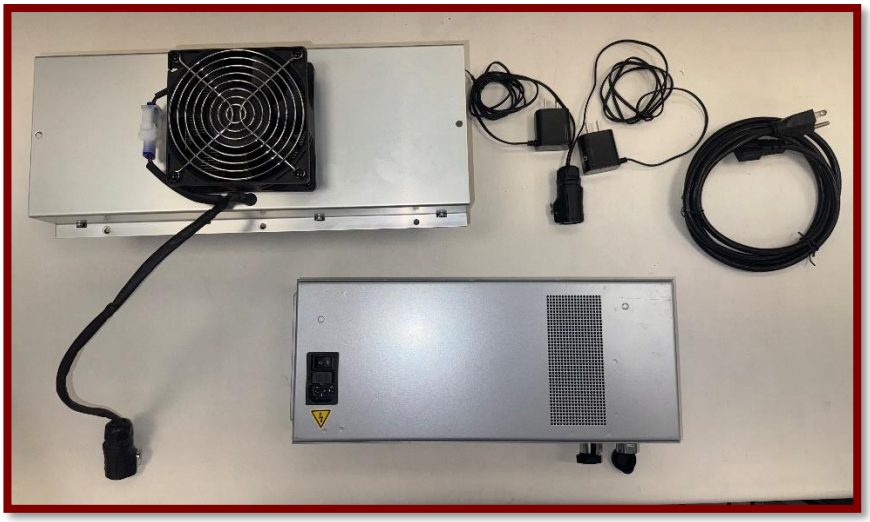
electro-tech systems



THERMOELECTRIC HEATING/COOLING SYSTEM

ETS Model's 5477-250, 5477-250-24, 5477-500, 5477-500-24 Operating Manual

Table of Contents

Products described in this manual are designed and assembled in the U.S.A. by

Electro-Tech Systems, Inc.

700 West Park Avenue

Perkasie, PA 18944

I. Important Safety Information

WARNING

This symbol accompanied by the word “WARNING” calls attention to an act or a condition which can lead to serious personal injury or death of operators and bystanders.

CAUTION

This symbol accompanied by the word “CAUTION” indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

The symbol without any warning text indicates potential damage to device when misused.

This symbol indicates the presence of hazardous AC or DC voltages constituting the risk of electric shock.

This symbol indicates a risk of fire due to improper handling or failure of device. For continued protection against risk of fire, when replacing fuses use only fuses of the specified type and current ratings.

This symbol indicates the danger of an electro-static discharge to which equipment may be sensitive.

Observe all precautions for handling electrostatic sensitive devices.

These symbols indicate extreme temperature which can cause burns or frostbite. Avoid contact with surface. Failure to follow precautions may result in moderate to severe injury.

SAFETY INSTRUCTIONS

The equipment described in this manual is designed and manufactured to operate within defined design limits. Any misuse may result in electric shock or fire. To prevent the equipment from being damaged, the following rules should be observed for installation, use and maintenance. **Read the following safety instructions before operating the instrument.**

POWER

POWER CORD: Use only the power cord specified for this equipment and certified for the country of use. If the power (mains) plug is replaced, follow the wiring connections specified for the country of use. When installing or removing the power plug, **hold the plug, not the cord.** The AC supply must be single phase, with RMS Voltage in range 90 – 264 VAC, alternating at a frequency in range 47 – 63 Hz.

OPERATION

CAUTION

DO NOT OPERATE WITH COVERS OR PANELS REMOVED. **Voltages inside the equipment consist of line operating at 24 VDC.**

DO NOT OPERATE WITH SUSPECTED EQUIPMENT FAILURES. If any odor or smoke becomes apparent turn off the equipment and unplug it immediately. Failure to do so may result in electrical shock, fire, or permanent damage to the equipment. Contact the factory for further instructions.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE. Operating the equipment in the presence of flammable gases or fumes **constitutes a definite safety hazard**. For equipment designed to operate in such environments the proper safety devices must be used such as dry air or inert gas purge, intrinsic safe barriers and/or explosion-proof enclosures.

