

High Speed Evaporator Systems



Operating Manual

Warranty

Ecodyst provides a 2-year warranty for the products described here (excluding glass and wearing parts) if you register using the warranty card enclosed. The warranty is valid from the point of registration. The serial number is also valid without registering. The warranty covers part and manufacturing defects.

(Serial number on back top corner of EcoChyll)

If the device should break down, it must be taken back to the manufacturer for inspection. Ecodyst will repair or replace the device at no cost if it is determined to be faulty after inspection. This WARRANTY, however, is VOID if the device demonstrates signs of tampering or demonstrates signs of damage brought on by an excessive current, heat, moisture, vibration, corrosive elements, or misuse. If the controller is used to power devices other than those listed in Section 3.2, this WARRANTY is VOID. This warranty also doesn't cover components that deteriorate or are damaged due to abuse. This applies to solid-state relays, fuses, and contact points.

APART FROM WHAT IS STATED HEREIN, THERE ARE NO WARRANTIES. OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE, ARE NOT MADE. ECODYST SCIENTIFIC, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES. THE PURCHASER'S SOLE REMEDY FOR ANY BREACH BY ECODYST SCIENTIFIC, INC. OF ANY WARRANTY SHALL NOT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER TO ECODYST SCIENTIFIC, INC. FOR THE UNIT OR UNITS OF EQUIPMENT DIRECTLY AFFECTED.

Operating Manual

About this Manual

This operating manual provides the technical and operational details for the Ecodyst's Product line.

- Please read this manual carefully and obey all safety and warning notices.
- Ensure that every operator reads this manual.
- Ensure that this manual is accessible for every operator.
- Pass on the operating manual to the subsequent owner.
- In addition, please observe the regional regulations

Introduction

Rotary evaporators (rotovaps) are ubiquitous devices in chemistry labs and industries performing chemistry, including labs in the chemical, pharmaceutical, environmental, materials, life science, and cannabis industries. Rotovaps consist of a heating fluid bath, rotating motor, evaporating flask, condenser, collection flask, and vacuum source. Traditional rotovap condensers require external sources of cooling materials such as dry ice, liquid nitrogen, water or glycol. Glycol requires additional recirculating chiller equipment, which are often bulky, heavy, and inefficient. The traditional rotovap for decades have also been characterized with inefficient vapor condensing, operational cost, unreliability, high energy consumption and material waste.

Using a proprietary and innovative self-cooling technology, Ecodyst has revolutionized the rotovap to be more efficient, to have a smaller footprint, to have greater output, and to be less costly to operate as compared with traditional rotovaps. This disruptive technology has set new standards worldwide for rotary evaporators.

Ecodyst's green condenser technology does not require an external source of cooling materials, eliminating the major sources of material waste associated with rotovaps. Ecodyst's devices are equipped with intelligent self-cooling condenser technology that is extremely efficient at condensing vapors. This technology is environmentally friendly, energy efficient, reliable and sustainable. Additionally, the condenser achieves rapid cool down (reaches -40oC in 60 seconds) and is always-available, which eliminates downtime, increases productivity, and saves time and money.

Product Line

Hydrogen

All-in-one rotovap



EcoChyll X1

Upgrades any brand rotovap



EcoChyll X3

Available sizes: 12L, 20L



EcoChyll X5

Available sizes: 22L, 50L



EcoChyll X7

Available sizes: 22L, 50L, 72L, 100L



EcoChyll X9

Available sizes: 200L



Table of Contents

General Safety Instructions

General Safety Instructions	1
Intended Use	1
Improper Use.	1
Installation / Electrical Safety	1
Personnel Qualification	2
Operating Company's Obligations	2
Safety During Use	3
Disposal	3

Hydrogen

Summary	4
Device Description	5

EcoChyll X1

Summary	6
Device Description	7

EcoChyll X3

Summary	8
Device Description	9

EcoChyll X5

Summary	10
Device Description	11

EcoChyll X7

Summary	13
Device Description	15

EcoChyll X9

Summary	17
Device Description	18

EcoChyll Parts List	20
-------------------------------	----

Technical Data

Power Requirements	32
Cooling Capacities	34
Components	35

High Powered Heating Mantle (HPM)

Models & Specifications	39
Installation	39
Operation	40
Maintenance	42
Troubleshooting	43

High Powered Heating Mantle Controllers (HPC)

Guidelines.	44
Operation	47
Troubleshooting	55
Safety Procedures	58

Post Operations

Cleaning.	62
Maintenance	62
Troubleshooting	62
Transporation and Storage	62

Support

Questions/Repair Work	62
---------------------------------	----

Contact Details.	63
--------------------------	----

General Safety Instructions

General Safety Instructions

The device has been constructed according to state-of-the-art technology and recognized safety regulations. However, risks may still arise during installation, operation and maintenance.

Please ensure the operating manual is available at all times.

The device may only be used under the following circumstances

- Only operate the device, if it is in full working order.
- Ensure all operators of the device possess the necessary safety and risk awareness.
- Operate the device according to the instructions stipulated in this manual only.
- If there is something you do not understand, or certain information is missing, ask your manager or contact the manufacturer.
- Do not do anything on the device without authorization.
- Only use the device according to its intended use.

Intended Use

The device is intended for use by trained and authorized personnel only. The device is suitable for the following

- Economical cooling as alternative to tap water systems use.
- Research application.

Improper Use

Any use which deviates from the device's intended use is considered to be improper. The manufacturer does not accept liability for any damages resulting from non-permitted uses. The risk is carried by the operator alone.

Installation/Electrical Safety

- The device may only be connected when the main voltage corresponds to the information on the type plate of the unit.
- The main connection must be accessible at all times.
- Repairs may only be performed by a qualified electrician.
- Never operate the unit with a damaged power cord.
- Always turn the unit OFF and disconnect main power before performing any maintenance or service.

Personnel Qualification

- The device may only be operated by qualified persons.
- The device may only be operated by individuals who have been instructed in its proper use by qualified persons.
- The device may only be operated and maintained by persons who are of legal age.
- Other personnel may only work with the unit under continuous supervision of an experienced qualified operator.
- This manual must be read and understood by all persons working with the device.
- The personnel must have received special safety instructions in order to guarantee responsible and safe work procedures.

Operating Company's Obligations

Installation Site

- The device must be positioned in a suitable location.
- The device must be installed sufficiently stable on a strong and level surface.
- All screw connections must be securely tightened.
- The device should be located as close as possible to the process requiring cooling.
- The device should not be installed closer than 1.4 meters (4 feet) to a heat-generating source, such as heating pipes, boilers, etc.
- If possible, the device should be located near a suitable drain to prevent flooding in the event of leaks.
- Do not place the device where corrosive fumes, excessive moisture, excessive dust, or high room temperatures are present.
- The site must have an 80% relative humidity and temperature between 5–35 °C
- Adequate clearance should be allowed on the front, sides, top, and rear of the device for access to connections and components.
- The front and side vents of the device must be a minimum of 21 cm (8 inches) away from walls or vertical surfaces, so air flow is not restricted.

Changes to the Unit

- No unauthorized changes may be made to the unit.
- No parts may be used which have not been approved by the manufacturer.
- Unauthorized changes result in the EC Declaration of Conformity losing its validity, and the appliance may no longer be operated.
- The manufacturer is not liable for any damage, danger or injuries that result from unauthorized changes or from operating the unit other than described in this manual.

Safety for the Personnel

Ensure that only qualified personnel operate the device. Observe the following regulations:

- Laboratory guidelines
- Accident prevention regulation
- Ordinance on Hazardous Substances
- Other generally accepted rules of safety engineering and occupational health
- Local regulations

Safety During Use

- Wear the appropriate protective clothing when working on the device (clothing, protective glasses and if necessary, safety gloves).
- Do not use the device in potentially explosive areas. The device is not protected against explosion. There is no explosion or ATEX protection available.
- Do not operate or assemble devices in the vicinity which are emission or radiation sources (electromagnetic waves) for the frequency range (3×10^{11} Hz to 3×10^{15} Hz).
- Avoid putting pressure on the display when you do not operate the device.
- Eliminate errors immediately.
- Do not use abrasive material to clean the glass surfaces. Only wipe with damp cloths.
- Always switch the device off after use.

Disposal

- Check the device components for hazardous substances and solvents.
- Clean all components before disposal.
- Dispose of the device according to the valid national legal regulations.
- Dispose of the packaging material in accordance with the valid national legal regulations.
- Have refrigerant emptied before disposal

Hydrogen

Summary

Reduce electricity consumption by over 50%, never have to change chiller fluids again, and dramatically decrease your run times! Ecodyst's Hydrogen is a high performance, self-cooling rotary evaporator with a compact footprint. The eco-friendly, energy-efficient, sustainable rotovap uses a built-in condenser which eliminates the need for glycol, dry ice or water while massively reducing coolant pull-down times.

By eliminating coolant and cutting electricity use by more than half, the Hydrogen delivers substantial operating cost savings. By combining the functions of a recirculating chiller and a rotary evaporator in the same compact body, what would ordinarily take two pieces of equipment is done with just one, saving precious lab space while eliminating messy tubing and leaks.

Tired of waiting for your chiller to get cold? With the Ecodyst, the condenser is cold almost immediately. The condenser will cool to -10°C in just one minute, or all the way to -35°C in five minutes.

Overview

Available sizes: All-in-one rotovap



Hydrogen



EcoChyll X1

Summary

Rotary evaporators (rotovaps) are ubiquitous devices in chemistry labs and industries performing chemistry, including labs in the chemical, pharmaceutical, environmental, materials, life science, and cannabis industries. Rotovaps consist of a heating fluid bath, rotating motor, evaporating flask, condenser, collection flask, and vacuum source. Traditional rotovap condensers require external sources of cooling materials such as dry ice, liquid nitrogen, water or glycol. Glycol requires additional recirculating chiller equipment, which are often bulky, heavy, and inefficient. The traditional rotovap for decades have also been characterized with inefficient vapor condensing, operational cost, unreliability, high energy consumption and material waste.

