



Thermo Scientific

# RVT5105 Refrigerated Vapor Traps

## Installation and Operation

128-3000-51

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**IMPORTANT** Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel, and poor equipment performance.

**CAUTION** All internal adjustments and maintenance must be performed by qualified service personnel.

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# 1 Description

RVT series Refrigerated Vapor Traps are reliable, easy-to-use, compact benchtop traps for solvent vapor condensation and collection. Mechanically refrigerated vapor traps replace dry ice/methanol traps, and are the easiest, most practical, and safest way to protect high-vacuum, rotary vane oil pumps in a vacuum system.

Solvents are removed from samples during vacuum evaporation with a SpeedVac® Concentrator or during rotary evaporation and are collected in the CFC-free Refrigerated Vapor Trap. Solvent vapors pass into a Glass Condensation Flask and condense on its walls. This prevents the vapors from reaching and potentially damaging the oil-sealed vacuum pump. When used in conjunction with the ThermoSci VaporNet® controller, RVT-series traps provide levels of solvent recovery equal to the most elaborate liquid nitrogen traps.

Operating temperature is -105°C.

The RVT5105 is controlled simply by an on/off (I/O) switch located on the left side. An amber LED on the right front indicates that the unit is on. A green LED indicates that the operating temperature has been reached and the unit is ready to use.

The RVT5105 employs a cascade (dual compressor) refrigeration system to achieve its low operating temperatures.



**CAUTION!** To assure safe operation and best results, read this manual in its entirety before operating this instrument. Improper operation can damage the trap or your vacuum pump.

## 2 Receiving and Inspection

**2.1 Receiving** Inspect the shipping carton upon receipt. If the carton is damaged in anyway, call ThermoSci or your local distributor.

**2.2 Unpacking** Carefully remove the instrument from its shipping carton. **Lift and carry with two people, holding the unit securely underneath with both hands.** Compare the packing list to the box contents. If there is a discrepancy, call your distributor.

**2.3 Inspection.** Inspect the unit for any damage that may have occurred during shipment. Should there be damage, report it to the carrier and contact Thermo immediately. Make sure the carrier inspects the damage and leaves an inspection report. Register claims for shipping damage against the carrier or his agent. Save the shipping carton in the event a return is necessary.

## 3 Installation

**3.1 Site preparation** The trap is typically placed on a bench top at least 26 inches (66 cm) deep and located near a power outlet of the required voltage. The outlet must have a rating of at least 13 A for 115V operation, or 7 A for 230 V operation. The trap draws high current when first switched on; therefore, other high-powered equipment, or equipment that will be affected by a momentary drop in power, should not be placed on the same circuit as the trap. The refrigerated trap and SpeedVac® may also be installed on a sturdy mobile cart, such as Thermo Scientific's Deluxe Convenience Cart, (CC120/DX).

**Provide adequate ventilation.** Thermo refrigerated traps are air-cooled and require at least 3 inches (7.62cm) of clearance for ambient air suction. The RVT5105 draws air from the rear of the unit. Ambient temperature must not exceed +90 °F (+32 °C) during operation.

## 3.2 Other Components

The following accessories are ordered separately:

Glass Condensation Flasks. GCF400 and GF4000

Order the wide-mouth GCF400 flask (4-liter Glass Condensation Flask) for all standalone concentrators except for the SC250EXP. Order the GF4000 for use only with the SC250EXP.

The glass flasks are quickly exchanged between runs and are easy to clean. Having several available permits uninterrupted refrigerated trap operation while the used vessel is being defrosted, cleaned and dried for next time.

CryoCool® Heat Transfer Fluid. A permanent, safe, efficient, and economical alternative to methanol or ethanol. CryoCool does not evaporate, has very low water absorption, is odorless, and non-toxic. Order SCC1 for a 1-liter bottle; order SCC5 for a 5-liter bottle.

In addition, Thermo Scientific offers a complete line of other components required for drying, including vacuum tubing kits, SCT120 Chem traps and replacement Flask Covers for the GCF400.

## 3.3 Preparing for Operation

Switch the trap OFF. Connect the power cord to the receptacle on the right side of the instrument. Plug the trap into an appropriate wall outlet.

**CAUTION!** Before connecting the Refrigerated Vapor Trap to an outlet, check voltage, frequency, and amperage to be sure they match the power requirements indicated on the rear of each instrument. (115 VAC/60 Hz, 13 A, 230 VAC/50 Hz, 7 A.) If there are any questions, please consult an electrician.

