
UVS400/UVS400A Universal Vacuum System INSTRUCTION MANUAL



Thermo Savant

A Thermo Electron business

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1.0 DESCRIPTION

Thermo Savant's Universal Vacuum System (UVS400/UVS400A) is a multipurpose vacuum source and solvent recovery system, combined in a single, integrated unit (Figure 1). The system includes a refrigerated vapor trap, and oil-free vacuum pump; the UVS400A version (220 V/60 Hz or 230 V/50 Hz) also includes a VaporNet® controller. Together, these elements form a low-maintenance vacuum system that offers improved reliability over those based on oil-filled vacuum pumps, which require frequent maintenance and can easily be damaged by contaminating liquids.

The Universal Vacuum System is ideal for applications that evaporate solvents from samples or substances. It is used with Thermo Savant's SpeedVac® vacuum concentrator, Gel Dryer, or other vacuum-dependent equipment such as vacuum ovens or rotary evaporators. The vapor trapping efficiency and thermal capacity of the UVS400/UVS400A provides evaporation rates equivalent to or better than component systems relying on maintenance-intensive rotary vane oil vacuum pumps. At the same time, the UVS400/UVS400A is the most energy efficient and environmentally safe vacuum system available, providing complete recovery of evaporated solvents.

Three major elements are incorporated within the UVS400/UVS400A. The refrigerated vapor trap features a Glass Condensation Flask that collects condensing solvent vapors generated by the attached equipment. Recovered condensate can then be safely handled for proper disposal or recycling. The oil-free vacuum pump eliminates frequent maintenance required by oil-filled pumps, and is corrosion-resistant for long life.

Features:

- -50 °C operating temperature, 4-liter vapor trap, CFC-free refrigerant
- Wide-mouth Glass Condensation Flask (GCF400)
- 34.6 cm (13.6 in) of bench width used
- VaporNet controller (UVS400A, version only)
- TEFLON® coated oil-free vacuum pump, 36 l/min displacement (@ 60 Hz), 10 torr ultimate vacuum
- Automatic vacuum start sequence
- Optional traps for ammonia vapors, acids, and volatile radioactivity/organics

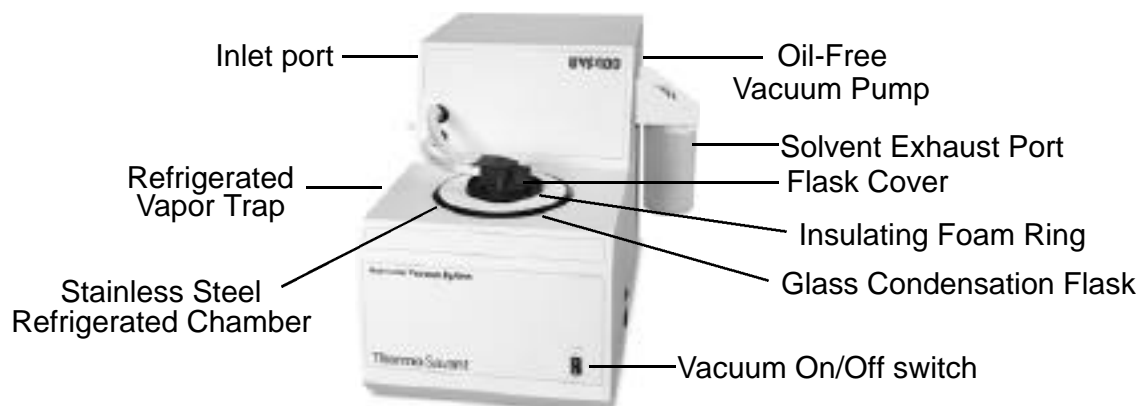


Figure 1. Universal Vacuum System UVS400


2.0 INSTALLATION

Unpacking. Carefully remove the instrument from its shipping carton. 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 packing list to the box contents. If there is a discrepancy, call Thermo Savant at 1-800-634-8886 or 631-244-2929, (fax) 631-244-0606 or contact your distributor.

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 Savant or your distributor 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 and all packing materials in the event a return is necessary.

Set-up. To assure safe operation and best results, read this manual in its entirety before operating the UVS400/UVS400A Universal Vacuum System.

- Place the Universal Vacuum System on a stable, level laboratory counter or heavy duty cart near a power outlet of the required voltage. The bench depth should be at least 66 cm (26 inches). The outlet must have a rating of at least 10 A for 230 V operation. The system draws high current when first switched on; therefore, other high-power equipment, or equipment that will be affected by a momentary drop in power, should not be placed on the same circuit. The UVS400 is air-cooled, requiring at least 10 cm (4 inches) clearance for ambient air circulation. The ambient temperature must not exceed 32 °C (90 °F) for optimum function.