Using a proprietary and innovative self-cooling technology, Ecodyst has revolutionized the rotovap to be more efficient, to have a smaller footprint, to have greater output, and to be less costly to operate as compared with traditional rotovaps. This disruptive technology has set new standards worldwide for rotary evaporators.

Ecodyst's green condenser technology does not require an external source of cooling materials, eliminating the major sources of material waste associated with rotovaps. Ecodyst's devices are equipped with intelligent self-cooling condenser technology that is extremely efficient at condensing vapors. This technology is environmentally friendly, energy efficient, reliable and sustainable. Additionally, the condenser achieves rapid cool down (reaches -40°C in 60 seconds) and is always-available, which eliminates downtime, increases productivity, and saves time and money.

EcoChyll X1 is a powerful, small footprint and intelligent self-cooling condenser invented for scientists by scientists. Additionally, this condenser has superior advantages, has a large cooling survey area condenser and extremely fast rates of evaporation. The EcoChyll S is a plug-and-play condenser that upgrades any bench.

Overview



EcoChyll X1



Controller



EcoChyll X3

Summary

Engineered for high-speed solvent evaporation and recovery in small- to medium-sized laboratories, the EcoChyll® X3 is a robust cooling system for chemical, botanical, and other extractions. Using the pioneering EcoChyll® direct cooling technology, the X3 bridges the gap between small-footprint, benchtop rotary evaporators and our larger, higher-capacity EcoChyll evaporators. With a true 12 L capacity and compact form factor, it holds more solvent than a “20 L” rotary evaporator while having a faster evaporation rate and much shorter total run time.

The EcoChyll® X3 is routinely used downstream of botanical extractions via BHO, CO₂, or ethanol. With twin metallic condenser coils, the EcoChyll® X3 carries out continuous direct-cooling of incoming vapors in an efficient and environmentally-friendly manner. No glycol or other coolant is necessary, start-up times are far shorter, and total energy usage is less than half. EcoChyll® evaporators also free up operator time due to low-intervention requirements. Because the evaporation flask is stirred rather than rotating, residual product can simply be drained from a valve. The EcoChyll X3 can also be set up for more complete process automation, saving time and money without compromising the quality of your results.

Overview

Available sizes: 12L, 20L



EcoChyll X3



EcoChyll X5

Summary

Designed for process scientists on a budget who cannot sacrifice quality, the EcoChyll® X5 is an extremely efficient alternative to all existing evaporative technologies. Compared to 20 L rotary evaporators from major manufacturers, the EcoChyll X5 provides over twice the capacity at a substantially lower cost. The patented direct cooling technology, direct heat, and stirred evaporation flask all contribute to dramatically lower energy consumption, without requiring a drop of glycol or other coolant fluid, significantly reducing your operating costs while increasing your recovery rates.

With a true 22 L capacity and a small footprint, it is a premium compromise between cost and convenience. Our cost-competitive evaporator comes as a turn-key solution for solvent recovery and decarboxylation. The EcoChyll® X5 automates the vapor cooling process to free-up user time for other operations, while reducing run time due to faster evaporation rates and significantly shorter start-up time. This method is now the preferred solution for evaporation in a wide range of botanical extraction applications.

Overview

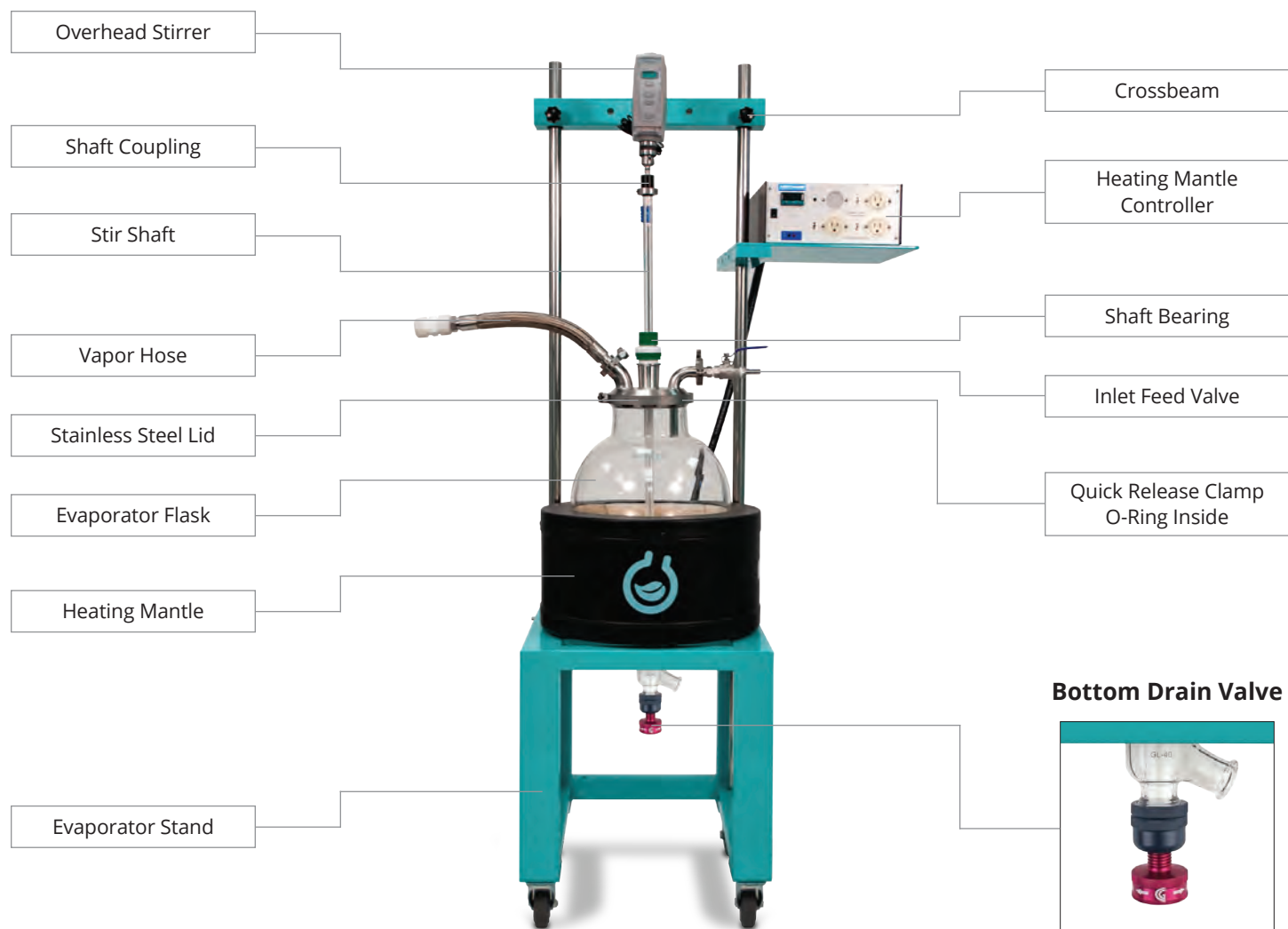
Available sizes: 22L, 50L



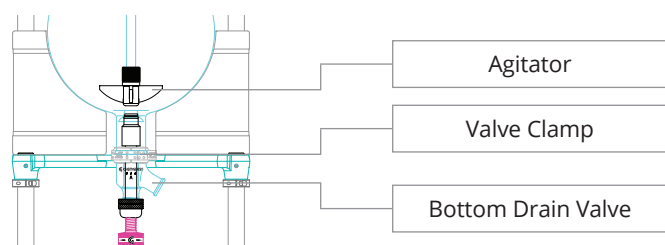
EcoChyll X5



12L, 22L Evaporator Systems



Cross Section of Evaporator Flask



Summary

When you cannot compromise on solvent recovery, you need the EcoChyll® X7.

Built for industrial-scale evaporation, the EcoChyll® X7 high speed evaporator from Ecodyst combines high loading capacities with rapid continuous cooling for efficient and fast solvent recovery. Courtesy of proprietary intelligent direct self-cooling condensers, the EcoChyll® X7 high cooling capacity and large surface area condensers can reliably condense large volume of solvents. Tired of waiting almost an hour for your chiller to get to temperature? The EcoChyll X7 can reach -40°C in just a few minutes. Never have to bother with glycol or other coolants again!

Our industrial-scale rotary vacuum evaporator is a turn-key solvent recovery system trusted by chemists and botanical extraction processors in both research and commercial laboratory settings. Based on innovative self-cooling technology, our smart cooling system is both eco-friendly and efficient, cutting your electricity consumption by half! The EcoChyll® X7 continuous cooling system is guaranteed to increase productivity for high throughput solvent recovery and decarboxylation applications while keeping user safety and usability at the forefront of all botanical extraction applications.

Unlike a 20 liter rotary evaporator, which holds only about 10L of product, the stirred, upright 22L EcoChyll X7 has a true 22L capacity!

Ecodyst was established with the aim of improving on the performance of standard laboratory rotary evaporators (rotovaps), setting a new benchmark for performance in extractions and solvent recovery across chemical, pharmaceutical, cannabis, and other industries. The EcoChyll® X7 rotary vacuum evaporator delivers on that promise for the industrial-scale scientist, providing a scalable modular solution that performs on numerous key fronts for the budget-conscious operator.