DO NOT IMPEDE THE CHAMBER FROM VENTING EXCESS PRESSURE. Dehumidification system is an open loop system that pumps external air into the chamber. If the chamber is not allowed to vent, pressure can build up and cause serious damage to the chamber. A pressure monitoring system is highly recommended.

INLET AIR PRESSURE MUST BE LESS THAN 100 PSI (6.89 Bar) & INLET AIR TEMPERATURE MUST BE WITH RANGE OF 33° - 120° F (0.5° - 49° C) Serious injury could result.

APPROPRIATE FILTRATION OF COMPRESSED AIR IS RECOMMENDED. Build-up of contaminates can damage the desiccant towers & reduce their effectiveness in drying inlet air. **AIR PRESSURE MUST BE GREATER THAN 50 PSI (3.45 Bar)** For optimal system performance.

DO NOT USE IN ANY MANNER NOT SPECIFIED OR APPROVED BY THE MANUFACTURER. Unapproved use may result in damage to the equipment or present an electrical shock or fire hazard.

Informations Importantes d’inocuite

Ce symbole accompagné du mot « AVERTISSEMENT »(WARNING) attire l’attention sur un acte ou une condition qui peut entraîner des blessures graves ou la mort des opérateurs et des passants.

Ce symbole accompagné du mot « ATTENTION » (CAUTION)indique une situation potentiellement dangereuse qui, si elle n’est pas évitée, pourra entraîner des blessures mineures ou modérées. Le symbole sans texte d’avertissement indique des dommages potentiels à l’appareil en cas d’utilisation abusive.

Ce symbole indique la présence d’une climatisation dangereuse ou d’un courant continu constituant le risque de choc électrique.

Ce symbole indique un risque d'incendie dû à une mauvaise manipulation ou à une défaillance de l'appareil. Pour une protection continue contre les risques d'incendie, lors du remplacement des fusibles, utilisez uniquement des fusibles du type et des valeurs nominales spécifiés.

Ce symbole indique le danger d’une décharge électrostatique à laquelle l’équipement peut être sensible. Observez toutes les précautions à prendre pour manipuler les appareils sensibles a l'electicite statique.

Ces symboles indiquent une température extrême qui peut causer des brûlures ou des engelures. Éviter le contact avec la surface. Le non-respect des précautions peut entraîner des blessures modérées à graves.

CONSIGNES DE SÉCURITÉ

Lisez et comprenez bien le manuel de l’utilisateur avant d’utiliser cette machine. Le non-respect des instructions d’utilisation peut entraîner la mort ou des blessures graves

L'équipement décrit dans ce manuel est conçu et fabriqué pour fonctionner dans les limites de conception définies. Toute mauvaise utilisation peut entraîner un choc électrique ou un incendie. Pour éviter que l'équipement ne soit endommagé, les règles suivantes doivent être respectées pour

l'installation, l'utilisation et l'entretien. Lisez les consignes de sécurité suivantes avant d'utiliser l'instrument.

ALIMENTATION

CORDON D'ALIMENTATION : Utilisez uniquement le cordon d'alimentation spécifié pour cet équipement et certifié pour le pays d'utilisation. Si la fiche d'alimentation (secteur) est remplacée, suivez les connexions de câblage spécifiées pour le pays d'utilisation. Lors de l'installation ou du retrait de la fiche d'alimentation, **tenez la fiche, pas le fil.**

MISE À LA TERRE : Le cordon d'alimentation fourni est équipé d'une **fiche à 3 broches avec mise à la terre (une fiche avec une troisième broche de mise à la terre).** Il s'agit à la fois d'une fonction de sécurité pour éviter les chocs électriques et d'une exigence pour le bon fonctionnement de l'équipement. Si la prise à utiliser n'est pas compatible avec la fiche à 3 broches, changez la prise ou utilisez un adaptateur de mise à la terre.