 **Warning:** Before connecting the UVS400/UVS400A to an outlet, check voltage, frequency, and amperage to be sure they match the power requirements indicated on the label on the right side of the instrument (115 V/60 Hz, 6 A; 230 V/50 Hz, 3 A). If there are 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.
- This unit is "FOR INDOOR USE ONLY". Avoid operating in areas of excessive humidity or extremes of temperature.

2.1 PREPARING THE VACUUM SYSTEM FOR USE

CryoCool.

Prepare the vapor trap by dispensing the correct level of CryoCool® Heat Transfer Fluid (SCC1); available separately. Pour 800 ml of CryoCool into the stainless steel trap chamber. A line scribed in the wall of the stainless steel chamber indicates the minimum appropriate CryoCool level (with glass flask not yet inserted). When replenishing CryoCool, add more fluid until the level reaches the scribed line.

Glass Condensation Flask (GCF400).

The GCF400 is a wide-mouth flask which facilitates removal of condensed solvent. 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 foam cover fits over the flask to seal in the cold and seal out atmospheric condensation from the refrigerated chamber.

Place a clean, dry Glass Condensation Flask into the stainless steel chamber. Fit the insulating cover (white foam ring) over the flask. Seal flask mouth with the black rubber Flask Cover. Press down flask and 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. 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.

Muffler and Optional Trays.

Attach the muffler to the solvent vapor exhaust port on the right side of the Universal Vacuum System. For applications requiring post-pump gas trapping, attach instead the optional Post-Trap Assembly (ANT100) or Chemical Trap Kit (DTK120; Figure 2). The ANT100 is used with either Ammonia Neutralizing Solution (ANS121), which neutralized ammonia vapors and reduces ammonia smell in the laboratory, or NSA300TF which neutralizes acids. The DTK120 comes with a DC120R Disposable Cartridge for adsorbing volatile radioactivity and trace organics. It may also be fitted with a DC120A Disposable Cartridge (available separately) for neutralizing acid vapors.

2.2 CONNECTION TO EVAPORATION/DRYING EQUIPMENT

The UVS400 Universal Vacuum System is designed for use in single or multifunction operation, with such instruments as the SpeedVac, Gel Dryer, Vacuum Oven, or Rotary Evaporator. Use the tubing and fitting kit (TFK120) to arrange the components in a convenient, space saving configuration. If necessary, place the UVS400/UVS400A on a shelf below the evaporation/drying components. Connect instrument(s) to the port on the left side of the UVS400/UVS400A. Install manual bleeder valve (BV130; available separately) in the tubing between the instrument and UVS400/UVS400A. This valve can be used to apply vacuum to the instrument, and to bleed the system back to atmosphere pressure at the end of a run.

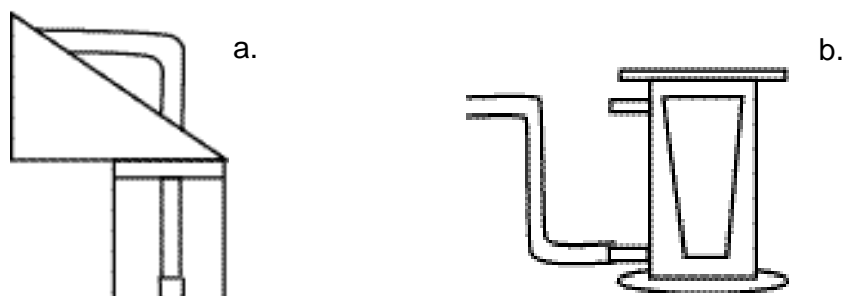


Figure 2. a. ANT100 Post-trap Assembly b. DTK120R Chemical Trap Kit

3.0 OPERATION

A two-position power switch (OFF/ON) is found on the right side panel. The system should be switched ON at least 30 minutes before using to ensure that it has reached its proper operating temperature of -50°C . It is suggested that the trap be left on at all times.

When samples or gels are in place and the evaporation/drying component is activated, switch the vacuum switch to ON. This two-position switch (ON/OFF) is located on the lower right-hand side of the front panel.

VAPORNET

On the UVS400A, the two-position SOLVENT switch (VOLATILE/AQUEOUS) is located left-most on the front panel. If volatile, low boiling solvents ($\text{bp} < 95^{\circ}\text{C}$) are being evaporated, activate VaporNet by switching to VOLATILE to maximize solvent recovery. If non-volatile, high boiling solvents ($\text{bp} > 95^{\circ}\text{C}$) are evaporated, select Aqueous (VaporNet off).