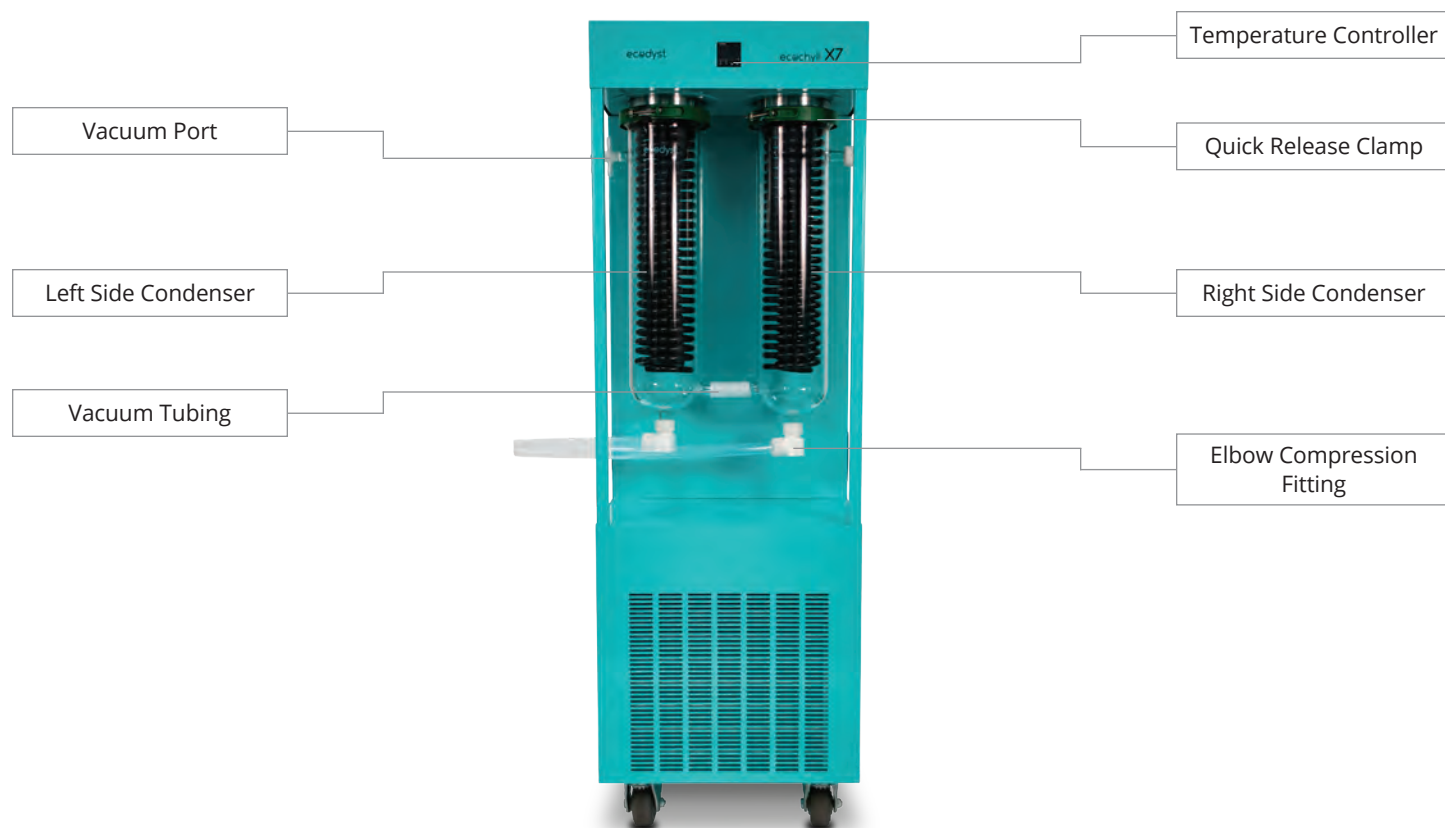
If you require a budget-friendly evaporator, consider our single condenser EcoChyll® X5, available in sizes of 22 liters and 50 liters.

Overview

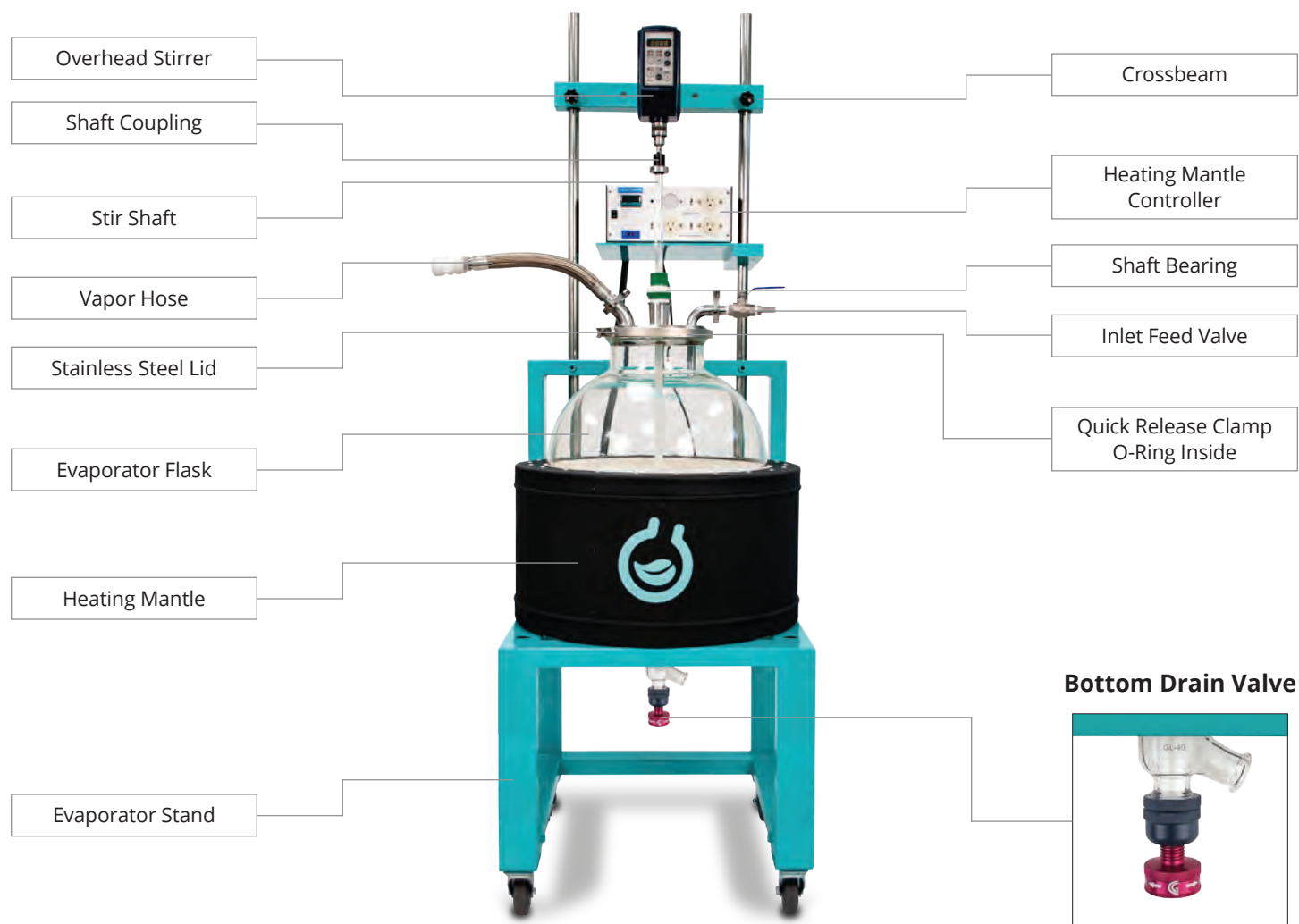
Available sizes: 22L, 50L, 72L, 100L



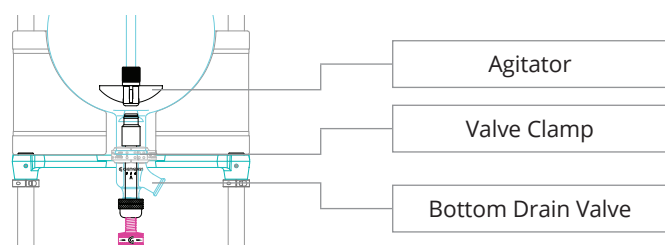
EcoChyll X7



50L, 72L, 100L Evaporator Systems



Cross Section of Evaporator Flask



EcoChyll X9

Summary

Engineered to satisfy the highest volume requirements for decarboxylation and solvent recovery, the EcoChyll® X9 large capacity evaporation unit is a high-speed and ultra-efficient system for demanding botanical extractions. Based on unique triple coil self-cooling technology, this workhorse solution is the best evaporation unit for large-scale extractions, with a greater maximum capacity than any alternative on the market.

The EcoChyll® X9 evaporation unit was engineered to address the bottleneck in botanical extraction laboratories servicing the booming hemp industry. Extractions, solvent recovery, and decarboxylation processes that once took several experienced operators with numerous rotary evaporators (rotovaps) hours, can now be accomplished in a fraction of the time. With a 16,000 watts heating mantle and a matching high cooling capacity, the EcoChyll® X9 comprehensively exceeds the performance of up to eight 50 liter traditional rotovaps.