FUSIBLES : Remplacez les fusibles uniquement par des fusibles ayant le courant nominal, la tension et le type spécifié tels que fusion normale, temporisation, etc. **N'UTILISEZ PAS** de fusibles de fortune ou ne court-circuitez pas le porte-fusible. Cela pourrait entraîner un risque d'électrocution ou d'incendie ou endommager gravement l'instrument.

OPÉRATION

PRUDENCE

NE PAS UTILISER AVEC LES COUVERCLES OU LES PANNEAUX RETIRÉS. **Les tensions à l'intérieur de l'équipement consistent en une ligne (secteur) pouvant aller de** 100 à 240 VAC.

NE PAS UTILISER AVEC DES PANNES D'ÉQUIPEMENT SUSPECTES. Si une odeur ou de la fumée se dégage, éteignez l'équipement et débranchez-le immédiatement. Le non-respect de cette consigne peut entraîner un choc électrique, un incendie ou des dommages permanents à l'équipement. Contactez l'usine pour plus d'instructions.

NE PAS UTILISER DANS UNE ATMOSPHÈRE EXPLOSIVE. L'utilisation de l'équipement en présence de gaz ou de fumées inflammables constitue un danger certain pour la sécurité. Pour les equipement concus pour fonctionnner dans de tels environnement, des dispositifs de sécurité appropriés doivent être utilisés, tels que la purge d'air sec ou de gaz inerte, les barrières de sécurité intrinsèque et/ou les enceintes antidéflagrantes..

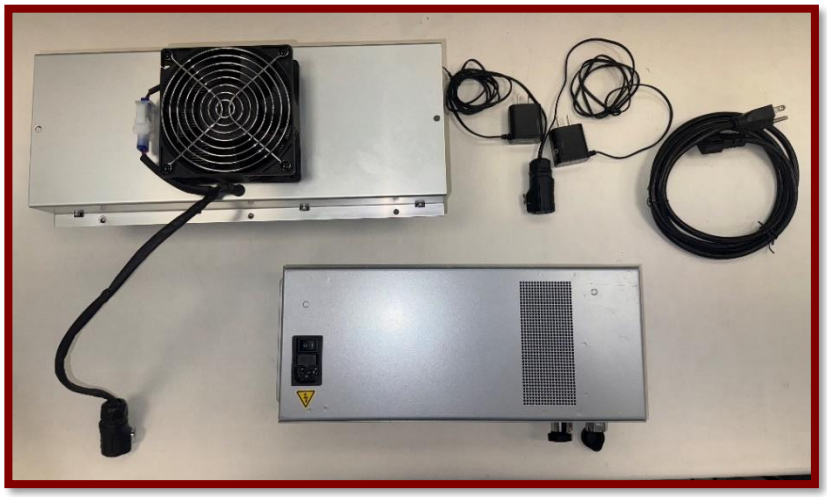
NE PAS EMPÊCHER LA CHAMBRE D'ÉVACUER L'EXCÈS DE PRESSION. Les systèmes de déshumidification disponibles comprennent des systèmes en boucle ouverte qui pompent l'air extérieur dans la chambre. Si la chambre n'est pas autorisée à s'aérer, la pression peut s'accumuler et causer de graves dommages à la chambre.

UTILISEZ UNE SOURCE D'EAU DISTILLÉE OU DÉSIONISÉE POUR L'HUMIDIFICATION. L'accumulation de contaminants sur le transducteur causera des contraintes au transducteur et à l'électronique et entraînera une défaillance prématurée et invalidera la garantie.

NE PAS UTILISER D'UNE MANIÈRE NON SPÉCIFIÉE OU APPROUVÉE PAR LE FABRICANT. Une utilisation non approuvée peut endommager l'équipement ou présenter un risque d'électrocution ou d'incendie.