NOTE: With VOLATILE selected, occasional clicking will be heard from the system. This indicates that the VaporNet Controller is functioning properly.

When the concentration process is complete, switch the UVS400/UVS400A vacuum pump OFF. Shut off VaporNet when not in use by setting to AQUEOUS.

3.1 EMPTYING THE GLASS CONDENSATION FLASK

During system operation, solvent vapors from the SpeedVac or other attached instrument will collect in the glass condensation flask. The flask must be regularly emptied to keep the entire system operating at peak efficiency. If the flask 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 the oil-sealed vacuum pump bypass the trap and be released to the atmosphere.

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



CAUTION: *The UVS400 and UVS400A reach low operating temperatures that can cause severe damage to unprotected skin. Wear protective gloves and clothing when removing glass flasks.*

To remove the GCF400 for cleaning, bleed the system back to atmospheric pressure. Remove rubber Flask Cover from flask, leaving tubing attached to cover. Withdraw the flask partially from the chamber and allow CryoCool to drain briefly. Fully remove flask and insulating foam ring. Avoid thermal shock by placing the flask on several thicknesses of absorbent paper toweling and allow to come to room temperature. Insert a spare GCF400, which is clean and dry, into the chamber. Cover with insulating foam ring, and seal with rubber Flask Cover. Make sure rubber cover is seated firmly for a good vacuum seal. This easy system maintenance can be done in a matter of minutes; the power (refrigeration) switch 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 flask for next use.

IMPORTANT: Check the Glass Condensation Flask before each run and replace with clean flask if approaching half full. Immediately wipe dry any CryoCool® Heat Transfer Fluid that falls on the rubber seal. Be sure Flask Cover is seated firmly on the flask.

NOTE: Collected solvents may be purified for reuse or disposed of safely according to applicable regulations.

If working with radioactive samples, test condensate for presence of radioactivity. If found to be radioactive, dispose of as radioactive liquid according to all applicable regulations.

3.1 EMPTYING THE GLASS CONDENSATION FLASK (cont'd)

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

NOTE: Periodically check Flask Cover for signs of wear or perishing, and replace if necessary.

3.2 OPTIONAL TRAPS

Optional traps (described in Section 2.1, Figure 2) must be maintained for optimal system performance. The ANT100 utilizes neutralizing solutions which exhibit a color change when depleted. Ammonia Neutralizing Solution (ANS121) changes from pink to blue; Neutralizing Solution for Acids (NSA300TF) changes from blue to pale yellow when depleted. Replace solution bottle when a color change is observed. If using solid chemical cartridge with DTK120R, the DC120A cartridge for acids turns white to blue; change when depleted. DC120R cartridge for radioactivity/organics has no color indicator; replace monthly.

4.0 SPECIFICATIONS

Vacuum Source:	
Type:	Oil-free diaphragm, TEFLON® coated heads, with built in VaporNet Controller
Displacement:	36 liters/min (@60 Hz), 32 liters/ min (@50Hz)
Maximum vacuum:	29.5 in Hg (10 torr)
Refrigerated Vapor Trap:	
Capacity	4 liters
Operating Temperature:	-50 °C
Dimensions (W x D x H):	35 x 61 x 45 cm (13.6 x 24 x 18 in)
Weight:	41 kg (90 lbs)
Power Requirements:	115 V, 50/ 60 Hz, 6A 230 V, 50 Hz, 3 A

5.0 ACCESSORIES

ANT100	Post-trap Assembly
ANS121/4	Ammonia neutralizing solution, (package or 4 bottles)
DTK120R	Chemical Trap Kit for radioactive samples
DC120A	Disposable cartridge for acid vapor neutralization
DC120R	Disposable cartridge for radiolabeled vapor adsorption
FC400	Flask Cover (black rubber)
GCF400	Glass Condensation Flask, 4 liters
BV130	Bleeder Valve
SCC1	CryoCool® Heat Transfer Fluid (1 liter)
DVG50	Digital Vacuum Gauge 0-50 Torr < 1 millitorr
CC120/DX	Deluxe Convenience Cart
NSA300TF/4	Neutralizing Solution for acid (pack of 4 bottles)

6.0 WARRANTY AND LIABILITY STATEMENTS

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

Thermo Savant will repair free of charge any apparatus covered by this warranty. If a new component fails to work, Thermo Savant 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 Savant. Cost 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) regulation applying to transportation of hazardous materials. Your shipping documents must also meet DOT regulations. All returned units must be decontaminated and free of radioactivity.

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

100 Colin Drive • Holbrook, NY 11741-4306 USA
Tel: 631-244-2929 • 1-800-634-8886 • Fax: 631-244-0606
www.thermosavant.com • E-mail: savantec@savec.com

Thermo Savant