Overview

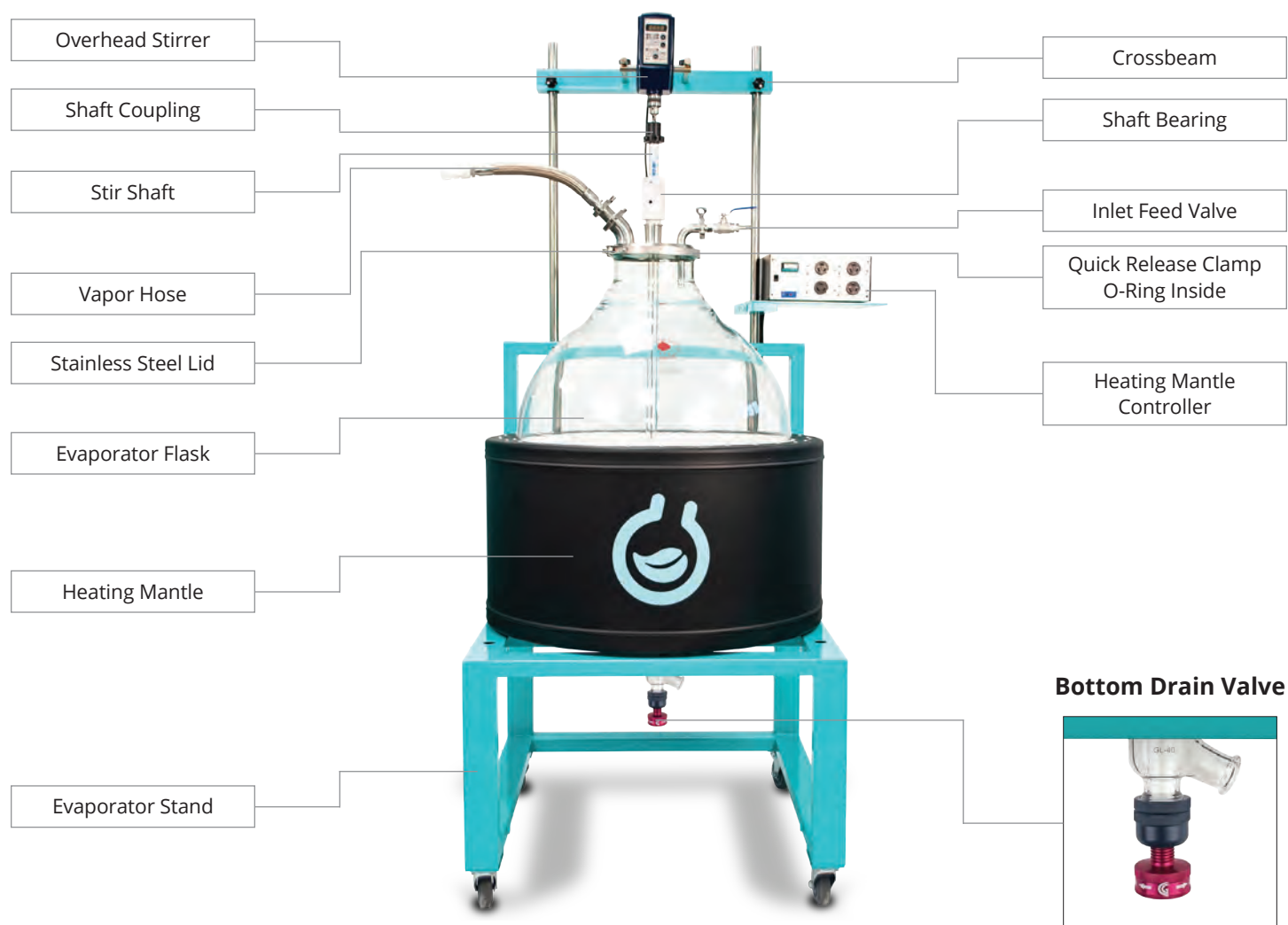
Available sizes: 100L, 200L



EcoChyll X9



200L Evaporator System



EcoChyll Parts List

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-026	1/4" Thermocouple Adapter, 24/40	Adapters			o	o	o	
ECO-777-027	90° Inlet Adapter, 1" OD Pipe to 35/25 Ball joint	Adapters			o			
ECO-777-029	Inlet Adapter, 0-4mm Valve to 24/40 Inner Drip joint, Hose Connection on Sidearm, 200mm Stem	Adapters						
ECO-777-058	Inlet Adapter, 0-14mm Valve to 35/25 O-Ring Ball joint, 1" OD Pipe on Sidearm	Adapters						
ECO-777-059	Inlet Adapter, 0-8mm Valve to 45/50 Inner Drip joint, Hose Connection on Sidearm, 200mm Stem	Adapters						
ECO-777-060	0-4mm High Vacuum Drip Tube on 24/40 Inner Joint	Adapters						
ECO-777-068	1/4" Thermocouple Adapter, 45/50 Inner	Adapters						
ECO-777-071	Stopcock Plug Only, 19/38, GL-14 Thread	Adapters	o	o	o	o	o	o
ECO-777-072	0-4mm Valve Replacement Plug and Control Knob, High Vacuum	Adapters						
ECO-777-073	0-8mm Valve Replacement Plug and Control Knob, High Vacuum	Adapters						
ECO-777-074	0-20mm Valve Replacement Plug and Control Knob, High Vacuum/For CG-500 Series	Adapters						
ECO-777-081	0-4mm High Vacuum Drip Tube on 24/40 with 200mm Stem	Adapters						
ECO-777-082	0-12mm HV Valve on 24/40 Joint with 1"OD Sidearm	Adapters						
ECO-777-083	0-8mm High Vacuum Valve on 24/40 Inner Joint with 1"OD Sidearm	Adapters						
ECO-777-084	0-20mm High Vacuum Valve on 35/25 O'Ring Ball Joint with 1" OD Sidearm	Adapters						
ECO-777-085	0-12mm High Vacuum Valve with 1" OD Side Arm and 35/25 O"Ring Ball Joint Outlet	Adapters						
ECO-777-086	45/50 Inner Joint with 90° 1" OD Side Arm	Adapters						

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-087	35/25 Ball Joint with 90° 1" OD Sidearm	Adapters						
ECO-777-088	45/50 Inner Joint with 90° 2" OD Sidearm	Adapters						
ECO-777-089	0-8mm High Vacuum Drip Tube On 45/50 with 200mm Stem	Adapters						
ECO-777-090	0-8mm High Vacuum Valve on 45/50 Inner Joint	Adapters						
ECO-777-107	PTFE Thermocouple adapter, 1/4" 24/40 joint	Adapters			o	o	o	o
ECO-777-155	50mm flange 100mL flask with #3 hose connector	Adapters	o	o				
ECO-777-156	45/50 outer joint feed adapter with stems	Adapters						
ECO-777-168	0-20mm High Vacuum Valve on 45/50 Inner Joint with 1" OD Sidearm	Adapters						
ECO-777-169	0-12mm High Vacuum Valve on 45/50 Inner Joint with 1" OD Sidearm	Adapters						
ECO-777-243	Continuous Feed Inlet Adapter with hose connector	Adapters	o	o				
ECO-777-258	45/50 Lower Joint Adapter	Adapters						o
ECO-777-267	Complete Kit: 24/40 Glass Adapter with All 6 Threaded Vial Adapters: 13-425, 15-425, 18-425, 20-400, 22-400, 24-400	Adapters						
ECO-777-271	hydrogen rotovap vapor duct	Adapters	o					
ECO-777-273	Rotovap adapter, 50mm flange 100mL flask to 24/40 Outer Joint	Adapters	o	o				
ECO-777-276	Plug & Valve Stem Assembly Only, for Zero Dead Space Drain Valve	Adapters			o	o	o	o
ECO-777-018	5.5" O.D. Teflon Agitator, High Viscosity	Agitators			o	o		
ECO-777-038	8" O.D. Teflon Agitator, High Viscosity	Agitators				o	o	
ECO-777-049	Agitator, 28mm, 178mm PTFE Blade	Agitators					o	o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-050	Turbine Agitator, 28mm, 150mm PTFE 4-Blade	Agitators					o	o
ECO-777-080	Agitators, PTFE, High Viscosity, 25.4mm, 10" Blades for old 100L X7 models	Agitators					o	o
ECO-777-197	Agitators, PTFE, High Viscosity, 25.4mm, 10" Blades, Solid One-Piece Design, Supplied with Safety Pin	Agitators					o	
ECO-777-222	19mm PTFE Agitator Compression Hub Only	Agitators			o	o	o	
ECO-777-252	10" O.D. PTFE Agitator, High Viscosity, Solid One-Piece Design, Stabilizing Pin Bore, Similar to CG-2096-M-12	Agitators					o	o
ECO-777-255	8" O.D. PTFE Agitator, Blades Angled 60	Agitators					o	o
ECO-777-019	19mm Flake-Free Teflon® Stirrer Bearing, 45/50	Bearing Seals			o	o	o	
ECO-777-051	Shaft Bearing, PTFE, 28mm, 45/50	Bearing Seals					o	o
ECO-777-075	Replacement Bearing Sleeve, 19mm	Bearing Seals			o	o	o	
ECO-777-076	Replacement PEEK Compression Spring, 19mm	Bearing Seals			o	o	o	
ECO-777-213	Green Replacement Screw Cap, 19mm	Bearing Seals			o	o	o	
ECO-777-257	25.4mm Stir Bearing, Mechanical Seal	Bearing Seals						o
ECO-777-270	hydrogen rotovap vacuum seal	Bearing Seals	o					
ECO-777-003	150mm Quick Release Clamp	Clamps			o	o	o	o
ECO-777-028	#35 Pinch Clamp, Stainless Steel	Clamps	o	o				
ECO-777-035	200mm Quick Release Clamp	Clamps				o	o	o
ECO-777-037	2" Coupling Clamp for Zero Dead Space Drain Valve	Clamps			o	o	o	o
ECO-777-062	Large Clamp, Three Prong Extension, Dual Adjust, 1/2" O.D. x 12" Long Arm	Clamps					o	o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-063	Universal Kwik Mount Klamp	Clamps			o		o	o
ECO-777-146	300mm Quick Release Clamp	Clamps					o	o
ECO-777-166	100mm Quick Release Clamp	Clamps	o	o				
ECO-777-167	120mm Quick Release Clamp	Clamps			o			
ECO-777-001	Condenser Body, Left Side, 150mm Flat O-Ring Flange, Vacuum Port 1" OD Pipe on Lower Side and Bottom Ports	Condensers				o	o	o
ECO-777-002	Condenser Body, Right Side, 150mm Flat O-Ring Flange, 1" OD Pipe on Upper/Lower Side and Bottom Ports	Condensers				o	o	o
ECO-777-091	100mm O-Ring Kettle Flange Condenser with 35/25 O"Ring bottom and top left side 19/38 Vacuum Port and bottom right side hose connector, 13" Length	Condensers	o	o				
ECO-777-110	EcoChyll X9 Condenser Body, Left Side, 200mm Flat O-Ring Flange	Condensers						o
ECO-777-111	EcoChyll X9 Condenser Body, Middle Side, 200mm Flat O-Ring Flange	Condensers						o
ECO-777-112	EcoChyll X9 Condenser Body, Right Side, 200mm Flat O-Ring Flange	Condensers						o
ECO-777-113	Condenser Body, Left Side, 120mm Flat O-Ring Flange, Vacuum Port 1" OD Pipe	Condensers			o			
ECO-777-114	Condenser Body, Right Side, 120mm Flat O-Ring Flange, 1" OD Pipe	Condensers			o			
ECO-777-148	EcoChyll X5 50L Jacketed Condenser Glass Body, 150mm Flat O-Ring Flange	Condensers				o		
ECO-777-216	Condenser Body New Descending Right Side 150mm Flange	Condensers				o	o	o
ECO-777-217	Condenser Body New Ascending Left Side 150mm Flange	Condensers				o	o	o
ECO-777-218	Right Side Jacketed Condenser Body, 150mm O-Ring Flange	Condensers				o	o	o
ECO-777-220	Condenser Body, Left Side, 150mm Flat O- Ring Flange, Vacuum Port with GL-14 Threads Near Top, 1" Swagelock on Lower Side Out Front and Bottom Ports	Condensers				o	o	o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-221	Condenser Body, Right Side, 150mm Flat O- Ring Flange, 1" Swagelock on Upper Side on Right Side, Lower Side Out Front, and Bottom Ports	Condensers				o	o	o
ECO-777-272	hydrogen condenser glass body 35/25 ball joint o-ring #121	Condensers	o					
ECO-777-020	Stirrer Shaft Coupling, 19mm	Couplings			o	o	o	
ECO-777-061	Stirrer Shaft Coupling, Swivel, 28mm	Couplings					o	o
ECO-777-077	Stirrer Shaft Coupling, 25.4mm 3/8" OD Stud	Couplings					o	o
ECO-777-226	Collar, 19mm Stirrer Shaft Retainer, Nylon	Couplings			o		o	
ECO-777-005	1" PFA Elbow Compression Fitting	Fittings			o	o	o	o
ECO-777-010	1" to 1" PFA Compression Fitting	Fittings			o	o	o	o
ECO-777-015	1" PFA Tee Compression Fitting	Fittings			o	o	o	o
ECO-777-123	PTFE Front Ferrule for 1 in. Swagelok Tube Fitting	Fittings			o	o	o	o
ECO-777-143	1" Stainless Steel Compression Fitting	Fittings			o	o	o	o
ECO-777-012	22 Liter Reaction Vessel, Spherical, 150mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks			o	o	o	
ECO-777-032	50 Liter Reaction Vessel, Spherical, 200mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks				o	o	
ECO-777-044	72 Liter Evaporator Flask, 200mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks					o	
ECO-777-047	100 Liter Evaporator Flask, 200mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks					o	
ECO-777-057	50 Liter Round Bottom Flask, 4 Neck, 45/50 Outer joint CN, 24/40 Outer joint, 2-Vertical 35/25 Polished Socket joints SN	Flasks				o	o	o
ECO-777-066	22 Liter Round Bottom Flask, 4 Neck, 45/50 Outer joint CN, 24/40 Outer joint, 2-Vertical 35/25 Polished Socket joints SN	Flasks				o	o	
ECO-777-069	200 Liter Evaporator Flask, Spherical, 300mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks						o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-070	10 Liter Receiving Flask, 3-Neck	Flasks			o	o		
ECO-777-115	12 Liter Evaporator Flask, 150mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks			o			
ECO-777-127	100 Liter Evaporator Flask, 300mm Flat O-Ring Flange, Schott Style, 2" Beaded Pipe Bottom Drain Valve	Flasks					o	
ECO-777-157	50mm 100mL flask with 24/40 inner joint	Flasks	o	o				
ECO-777-240	200 Liter Reaction Vessel, Spherical, 200mm Flat O-Ring Flange, 2" Beaded Pipe Bottom Drain Valve	Flasks						o
ECO-777-259	500mL Evaporating Flask, Oval-Shaped Single Neck 24/40 Outer joint	Flasks	o	o				
ECO-777-260	1000ml Evaporating Flask, Oval-Shaped Single Neck 24/40 Outer joint	Flasks	o	o				
ECO-777-261	2000mL Evaporating Flask, Oval-Shaped Single Neck 24/40 Outer joint	Flasks	o	o				
ECO-777-262	3000mL Evaporating Flask, Oval-Shaped Single Neck 24/40 Outer joint	Flasks	o	o				
ECO-777-268	1000mL Receiving Flask, 35/25 Ball joint	Flasks	o	o				
ECO-777-269	2000mL Receiving Flask, 35/25 Socket joint	Flasks	o	o				
ECO-777-013	150mm Reaction Vessel Lid, 4 Neck, 45/50 Outer joint CN, 2-Vertical 24/40 Outer joint, 1-Angled 35/25 Socket joint	Glassware			o	o		
ECO-777-014	Bottom Drain Valve Glass Body Only	Glassware			o	o	o	o
ECO-777-033	200mm Evaporator Lid, 4 Neck, 45/50 Outer joint CN, 2-Vertical 24/40 Outer joint, 1-Angled 35/25 Socket joint	Glassware				o	o	o
ECO-777-034	Zero Dead Space Drain Valve, 2" Beaded Pipe, 1" Beaded Pipe Sidearm, GL-40 Thread	Glassware			o	o	o	o
ECO-777-067	300mm Reaction Vessel Lid, Schott Style Flange, 4 Neck, 45/50 Outer joint CN, 3-Vertical 45/50 Outer joint	Glassware					o	o
ECO-777-254	Zero Dead Space Drain Valve, 2" Beaded Pipe, 1" Beaded Pipe Sidearm, GL-41 Thread, Stabilizing Pin	Glassware						o
ECO-777-023	High Power Digital Temperature Controller, 230V, 15 amps, 3450 watts	Heating Mantle Controllers			o	o		