II. Description of Contents

M 5477-250

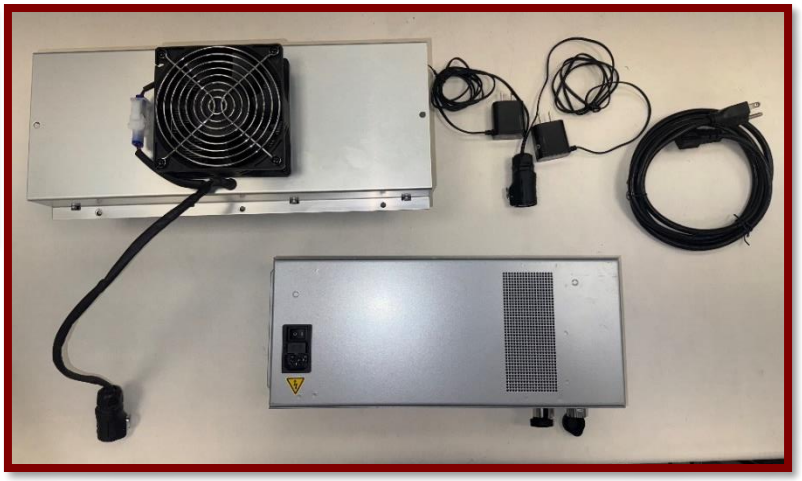


Item No.	Item	Qty.	Description
1	NEMA 1 power supply enclosure	1	An enclosure designed to provide a degree of protection against dust, light and indirect splashing to the power supply.
2	Thermoelectric Assembly unit	1	A solid-state device that being used as a heat pump to generate either heating or cooling.
3	8-32 X 1/2", 18-8 SS, PAN HEAD PHILLIPS	6	Attaching thermoelectric to chamber
4	8-32 X 3/4", 18-8 SS, PAN HEAD PHILLIPS	2	Attaching thermoelectric to chamber
5	No. 8 FLAT WASHER 18-8 SS	6	Attaching thermoelectric to chamber
6	No. 8 SPLIT LOCK WASHER, 18-8 SS	6	Attaching thermoelectric to chamber
7	No. 10 SPLIT LOCK WASHER, 18-8 SS	4	Mounting NEMA1 box
8	No. 10 FLAT WASHER 18-8 SS	4	Mounting NEMA 1 box
9	PID CABLE ASSEMBLY	1	Connection cable for thermoelectric units to controller
10	AC POWER CORD	1	Powering NEMA 1 enclosure

M 5477-250-24

Item No.	Item	Qty.	Description
1	NEMA 1 power supply enclosure	1	An enclosure designed to provide a degree of protection against dust, light and indirect splashing to the power supply.
2	Thermoelectric Assembly unit	1	A solid-state device that being used as a heat pump to generate either heating or cooling.
3	8-32 X 1/2", 18-8 SS, PAN HEAD PHILLIPS	6	Attaching thermoelectric to chamber
4	8-32 X 3/4", 18-8 SS, PAN HEAD PHILLIPS	2	Attaching thermoelectric to chamber
5	No. 8 FLAT WASHER 18-8 SS	6	Attaching thermoelectric to chamber
6	No. 8 SPLIT LOCK WASHER, 18-8 SS	6	Attaching thermoelectric to chamber
7	No. 10 SPLIT LOCK WASHER, 18-8 SS	4	Mounting NEMA1 box
8	No. 10 FLAT WASHER 18-8 SS	4	Mounting NEMA 1 box
9	CABLE ASSEMBLY	1	Connection cable for thermoelectric units to PLC
10	AC POWER CORD	1	Powering NEMA 1 enclosure