As a safety feature, units are equipped with a three-prong grounded plug that fits a grounding-type power outlet. Consult an electrician to replace outlet if necessary. **Do not defeat this safety feature by modifying the plug.**

These units are “FOR INDOOR USE ONLY”. Avoid operating in areas of excessive humidity or extremes of temperature.

Pour CryoCool Heat Transfer Fluid (500 ml) into the stainless steel trap chamber. Before each use, be sure the chamber is filled to the correct level. If necessary, add more CryoCool.

Cryocool can now be drained from the RVT5105 system to remove unwanted ice or other contaminants after the system has been fully defrosted. Refer to Section 5 on page 10 for troubleshooting and maintenance details.

## Glass Condensation Flasks

Glass condensation flasks are ordered separately. They come in two types: the GCF400 and the GF4000.

### 3.4 GCF400

The GCF400 is an open-mouth flask used with 4-liter traps. The wide mouth facilitates cleaning and removal. A rubber Flask Cover (FC400) fits over the top, and tubing attaches to this by means of fittings pushed into molded ports on the rubber cover. This forms the vacuum connection. An insulating cover fits over the flask to seal in the cold and seal out atmospheric condensation from the refrigerated chamber.

The figure below shows the GCF400 installation in the RVT5105 chamber. To the left is an insulation “lift and turn” retaining clip.

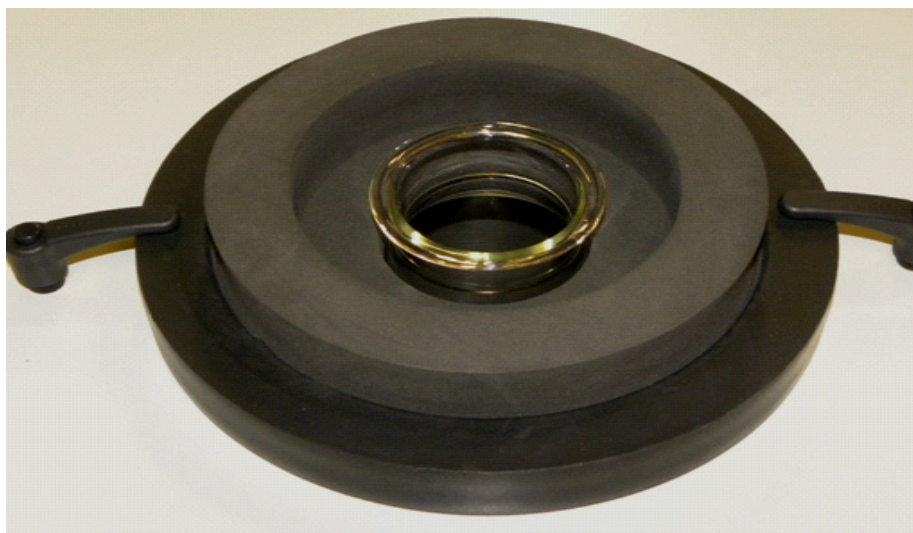


**Figure 1.** GCF400 in RVT5105 chamber

#### Installation

Place a clean, dry Glass Condensation Flask into the stainless steel chamber. Fit the black insulating cover over the flask. Seal flask mouth with the black rubber Flask Cover (FC400). Press down flask and black insulating cover so that the level of CryoCool rises around the flask, and so that the flask, its cover, and insulation are seated to operating position. Lift and rotate the two black retaining clips to hold down both the insulation ring and the Glass Flask.

The figure below shows the GCF400 with the black insulation ring, locked down in the chamber by means of the retaining clips.



**Figure 2.** GCF400 locked down in chamber

This will fully seal the chamber. Withdraw the flask again and verify that the level of CryoCool came to within about a half-inch (12–15 mm) from the top (shoulder) of the flask. If the level is low, carefully pour more CryoCool into the chamber while holding down the flask. Immediately wipe clean any CryoCool that spills onto the rubber chamber seal or Flask Cover.

### **3.5 GF4000 (use with SC250EXP only)**

The GF4000 is a wide-mouth threaded flask used exclusively with the SC250EXP SpeedVac system. The wide mouth facilitates easier cleaning and removal of solvents.

A black insulating cover fits over the flask to seal in the cold and seal out atmospheric condensation from the refrigerated chamber. A large polypropylene vacuum connection fits over the top and is secured by means of a threaded poly nut, and tubing attaches to this by means of stainless steel fittings. This forms the vacuum connection.



The following figures illustrate GF4000 condensation flask installation.