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-040	High Power Digital Temperature Controller, 230V, 30 amps, 6900 watts	Heating Mantle Controllers				o	o	
ECO-777-053	High Power Digital Temperature Controller, 230V, 50 amps, 11500 watts	Heating Mantle Controllers					o	
ECO-777-116	200L Mantle Controller for 3 Phase Current, 4 Circuits @ 4000 watts each. 200 Liter Mantle controller, 230V, 80 amps, 18400 watts	Heating Mantle Controllers						o
ECO-777-181	50L 120V Heating Mantle Controller Modeled off of J-KEM's HCC130 Controller, 120V 40 amps 4800 Watts	Heating Mantle Controllers				o	o	
ECO-777-236	High Power Digital Temperature Controller, 230V, 20 amps, 4600 watts	Heating Mantle Controllers				o	o	
ECO-777-237	High Power Digital Temperature Controller, 230V, 40 amps, 9200 watts	Heating Mantle Controllers				o	o	o
ECO-777-249	200L High Power Heating Mantle Digital Temperature Controller with Safety Limit Controller	Heating Mantle Controllers						o
ECO-777-274	High Power Digital Temperature Controller for Three Phase Current with DELTA wiring input voltage. Input voltage: 208-240 Vac, three phase, Delta configuration. 15,900 watts, 32 amps continuous current on all three phases	Heating Mantle Controllers						o
ECO-777-022	22 Liter Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @1000 Watts, 230V, 2000 watts total	Heating Mantles			o	o	o	o
ECO-777-039	50 Liter Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @2000 Watts, 230V, 4000 watts total	Heating Mantles				o	o	
ECO-777-045	72 Liter Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @3000 Watts, 230V, 6000 watts total	Heating Mantles				o	o	
ECO-777-052	100 Liter Heating Mantle, 5" Diameter Hole in Bottom, 3 Circuits Rated @ 2670 Watts, 230V, 8010 Watts Total	Heating Mantles					o	
ECO-777-097	Insulating Mantle Top, for 22 Liter RBF, 6.5" Diameter Hole, Jacket is an Insulator Only	Heating Mantles			o	o	o	
ECO-777-098	Insulating Mantle Top, for 50 Liter RBF, 9" Diameter Hole, Jacket is an Insulator Only	Heating Mantles				o	o	
ECO-777-099	Insulating Mantle Top, for 72 Liter RBF, 9" Diameter Hole, Jacket is an Insulator Only	Heating Mantles					o	
ECO-777-100	Insulating Mantle Top, for 100 Liter RBF, 13" Diameter Hole, Jacket is an Insulator Only	Heating Mantles					o	
ECO-777-101	200 Liter Heating Mantle, 5" Diameter Hole in Bottom, 3 Circuits Rated @4000 Watts, 230V, 16000 Watts Total	Heating Mantles						o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-102	Insulating Mantle Top, for 200 Liter RBF, 13" Diameter Hole, Jacket is an Insulator Only	Heating Mantles						o
ECO-777-103	12L Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @770 Watts, 115V, 1540 watts total	Heating Mantles			o			
ECO-777-104	Insulating Mantle Top, for 12 Liter RBF, 6.5" Diameter Hole, Jacket is an Insulator Only	Heating Mantles			o			
ECO-777-233	12 Liter Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @1000 Watts, 230V, 2000 watts total	Heating Mantles			o			
ECO-777-234	22 Liter Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @1500 Watts, 230V, 3000 watts total	Heating Mantles			o	o	o	
ECO-777-235	50 Liter Heating Mantle, 5" Diameter Hole in Bottom, 2 Circuits Rated @2500 Watts, 230V, 5000 watts total	Heating Mantles				o	o	
ECO-777-130	1.5" TC Silicone Gasket	Keg Accessories			o	o	o	o
ECO-777-132	NPT Ball Valves, 1/2" NPT Female	Keg Accessories			o	o	o	o
ECO-777-133	1.5 TC Tee	Keg Accessories			o	o	o	o
ECO-777-134	1.5" Clamp	Keg Accessories			o	o	o	o
ECO-777-135	Elbow Hose Adaptor 1" X 1.5 TC	Keg Accessories			o	o	o	o
ECO-777-136	Staright Long Hose Barb 1" x 1.5" TC	Keg Accessories			o	o	o	o
ECO-777-137	1.5 TC Elbow	Keg Accessories			o	o	o	o
ECO-777-138	1.5" TC x 1/2" NPT Male Adaptor	Keg Accessories			o	o	o	o
ECO-777-139	NPT Hose Nipple, 1/4" barb x 1/2 NPT	Keg Accessories			o	o	o	o
ECO-777-140	Vista Sight Glass TC, 1-1/2" TC	Keg Accessories			o	o	o	o
ECO-777-141	NPT Hose Nipple, 3/8" barb x 1/2 NPT	Keg Accessories			o	o	o	o
ECO-777-142	1.5" Butterfly Valves TC	Keg Accessories			o	o	o	o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-144	1.5 TC End Cap	Keg Accessories			o	o	o	o
ECO-777-145	1.5" TC Male Adapter Ball Valve with 12mm Hose Nipple	Keg Accessories			o	o	o	o
ECO-777-290	Inlet Feed Adapter, 1.5" TC Male Adapter Ball Valve with 1/2" NPT Hose Nipple 8mm	Keg Accessories			o	o	o	o
ECO-777-129	20L Keg Receiving System for 12 and 22 liter systems	Kegs			o	o		
ECO-777-131	15 Gallon Keg Receiving System, Complete with Adapters and Valves	Kegs				o	o	o
ECO-777-004	150mm Viton O-ring	O-Rings			o	o	o	o
ECO-777-036	200mm Viton O-Ring	O-Rings				o	o	o
ECO-777-147	300mm Viton O-Ring	O-Rings						o
ECO-777-164	100mm Viton O-Ring	O-Rings	o	o				
ECO-777-165	120mm Viton O-Ring	O-Rings			o			
ECO-777-250	O-Ring, Perfluoro, #213, Black	O-Rings			o	o	o	o
ECO-777-021	Ultra Torque Overhead Stirrer with mount rod	Overhead Stirrers				o	o	o
ECO-777-108	Compact Overhead Stirrer with mounting rod	Overhead Stirrers		o	o			
ECO-777-203	150mm 4 Neck Stainless Steel Evaporator Lid, 45/50 joint CN, 24/40 joint SN, 2-Elbow 1.5" TC Pipes	Stainless Steel Lids			o	o		
ECO-777-204	200mm 4 Neck Stainless Steel Evaporator Lid, 45/50 joint CN, 24/40 joint SN, 2 1.5" TC Pipe	Stainless Steel Lids				o	o	
ECO-777-205	300mm 4 Neck Stainless Steel Evaporator Lid, 45/50 joint CN, 24/40 joint SN, 1.5" TC Pipe, 2" TC Pipe	Stainless Steel Lids						o
ECO-777-016	19mm Polished Stir Shaft, Overall Length: 30.6"	Stir Shafts			o	o	o	
ECO-777-017	19mm Polished Stir Shaft, Overall Length: 32.75"	Stir Shafts			o	o	o	