M 5477-500



Item No.	Item	Qty.	Description
1	NEMA 1 power supply enclosure	1	An enclosure designed to provide a degree of protection against dust, light and indirect splashing to the power supply.
2	Thermoelectric Assembly unit	2	A solid-state device that being used as a heat pump to generate either heating or cooling.
3	8-32 X 1/2", 18-8 SS, PAN HEAD PHILLIPS	12	Attaching thermoelectric to chamber
4	8-32 X 3/4", 18-8 SS, PAN HEAD PHILLIPS	4	Attaching thermoelectric to chamber
5	No. 8 FLAT WASHER 18-8 SS	12	Attaching thermoelectric to chamber
6	No. 8 SPLIT LOCK WASHER, 18-8 SS	12	Attaching thermoelectric to chamber
7	No. 10 SPLIT LOCK WASHER, 18-8 SS	4	Mounting NEMA1 box
8	No. 10 FLAT WASHER 18-8 SS	4	Mounting NEMA 1 box
9	PID CABLE ASSEMBLY	1	Connection cable for thermoelectric units to controller
10	AC POWER CORD	1	Powering NEMA 1 enclosure

M 5477-500-24

Item No.	Item	Qty.	Description
1	NEMA 1 power supply enclosure	1	An enclosure designed to provide a degree of protection against dust, light and indirect splashing to the power supply.
2	Thermoelectric Assembly unit	2	A solid-state device that being used as a heat pump to generate either heating or cooling.
3	8-32 X 1/2", 18-8 SS, PAN HEAD PHILLIPS	12	Attaching thermoelectric to chamber
4	8-32 X 3/4", 18-8 SS, PAN HEAD PHILLIPS	4	Attaching thermoelectric to chamber
5	No. 8 FLAT WASHER 18-8 SS	12	Attaching thermoelectric to chamber
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9	CABLE ASSEMBLY	1	Connection cable for thermoelectric units to controller
10	AC POWER CORD	1	Powering NEMA 1 enclosure

III. Setup Guide

Setup Guide

Step 1. Install NEMA-1 box to the chamber

To install the NEMA-1 box on the chamber, use four 10-32 X 7/16” Truss head along with no.10 Flat washer on each side to properly mount the NEMA box.

M 5477-500 and M 5477-500-24 are not shown. NEMA box will be mounted vertically with the same hardware.

Step 2. Install thermoelectric(s) to the chamber

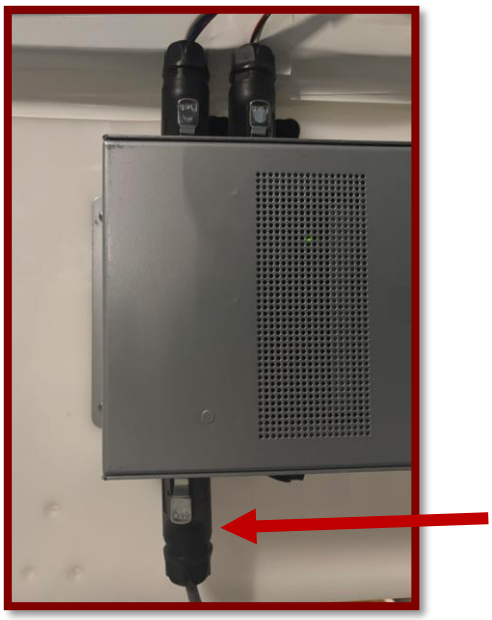
To install a thermoelectric unit on the chamber, use six 8-32X1/2” screws along with No.8 Flat Washer which will be the top row and bottom row respectively (indicated in blue).

Use two 8-32 X ¾” screws which goes on the left and the right side of the thermoelectric unit (indicated in red) which will mount the thermoelectric unit on the chamber securely. There should be about minimum of 6 inches (recommended 1 foot) gap between the thermoelectric unit and anything behind it to prevent restricting of the airflow.