**Figure 3.** GF4000 with insulation ring



**Figure 4.** GF4000 locked down with retaining clips



**Figure 5.** GF4000 with SC250 vacuum cap installed

To install the GF4000, place a clean, dry Glass Condensation Flask into the stainless steel chamber. Fit the black insulating cover over the flask. Lift and rotate the two black retaining clips to hold down both the insulation ring and the glass flask.

NOTE: After the large Polypropylene cap has been installed, follow directions for installation of vacuum lines included with the SC250EXP system.

### 3.6 Tubing Connections

A 1/2-inch O.D. fitting is required to connect tubing to the rubber flask cover. If tubing from the SpeedVac concentrator (or other drying apparatus) is wider (for example, SC250DDA or SPD131DDA), a reducer fitting (such as the 3/4 – 1/2 inch M60-0044-24 included with these units) is needed. Fit the fitting to the tubing, and press the fitting into the molded port on the rubber cover. Fit the suction line from the pump end of the system in a similar manner.

For tubing instructions, refer to the installation instructions with tubing kits (UTP-TYG) or with the SpeedVac concentrators. It does not matter which molded port is used for the SpeedVac and which is used for the pump. The best setup will have the shortest, straightest line of tubing with the fewest amount of bends. It should achieve a convenient and comfortable lay of tubing, with little stress on the fittings. The rubber cover and flask should be easy to remove for system maintenance.

NOTE: Previous SpeedVac users may note that the GCF400 does not have an internal funnel like the older GIT-type trap. In many cases, this is not needed to assist in vapor collection. However, if desired, an extender fitting (such as the M60-0044-14 straight fitting included in the UTP-TYG kit) can be inserted under the rubber cap, so that vapors from the concentrator enter toward the center of the flask.

## 4 Operation

### 4.1 Sequence of Operation

After preparing the unit as described in Section 3 on page 2, switch it ON. The power switch is located on the left side of the RVT5105. An amber LED on the front illuminates when power is on.

It may take up to 90 minutes for the trap fluid to reach its operating temperature. When this occurs, you may begin drying operations as outlined in the instruction manual of your drying apparatus.

The RVT5105 Refrigerated Vapor Traps are designed to operate continuously and may be left on for extended periods. Be sure to regularly check the glass trap or flask and empty it as required. For maximum efficiency, replace with clean vessel when not more than half full (see Section 3.1).

The RVT5105 operates in the following sequence. When you switch the RVT5105 ON, an amber LED located on the front panel will illuminate. The unit starts up and both the fan and compressors can be heard. When the trap temperature reaches  $-75^{\circ}\text{C}$  (approximately 60mins), a green LED also located on front panel illuminates to indicate that trap is ready to be used. Ultimate trap temperature,  $-105^{\circ}\text{C}$ , typically will be reached in approximately 90 minutes. During operation, the trap temperature may rise because condensing and freezing solvent vapors cause transfer of heat into the trap.

### 4.2 Emptying the Glass Vessel

Vessels are available separately and are described in Sections 3.4 and 3.5. During system operation, solvent vapors from the SpeedVac will collect in the glass vessel. The vessel must be regularly emptied to keep the entire system operating at peak efficiency. If the vessel is not maintained, it may become so full that sample drying rate is adversely affected. Another consequence of a full vessel is that solvent vapors are more likely to contaminate and possibly damage an oil-sealed vacuum pump that may be used with the SpeedVac system.

Empty the glass vessel before it is half full. Often it is convenient and good practice to change the vessel at the end of the workday or workweek, no matter the depth of fill. For aggressive solvents, you may wish to remove the vessel at the end of each run for maximum protection of the system components.



**CAUTION!** Refrigerated vapor traps reach low operating temperatures that can cause severe damage to unprotected skin. Wear protective gloves and clothing when removing glass vessels.

To remove the GCF400 or GC4000 for cleaning:

1. Bleed the system back to atmospheric pressure.
2. Remove the rubber flask cover from the flask on the GCF400 or by unscrewing the poly nut on the vacuum connector used on the GC4000, leaving tubing attached to cover.
3. Withdraw the flask partially from the chamber and allow CryoCool to drain briefly.
4. Fully remove the flask and insulating black foam ring.
5. Avoid thermal shock by placing the flask on several thicknesses of absorbent paper toweling and allow to come to room temperature.
6. Insert a spare GCF400 or GF4000, clean and dry, into the chamber. Cover with insulating Black foam ring, and seal with either FC400 Flask Cover (for GCF400) or large Polypropylene cap (used with GF4000 only).
7. Make sure FC400 rubber cover is seated firmly for a good vacuum seal or that the Polypropylene cap is screwed down firmly.