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-048	Stir Shaft, 28mm 40in length	Stir Shafts					o	
ECO-777-079	25.4mm Polished Stir Shaft for old 100L X7	Stir Shafts					o	
ECO-777-117	Stir shaft, polished glass, heavy duty, 45in length, 28mm OD 200L	Stir Shafts						o
ECO-777-118	Stir shaft, polished glass, heavy duty, 51in length, 28mm OD	Stir Shafts						o
ECO-777-231	Stir Shaft Bearing, PTFE, non-shedding, low-vacuum, 45/50 inner joint, 25.4mm OD stir shaft	Stir Shafts					o	
ECO-777-256	25.4mm Polished Stir Shaft, 44 7/8" OAL	Stir Shafts						o
ECO-777-282	25.4mm Stirrer Shaft, Overall Length: 40.9"	Stir Shafts					o	
ECO-777-283	19mm Stirrer Shaft, Overall Length: 29-3/16"	Stir Shafts			o	o		
ECO-777-024	10 foot coiled thermocouple extension cord	Thermocouples			o	o	o	o
ECO-777-025	Teflon coated Temperature probe 1/4x28	Thermocouples			o	o	o	
ECO-777-041	Teflon coated Temperature Probe 1/4x32	Thermocouples				o	o	
ECO-777-106	Thermocouple for 12 liter, 22" long, 1/4" diameter, Teflon coated	Thermocouples			o			
ECO-777-109	Thermocouple for 200 liter, 42" long, 1/4" diameter, Teflon coated	Thermocouples						o
ECO-777-248	Dual Thermocouple 1/4" OD x 45" Lgth, 200L Flask, Type "T"	Thermocouples						o
ECO-777-294	Teflon coated dual element temperature probe for 200L 1/4x42	Thermocouples						o
ECO-777-295	Teflon coated dual element Temperature probe for 22L, 50L and 72L 1/4x28	Thermocouples			o	o	o	
ECO-777-296	Teflon coated dual element Temperature probe for 12L 1/4x22	Thermocouples			o			
ECO-777-297	Teflon coated dual element Temperature probe for 100L 1/4x36	Thermocouples					o	

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-298	Teflon coated temperature probe 1/4x36	Thermocouples					o	
ECO-777-128	Beam Torque Wrench with 7/16" deep socket	Tools			o	o	o	o
ECO-777-064	Peristaltic, Liquid Transfer Pump	Transfer Pumps			o	o	o	o
ECO-777-124	Positive Displacement Transfer Pump, WOB-L 2511 Piston Pump	Transfer Pumps			o	o	o	o
ECO-777-162	2522B-01 Wobl pump	Transfer Pumps			o	o	o	o
ECO-777-006	FEP Tubing, 1" O.D. x 7/8" I.D., 6ft Length	Tubings			o	o	o	o
ECO-777-007	Vacuum tubing, silicone tubing 3/8" ID X 3/4" OD	Tubings	o	o	o	o	o	o
ECO-777-031	Vapor Hose, 1" ID PTFE, End Connection 1" OD, 18 OAL	Tubings			o	o	o	o
ECO-777-043	Vapor Hose, 1" ID PTFE, End Connection 1" OD, 24 OAL	Tubings			o	o	o	o
ECO-777-046	Vapor Hose, 1" ID PTFE, End Connection 1" OD, 30 OAL	Tubings			o	o	o	o
ECO-777-055	Vapor Hose, 1" ID PTFE, End Connection 1" OD, 36 OAL	Tubings			o	o	o	o
ECO-777-096	Vapor Hose, 1" ID PTFE, End Connection 1" OD, 33 OAL	Tubings			o	o	o	o
ECO-777-154	FEP Tubing, 1" O.D. x 7/8" I.D., 100ft Length	Tubings			o	o	o	o
ECO-777-008	Advanced Self Cleaning Dry Vacuum Pump with Digital Controller, 2028	Vacuum Pumps	o	o	o	o	o	
ECO-777-009	Vacuum Pump, Self Cleaning Dry Vacuum with Knob Controller, 2026	Vacuum Pumps	o	o	o	o		
ECO-777-149	Advanced Self Cleaning Dry Vacuum with manual controller, 2025	Vacuum Pumps	o	o	o	o		
ECO-777-163	8115B-05 Internal Vacuum pump	Vacuum Pumps			o	o	o	o
ECO-777-193	Welch 4-Head Vacuum Pump, 115V 60HZ 6 TORR 97 LPM	Vacuum Pumps				o	o	o

Part No	Description		Model					
			1H	X1	X3	X5	X7	X9
ECO-777-199	Welch Vacuum Controller for 4-head vacuum pump	Vacuum Pumps				o	o	o
ECO-777-201	Welch 8-Head Vacuum Pump, 115V 60HZ 6 TORR 170 LPM	Vacuum Pumps					o	o
ECO-777-202	Welch Vacuum Controller for 8-head vacuum pump	Vacuum Pumps					o	o
ECO-777-223	DryFast Collegiate Diaphragm Pump 2014	Vacuum Pumps	o	o				
ECO-777-224	Vacuum Pump, Ecodyst High CFM Advanced Self Cleaning Dry Vacuum with Digital Controller, 70L/m	Vacuum Pumps						
ECO-777-230	WELCH Self-Cleaning Vacuum System 2027	Vacuum Pumps	o	o	o	o		
ECO-777-238	DryFast Collegiate Diaphragm Vacuum Pump 3032	Vacuum Pumps	o	o				
ECO-777-244	Automated Diaphragm Vacuum System LVS 105 T ef+ 124184	Vacuum Pumps	o	o				
ECO-777-246	4-Head 3-Stage High Capacity Diaphragm Vacuum Pump 2052, 1.5 Torr 65 L/M	Vacuum Pumps				o	o	

Technical Data

Power Requirements

Hydrogen and EcoChyll X1

	Hydrogen	X1
Standard Supply Voltage	115V / 230V, 50Hz / 60Hz	
Power Supply	656 W	
Default Set Temperature	-40°C	
Operating Temperature Range	Ambient to -40°C	-5°C to -40°C
Temperature stability of condensor coils	+/- 0.1	
Side Vents	Vents must be unblocked for proper cooling transfer	
Dimensions (inches)	24 x 18 x 30	12.25 x 13 x 29

EcoChyll X3, EcoChyll X5, EcoChyll X7, EcoChyll X9

	X3 12L	X5/X7 22L	X5/X7 50L	X7 72L	X7 100L	X9 200L
Power Requirements	230 Vac, 15A, single phase Three 115V receptacles	(2) 230 Vac, 15A, single phase Three 115V receptacles	230 Vac, 20A, single phase 230 Vac, 15A, single phase Four 115V receptacles	230 Vac, 15A, single phase 230 Vac, 40A, single phase Three 115V receptacles	230 Vac, 20A, single phase 230 Vac, 50A, single phase Four 115V receptacles	230 Vac, 30A, single phase 230 Vac, 50A, single phase Four 115V receptacles
NEMA Configuration	NEMA L6-15P	X5: NEMA L6-15P X7: NEMA L6-20P	X5: NEMA L6-15P X7: NEMA L6-20P	NEMA L6-20P	NEMA L6-20P	NEMA L6-50P
Style	Twist Lock	Twist Lock	Twist Lock	Twist Lock	Twist Lock	Straight Pin
Amperage	15A	X5: 15A X7: 20A	X5: 15A X7: 20A	20A	20A	50A & 80A
Plug	250V, 15A Locking	250V, 20A Locking	X5: 250V, 15A Locking X7: 250V, 20A Locking	250V, 20A Locking	250V, 20A Locking	15-30P
Outlet Receptacle (Customer Provided)	NEMA L6-15R	X5: NEMA L6-15R X7: NEMA L6-20R	X5: NEMA L6-15R X7: NEMA L6-20R	NEMA L6-20R	NEMA L6-20R	NEMA 15-30R
Voltage	230V, single phase	230V, single phase	230V, single phase	230V, single phase	208-230V, single phase	208-240V, three phase