Step 3.A. Connect the NEMA-1 box to the Thermoelectric unit

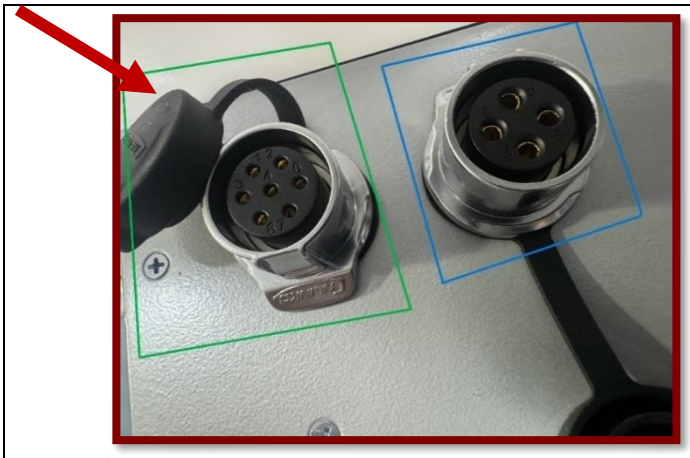
For a Single Thermoelectric (M 5477-250, M 5477-250-24)

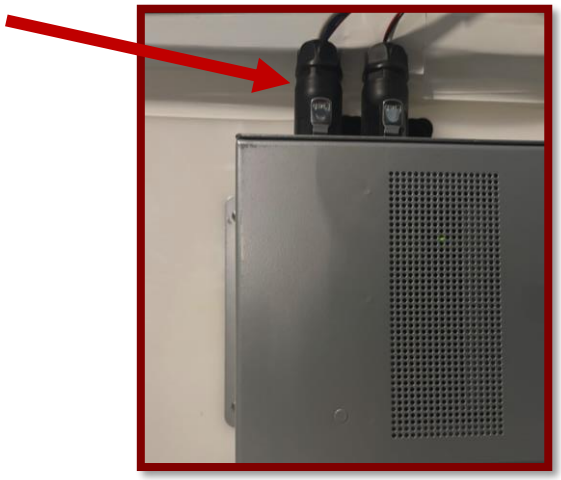
Connect the 4-pin cable from the thermoelectric unit to the NEMA-1 Power Supply (indicated in blue).



Step 3.B. For a Dual Thermoelectric System (M 5477-500, M 5477-500-24), connect the 2nd thermoelectric.

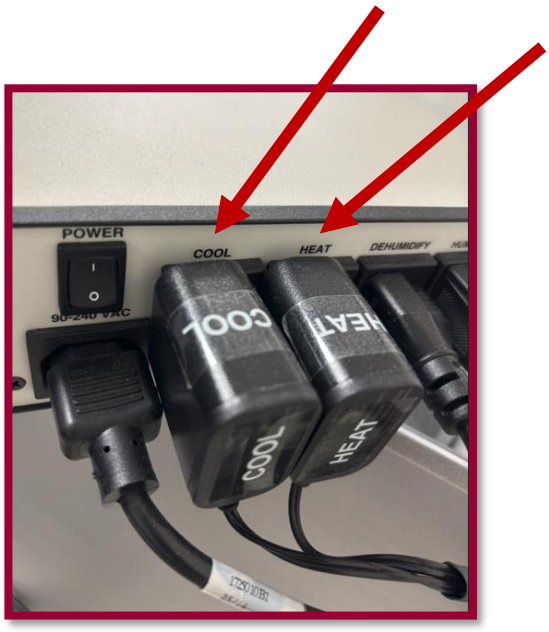
Connect the 4-pin cable from the second thermoelectric unit to the 4-pin connector on the opposite side of the NEMA-1 Power Supply.





Step 4. Connect 7-Pin Cable to NEMA Power Supply.

The 7-pin cable is used to connect the Temperature controller to the NEMA-1 Power Supply (indicated in green).



Step 5. Connect to the Controller.

At the end of the 7-Pin Cable with either be two signal power adapters or another 7-pin connectors.