This easy system maintenance can be done in a matter of minutes; the Refrigerated Vapor Trap need not be shut off during this process. When the used flask has defrosted, dispose of contents in an environmentally responsible manner. Clean and dry all flasks for next use.

NOTE: If the Refrigerated Vapor Trap is not needed for several weeks, you may wish to shut it off between uses. Before switching on again, always remove the used glass vessel and replace with a clean, dry trap. Check the condition of the CryoCool; if a layer of water is visible under the CryoCool, remove by opening the drain on the right side of the instrument (refer to Section 5).

Failure to follow these precautions may cause the glass vessel to break when the trap returns to operating temperature.

## 5 Maintenance and Troubleshooting

### 5.1 Replenishing CryoCool

When cold, CryoCool condenses water vapor from the air and develops a build-up of ice. This process is accelerated in humid environments. Loose crystals may be removed with a strainer. Periodically, the CryoCool must be refreshed if:

You see an ice build-up on the stainless steel chamber walls; the glass vessel rises above its usual position, indicating an ice build-up beneath; or the refrigerated trap seems to be losing efficiency.

The RVT5105 has a drain valve that allows you to removed the defrosted Cryocool and water contaminates directly from the condenser. To operate the valve:

Turn the unit off and allow it to defrost (this could take several hours); or you could pour hot water to melt the ice.

The drain valve may be hooked up to a hose with 3/8 in. barbed fitting to drain directly into a waste can.

The following pictures show the drain valve open and closed:



**Figure 6.** Drain valve open



**Figure 7.** Drain valve closed

To reuse CryoCool that has a layer of water, transfer it to a container and allow to settle again into a bilayer. Place in a freezer until the water layer freezes. The liquid fraction is CryoCool, which can be reused. Decant off the CryoCool and dispose of the ice.



**CAUTION!** Refrigerated Vapor Traps reach low operating temperatures that can cause severe damage to unprotected skin. Wear protective gloves and clothing when removing CryoCool, ice, and glass vessels from the trap.

## 5.2 Vibration

If the vapor trap vibrates excessively, have the line voltage checked with a voltmeter. The voltage must be above 108V for 120V units and above 209V for 240V units.



**CAUTION!** Low line voltage may cause thermal overload of the unit.

## 5.3 Cleaning the Condenser

Vapor traps require proper air flow for ventilation. At least every three months, clean the condenser grill. Dust and dirt on the grill can block air flow. **Be sure to turn the trap off before cleaning so that dust and dirt are not drawn into the trap.** Use a vacuum cleaner with a brush attachment, or purge the condenser with compressed air.

The refrigeration system in the trap is hermetically sealed and does not require maintenance.

## 6 Specifications

Operating temperature: -105°C

Capacity: 4 liters

Dimensions (W x D x H)

Inches: 24.1 x 23.9 x 17.6

Cm: 61.2 x 60.7 x 44.7

Net shipping weight: 170 lbs. (77 kg)

Power requirements:

115 VAC/60 Hz, 13A

230 VAC/50 Hz, 7A



230 volt models are designed to conform with CE standards.

## 7 Accessories

GCF400	Glass Condensation Flask (wide-mouth)
GF4000	Glass Wide Mouth Flask (threaded) (Used with SC250EXPonly)
FC400	Flask Cover (black rubber) for GCF400
145-6012-00	Insulating Cover (white foam) for GCF400
SCT120	Chemical Trap
DC120A	Disposable Cartridge for SCT120 when trapping acid and water vapors.
DC120R	Disposable Cartridge for SCT120 when trapping radioactivity and organic solvent vapors.
SCC1	CryoCool Heat Transfer Fluid (1 liter)
SCC5	CryoCool Heat Transfer Fluid (5 liters)
CC120/DX	Deluxe Convenience Cart

## 8 Technical Support

For technical support, laboratory parts and service, call:

1-800-438-4851

For application support, contact:

[speedvac@thermofisher.com](mailto:speedvac@thermofisher.com)



## 9 Warranty

All Thermo Fisher Scientific products mentioned in this manual) excluding glassware) are warranted against defects in workmanship for one year after the date of delivery to the original purchaser. This warranty is limited to defective materials and workmanship and does not cover incidental or consequential damages.

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

When returning apparatus that may contain hazardous material, 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 (free of radioactivity, biological, or chemical contamination).**

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

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