Heating Mantle Digital Temp Controller

	X3 12L	X5/X7 22L	X5/X7 50L	X7 72L	X7 100L	X9 200L
Circuits	2 @ 1000W each	2 @ 1000W each	2 @ 2000W each	2 @ 3000W each	4 @ 2000W each	4 @ 4000W each
Voltage	120V, single phase	230V, single phase	230V, single phase	230V, single phase	230V, single phase	230V, single phase
Power	15A, 1800W	15A, 3450W	30A, 6900W	40A, 9200W	50A, 11500W	80A, 18400W
Plug	5-15P	L6-15P	L6-30P	L6-50P	L6-50P	
Outlet Receptacle (Customer Provided)	NEMA 5-15R	NEMA L6-15R	NEMA L6-30R	NEMA L6-50R	NEMA L6-50R	NEMA L6-20R
Temperature Range			-200 to 250°C	-200 to 250°C	-200 to 250°C	-200 to 250°C

Other Components

115V, 150W	X3 12L	X5/X7 22L	X5/X7 50L	X7 72L	X7 100L	X9 200L
Vacuum Pump	115V, 150W					
Overhead Stirrer	115V, 150W					
Liquid Transfer Pump	115V, 34W					
Dimensions (L x W x H)	60 x 24 x 72	50 x 20 x 72	60 x 26 x 75	66 x 26 x 75	72 x 30 x 75	120 x 36 x 96

Cooling Capacities

Hydrogen and EcoChyll X1

Evap. temp		Capacity	Power cons.	Current cons.	EER
°F	°C	BTU/h (+/-5%)	W (+/-5%)	A (+/-5%)	BTU/Wh
-40	-40	122	145	4.21	0.84
-30	-34	482	248	4.64	1.95
-20	-29	909	339	5.10	2.68
-13	-25	1257	398	5.44	3.16
-10	-23	1420	422	5.58	3.36
0	-18	2034	500	6.09	4.07
10	-12	2769	573	6.63	4.83
14	-10	3101	602	6.85	5.15
20	-7	3643	645	7.19	5.64
30	-1	4677	719	7.78	6.51

EcoChyll X3, EcoChyll X5, EcoChyll X7, EcoChyll X9

90°F Ambient Air temp		EcoChyll® Cooling Capacity							
Evap. temp		X3		X5		X7		X9	
°F	°C			Btu/hr	Watts	Btu/hr	Watts	Btu/hr	Watts
-40	-40	ND		2,650	777	4,750	1,339	11,300	3,869
-35	-37	ND		2,970	870	5,530	1,539	12,800	4,396
-30	-34	2,310	759	3,360	985	6,330	1,738	14,300	4,924
-25	-32	2,710	821	3,810	1,117	7,160	1,952	16,000	5,480
-20	-29	3,130	883	4,330	1,269	8,020	2,180	17,700	6,067
-15	-26	3,580	946	4,910	1,439	8,930	2,418	19,600	6,653
-10	-23	4,060	1,011	5,560	1,629	9,900	2,667	21,500	7,297
-5	-21	4,550	1,078	6,260	1,835	10,900	2,931	23,600	7,942
0	-18	5,060	1,145	7,010	2,054	12,100	3,224	25,700	8,616
5	-15	ND		7,830	2,295	13,300	ND	ND	ND
10	-12	ND		8,690	2,547	14,600	ND	ND	ND

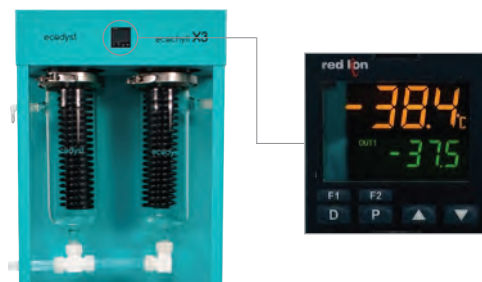
Components

A. EcoChyll PID Controller

This PID controller is preset from factor for ultimate cooling temperature and customers do not need to change the settings. Call Ecodyst before changing settings as wrong changes can result in equipment malfunction. Only action required for EcoChyll is to On/Off.

Specifications

- PID Control
- Main Control Output—Relay
- Accepts TC and RTD
- Accepts 0-10 V, 0/4-20 mA or 0-50 mV Signals
- On Demand Auto-Tuning of PID Settings
- Dual Relay Alarms
- 1/16 DIN Size
- Controllers Meet IP65 Requirements
- 100 to 240 VAC Power Input
- https://www.redlion.net/sites/default/files/213/6305/PXU%20Manual_0.pdf

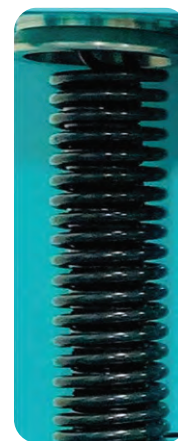


B. Material for EcoChyll Condensers

EcoChyll condensers are made of stainless steel 316 metallic alloy and coated with chemical resistance Halar (ECTFE). Halar¹ is virtually unaffected by most corrosive chemicals commonly encountered in industry. Among those substances that Halar fluoropolymer is resistant to are strong mineral and oxidizing acids, alkalis, metal etchants, and most organic solvents except hot amines (e.g. aniline, dimethylamine).

Halar Chemical Resistance Examples

	Test Temp	Halar ECTFE
Organic Solvents		Unaffected
Acids		
98% Sulfuric Acid	220	Unaffected
37% Hydrochloric Acid	220	Unaffected
Bases		
50% Sodium Hydroxide	220	Unaffected
50% Sodium Hydrosulfide	220	Unaffected
Oxidizers		
50% Sodium Chlorate	220	Unaffected
100 Chlorine (anhydrous)	220	Slightly Affected



Halar Coated Stainless Steel Condenser

¹ Solvay Solexis, Inc., <https://www.solvay.com/en/brands/halar-ectfe>

C. WELCH Self-Cleaning Vacuum Pump System with built-in Digital Controller

Complete programmable oil-free dry vacuum systems for rotary evaporators and concentrators. Corrosion-resistant PTFE diaphragm vacuum pump systems enable superior control and efficiency for each evaporation. Store up to 5 methods for 2 solvent evaporations. Provides walk-away solvent stripping in flasks up to 5 L. Includes keypad controller interface with LED readout. Inlet and exhaust separators protect pump and lab atmosphere.

Product Details

- Automatic Self-cleaning purge maintains efficiency, extends diaphragm life
- Free air displacement: 35 L/min (1.2 CFM)
- Incremental ballast button enables fast response to bumping / foaming
- Ultimate Pressure, Torr (mbar): 2 (2.7)
- <https://welchvacuum.com/products/welch-self-cleaning-vacuum-system-2028#brochures>



Ecodyst have access to a wide variety of pumps including high-capacity diaphragm pumps. We can source any type of pump that customers desire



D. Liquid Transfer Pump

Chemically resistant liquid transfer diaphragm pump. Offers wetted material combinations for optimal chemical resistance. Manual control of flow rate with LED indicator.



D. Positive Displacement Transfer Pump

Reliable WOB-L Piston pumps are used for faster draining of keg receiving systems.



E. Compact Digital Overhead Stirrer for 12- and 22-Liter Systems

Compact overhead stirrer offers ultimate versatility and maximizes productivity. With the push of a button, the unique Stirlight™ lights up so that solutions can be seen clearly. Engage the Auto Start feature to start or resume stirring automatically when power is supplied by control equipment or after a power outage.



F. Ultra-Torque Overhead Stirrer for 50- to 200-Liter Systems

Ultra Torque overhead stirrer lives up to its name, delivering high torque mixing action within the footprint of a bench top overhead stirrer.

Product Details

- Brushless DC motor
- Totally enclosed metal housing
- Electronic control
- Smart two-speed transmission
- <https://www.caframolabsolutions.com/products/overhead-stirrers/ultra-torque-1850/>



Other Parts

A. High temperature vapor hose

Features

- Highly flexible PTFE hose
- Smooth-bore PTFE core
- Fiber braid bonded to the core with a patent-pending process supports core to resist kinking
- 304 stainless steel braid protects the core from abrasion and enhances hose pressure rating



Nominal Hose Size (in.)	I.D. (in.)	O.D. (in.)	Minimum Inside Bend Radius (in.)		Temperature Range °F (°C)	Vacuum (28.5 in. Hg [96.5 kPa]) Rated to °F (°C)	Working Pressure at 70°F (20°C) PSIG (bar)	Minimum Burst Pressure at 70° F (20° C) PSIG (bar)
			Static	Dynamic				
1	1.00	1.32	5.50	7.15	-65 to 450 (-53 to 230)	150 (65)	1000 (68.9)	4000 (275)

B. FEP Tubing

FEP Tubing (Fluorinated Ethylene Propylene) has chemical and dielectric properties similar to those of PTFE. FEP tubing is a clear tubing that is an economical choice for applications requiring chemical resistance and a broad temperature exposure.