For the **M 5477-250** and **M 5477-500** thermoelectric systems that are compatible with ETS Model 5100 and 5200 Series PID controllers, plug the signal power adapters into the back of the controller in the matching Cool and Heat locations as shown.

For the **M 5477-250-24** and **M 5477-500-24** thermoelectric systems that are compatible with the ETS Model 5300 Series EnviroPro PLC controllers, plug the 7-pin cable into the matching 7-pin connection marked “POWER”.

Step 6. Plug in the NEMA-1 Power Supply to a power outlet.

There's a replaceable fuse present in case of any mishappen. If the power outlet has an AC surface less than 10 A can cause thermoelectric unit to be in idle state and not function.

Step 7. Start Heating/Cooling on your controller.

For the **M 5477-250** and **M 5477-500** thermoelectric systems that are compatible with the ETS Model 5100 and 5200 Series PID controllers, the temperature is controlled on the PID and the system power switches.

For the **M 5477-250-24** and **M 5477-500-24** thermoelectric systems that are compatible with the ETS Model 5300 Series EnviroPro PLC controllers, the temperature is controlled on the main screen of the PLC. Using the ETS Controller, set the desired set point for the temperature in the chamber and turn on temperature control.

If you need further assistance with the controller, please see the controller operating manual for additional details regarding setup and functionality.

IV. Functionality

The M5477 Series Thermoelectric Heating/Cooling Systems provide precise and reliable temperature control for diverse chamber applications. Leveraging the inherent advantages of thermoelectric technology— rapid thermal response and dual heating/cooling functionality in a single device — the M5477 Series delivers efficient, refrigerant-free thermal management, making it an environmentally responsible choice.

These compact, lightweight systems offer 250 to 500 Watts of power and utilize integrated forced-air cooling for effective temperature regulation across a range of chamber sizes. Designed for seamless integration with ETS controllers, the M5477 Series also offers flexible implementation with other systems via standard 24 VDC signal and ground connections.

Features:

- **Precise Temperature Control:** Thermoelectric systems offer highly accurate temperature control, making them ideal for applications requiring precise thermal management, such as scientific instruments, medical devices, and certain electronics.
- **Reliability and Longevity:** With no moving parts, thermoelectric systems are highly reliable and require minimal maintenance, leading to lower long-term operating costs.
- **Environmentally Friendly:** Thermoelectric devices use no refrigerants or harmful chemicals, making them an environmentally friendly option for heating and cooling.
- **Heating and Cooling in One Device:** A single thermoelectric device can be used for both heating and cooling by simply reversing the direction of the current.
- **Rapid Response:** Thermoelectric systems can switch from heating to cooling quickly, enabling precise temperature control and rapid thermal cycling.
- **Ideal for hazardous environments:** Unlike traditional systems, thermoelectric devices don’t require flammable refrigerants, making them safer for use in hazardous environments.
- **Reduced electromagnetic interference (EMI):** Thermoelectric devices produce very little EMI, making them suitable for use in sensitive electronic equipment.
- **Integrated thermal protection:** A built-in lockout system prevents simultaneous heating and cooling operation, and thermal protection shuts down the thermoelectric unit if internal temperatures exceed 100 degrees Celsius to ensure system longevity and prevent damage.

Core Functions:

- **Cooling & Heating:** All thermoelectric systems can both cool and heat enclosed spaces.
- **Power Generation:** NEMA 1 Power Supply
  - M 5477-250/250-24 648W
  - M 5477-500/500-24 1008W

Performance:

- **Power Output:**
  - M 5477-250/250-24: Approximately 250 Watts
  - M 5477-500/500-24: Approximately 500 Watts

Control & Compatibility:

- **ETS Controllers:** Designed for optimal operation with ETS controllers.
- **PLC Compatibility:** The M 5477-250-24 and M 5477-500-24 are specifically designed to work with M 5300 EnviroPro PLCs.
- **Other Systems:** Can be used with other systems or controllers by utilizing AC adapters or quick connect cables.

V. Specifications

ELECTRICAL

- **Thermoelectric:**
  - Overtemp thermostat: 100°C with a factor of 5 (This likely indicates a safety mechanism that triggers at 100°C and has a safety margin of 5 times the set point)
  - Voltage: 24 VDC (maximum 28 VDC)
  - Current: 14 A (maximum 16 A)
- **NEMA Power Supply:**
  - Input:
    - Voltage range: 85-264 VAC
    - Frequency: 47-63 Hz
    - AC Input: 7.6 A at 115 VAC; 3.6 A at 230 VAC
  - Efficiency: 88%
  - Output: M 5477-250/250-24
    - Voltage: 24 VDC
    - Rated Current: 27 A
    - Rated Power: 648 W
  - Output: M 5477-500/500-24
    - Voltage: 24 VDC
    - Rated Current: 34 A
    - Rated Power: 1008 W

MECHANICAL

- **Weight:**
  - M 5477-250/250-24 System: 9.7 kg
  - Thermoelectric: 5.5 kg
  - NEMA Power Supply: 4.2 kg
  - M 5477-500/500-24 System: 15.2 kg
  - Thermoelectric: 11.0 kg
  - NEMA Power Supply: 4.2 kg
  -
- **Dimensions:**
  - Thermoelectric Unit: 400 mm x 180 mm
  - NEMA Power Supply: 218 mm x 105 mm x 63.5 mm

VI. Repair and Maintenance

Maintenance:

- Under normal use, these systems require minimal to no regular maintenance.
- In dusty environments or with high usage, periodically check the NEMA Power Supply air filters as needed based on the environment. Refer to the Troubleshooting Guide for specific instructions.

Repair:

- To get your unit repaired or serviced by ETS, you need to obtain an RMA (Return Merchandise Authorization) number first.
- You can obtain an RMA by:
    - Calling: 215-887-2196
    - Emailing: service@ets2.com
    - Completing the contact form on the website: www.electrotechsystems.com

VII. Troubleshooting

Troubleshooting Guide

Problem	Possible Causes	Corrective Actions
No Power	Power cord connection	Ensure the cord is plugged into the NEMA box and the AC outlet securely.
	Power switch is off	Confirm the power switch on NEMA power supply enclosure is switched on.
System was running but loses power.	Fuse blew	Replace the fuse. (See step 4 of the Setup instructions for the location).
	Inadequate ventilation. Power supply overheated due to clogged air filters.	Turn off the power on the NEMA power supply enclosure and unplug the system. Remove the screws holding the NEMA cover on and carefully remove the cover. Check the air filter(s) inside the NEMA enclosure and replace or blow out the filter(s). Replace and reassemble. Restore power to the system.
System is not cooling/heating effectively	Inadequate air flow	Distance between the back of the chamber thermoelectric fan and wall behind it should have a minimum of 6 inches (1-foot of space recommended).

VIII. Warranty

Limited Warranties. Seller warrants that all goods manufactured and delivered hereunder shall (a) conform to any samples, drawings, specifications, or other written documents provided to Seller by Buyer or approved by Buyer to Seller and (b) be free from all defects in workmanship and material. Buyer's sole remedy against Seller for breach of either of the specifically mentioned warranty shall be the repair or replacement, at Seller's sole option, of the defective workmanship or material. Seller expressly disclaims all other warranties, express and/or implied, including but not limited to those of merchantability and fitness for a particular purpose. In no event shall Seller be liable, under either warranty or otherwise, to Buyer in excess of the purchase price of the products paid to Seller by Buyer. In no event shall Seller be liable for any loss or damage arising directly or indirectly from the use of the product or for consequential or incidental damages. Seller's specified warranties will expire and lapse (i) for renewable items (such as gloves, iris ports and desiccants), sixty (60) days from date of shipment and (ii) for all standard equipment and otherwise nonrenewable items, one year from date of shipment.