FEP Tubing Features

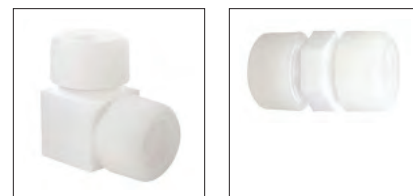
- Chemically inert to most industrial chemicals and solvents
- Non-flammable
- High thermal stability

O.D. (in.)	I.D. (in.)	Wall (in.)	Nominal O.D. (in.)	O.D. Tolerance (in.)	Wall Tolerance (in.)	Working Pressure PSIG (bar)	Burst Pressure+ PSIG (bar)	Minimum Bend Radius (in.)
1	0.875	0.062	1.000	+/- 0.010	+/- 0.003	80 (5.5)	398 (27.4)	16

FEP Metric Size

C. Compression Fittings, PTFE

- Fittings are made entirely of chemically inert corrosion resistant PTFE.
- Ferrules: Ferrules are machined from virgin Polytetrafluoroethylene (PTFE)
- Grippers: The Gripper in the two-piece Ferrule-Gripper assemblies are manufactured from PVDF
- Nuts: Nut are molded PVDF

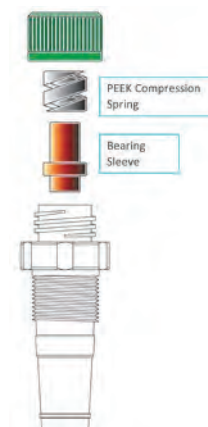


D. Stirrer Bearing

Chemglass Stirrer Bearing for 19mm polished stirrer shaft

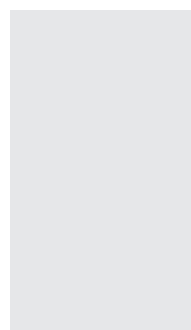
- Flake-Free
- Chemically Resistant
- Vacuum (~5 Torr) and Pressure (~5 PSI)
- Polymer Blend Sleeve Provides Excellent Wear Resistance
- For Use with Polished Glass or S.S. Stirrer Shafts

PTFE stirrer bearing provides a VACUUM TIGHT FLAKE-FREE SEAL. The stabilizer series incorporates a PEEK®/PTFE stabilizing bushing that is molded to the lower portion of the inner joint. The stabilizer greatly reduces stirrer shaft whip on larger vessels. The bearing consists of a PTFE standard taper body, Glass filled polypropylene screw cap, PEEK® Compression spring, PEEK®/PTFE sleeve and a glass filled polypropylene loosening nut.



Ace Glass Stirrer Bearing for 19mm and 28mm polished stirring shaft

Self-aligning, lubricant free PTFE Trubore bearing or combination bearing / debris trap. Use with 19mm or 28mm polished glass stir shafts. Debris trap model prevents bearing-wear particles from contaminating the evaporator vessel and has a side port for clean-out, evacuating or purging. You can stir in either direction and achieve vacuum down to 1mm Hg.



E. High Viscosity PTFE Agitators

High viscosity agitator, made entirely of PTFE and glass filled PTFE, provides excellent stirring at the bottom of 12L through 200L evaporators, especially when heavy slurries are being mixed. Agitator attaches to stir shaft by both a compression fitting and a glass filled PTFE safety pin. PTFE, large-scale, multi-paddle agitator design to accept pinned bottom valves.



F. Polished Glass Stirrer Shafts

Precision ground and polished stirrer shaft for use with EcoChyll Evaporator Systems. 19mm OD for used with 12, 22, 50 and 72 liter and heavy duty 28mm 28mm OD for use with EcoChyll 100- and 200-liter systems.



G. O-Rings

Precision ground and polished stirrer shaft for use with EcoChyll Evaporator Systems. 19mm OD for used with 12, 22, 50 and 72 liter and heavy duty 28mm 28mm OD for use with EcoChyll 100- and 200-liter systems.



High Powered Heating Mantle (HPM)

Ecodyst High-Powered Heating Mantles act as a heater for the solvent extraction process. With proper care and operation, Ecodyst Scientific, Inc. mantles will give long and efficient service. Contamination, overheating and general misuse will greatly reduce the life of a mantle. The Ecodyst High-Powered Heating Mantles consist of an insulated electrical-resistance heater and require a controlled source of power, thus a temperature controller. The use of a variable voltage source such as our High-Powered Heating Mantle Controller is recommended to prevent overheating and to effect accurate temperature control. It is never advised to plug the heating mantle directly into a wall socket. If connected directly to a wall socket, this can cause overheating, and dangerous hazards such as fires and burns.

Heating Mantle Models & Specifications

Ecodyst Scientific, Inc. has several heating mantles to match each available reaction vessel size. In the table below, each heating mantle is illustrated alongside its corresponding current, voltage, and reaction vessel size.

Model Number	Relative Reaction Vessel Size	Output Voltage	Maximum Output Current
HPM-2000	12L	208-240VAC, 1-ph, 50-60Hz	10 Amps max
HPM-3000	22L	208-240VAC, 1-ph, 50-60Hz	15 Amps max
HPM-5000	50L	208-240VAC, 1-ph, 50-60Hz	25 Amps max
HPM-6000	72L	208-240VAC, 1-ph, 50-60Hz	30 Amps max
HPM-8000	100L	208-240VAC, 1-ph, 50-60Hz	40 Amps max
HPM-16000-3Ph	200L	208-240VAC, 3-ph, 50-60Hz	80 Amps max

Other power options are available upon request

WARNING: Only the right size of reaction vessels should be used with each controller for safe operations and maximum efficiency. Using a smaller heating mantle for a bigger reaction vessel or vice versa could lead to hazardous incidents such as burns, fire, chemical spillage, and similar dangerous hazards.

Installation

1. Remove the covering after receiving the unit and placing it in the designated location.
2. Inspect the unit for any potential shipment damage. If any transit damages are discovered, please notify the forwarder and your contractor as soon as possible. If there are no damages, continue to step 3.
3. Position the unit on the support stand. Now allow the device to stand for a few minutes to allow all the internal parts and components to stabilize.
4. For electrical power, connect the main power cables to the temperature controller's socket.

Installation Warnings

1. Place the device on the proper support stand to sustain the device's capacity without vibration. Placing the heating mantle on a smaller surface would only cause it to fall, causing other hazards.
2. Never put it in a hazardous location. Do not use the gadget in areas where there are combustible materials. It has the potential to produce major accidents such as explosions or fires.
3. Do not use this gadget if the ambient temperature is below 5°C or over 35°C.
4. Do not use the gadget in a high-temperature environment. Do not use the gadget near another heater or an air conditioner that is blowing. If ignored, this might lead to an accident due to overheating.
5. The gadget should be placed in a well-ventilated area. Check that the openings on the side or back of the body are not obstructed by a wall or an item. Also, do not open the gadget in a poorly ventilated area or use it closed. It may create a fire or harm the equipment by preventing it from creating enough heat, or it may produce insufficient ventilation.
6. Never use the device outside. Avoid placing the device in regions where it will be directly exposed to the sun or rain. This is extremely dangerous since it can cause overheating, a short circuit, or moisture damage.
7. Do not place the gadget in areas where it may become moist or dusty. This may result in overheating, a short circuit, or a fire caused by moisture or dust inside of the device.
8. Place the gadget in a well-lit area. When you position the device in a dark area, it may result in an unforeseen mishap owing to a probable operating error caused by decreased vision.

Support Stand

Purchasing a complete system comes with an evaporator support stand which serves as a support stand for the heating mantle and other components. The heating mantle is rested in this stand for all its procedures when in use. The evaporator support stand is engineered to support the weight of the reaction vessel, an appropriate volume solution being heated, the necessary equipment which makes up the evaporation system, and then the heating mantle along with its components. For the safe operation of the heating mantle, Ecodyst strongly advises the evaporator support stand as the safest support for our heating mantles. Using other support stands would be at the sole discretion of the user, and hence, Ecodyst Scientific, Inc. shall not be liable for any accidents or hazards that arise because of using such. Also, Ecodyst Scientific, Inc. does not assume responsibility for mantles damaged because of being supported otherwise—for instance, directly on ring stands, cork rings, lab jacks, and so on.

Operation

The Ecodyst High Powered Heating Mantle's operation requires manual or automatic temperature control to maintain the desired temperature and to prevent overheating of the mantle, the vessel, and its contents. This temperature control can be done by Ecodyst Scientific, Inc's recommended Ecodyst High Powered Heating Mantle Controller, which is available from Ecodyst Scientific, Inc. Contact the factory if assistance is needed in selecting the appropriate heating mantle controller.

Some units contain two lower circuits, others three. The HPM-8000 and HPM-16000-3ph are both equipped with 3 circuits. When in operation, the two lower circuits (one lower circuit for HPM-2000, HPM-3000, HPM-5000, and HPM-6000) furnish heat for boiling the liquid contents, while the upper circuit prevents condensation of the vapors.

It may often be necessary to operate the upper circuit at not more than 50% of full power. For low-boiling liquids, the upper circuit need not be used. When the flask is more than half full of liquid, the two bottom circuits may be operated at the rated voltage. When the liquid level falls below the halfway mark in the flask, the power to the upper circuit of the lower half should be reduced to 50% or less. This will prevent the superheating of the vapors and overheating of the glass fabric in this circuit.

To operate the heating mantle, the following steps can be followed:

1. **Power connection:** Connect the power cable of the heating mantle to its appropriate temperature controller.
2. **Power-on:** When connected, the heating mantle immediately starts heating up to the temperature established on the setpoint controller meter of the temperature controller.
3. **Temperature control:** The temperature of the heating mantle can only be regulated via the temperature controller. For desired temperatures, the setpoint controller meter can be used for altering the temperatures. And the high limit temperature controller meter is engineered to be a safety circuit breaker for conditions where the mantle heats up beyond the set temperature limit.

WARNING: For maximum safety, the three-prong plug of the cord on the Ecodyst High-Powered Heating Mantles should always be inserted into a grounded outlet; thus, the receptacle of only the Ecodyst-approved heating mantle controller for the specific mantle.

Operational Safety

1. When using this equipment, use caution. Before utilizing it, users should read this manual. The equipment should only be used by laboratory professionals who have been professionally trained for this purpose and are familiar with all laboratory safety precautions.
2. If unusual sounds, odors, or smog are produced, disconnect the controller's main plug and contact the manufacturer or supplier. It is usual to experience smog or smell while using the machine for the first time. Any further incidents should be handled as soon as possible by contacting the manufacturer or supplier.
3. Other than the correct size of the reaction vessel, no objects should be placed within the machine. When a conductive material, such as cloth, metal, or paper, is placed inside the heating mantle, it might produce a fire, or electric shock, or even cause the machine to break down.
4. Do not attempt to disassemble or redesign the equipment on your own. It may compromise the device's intended safety. Ecodyst Scientific, Inc. shall not be liable for any accident, decrease in quality, or defect caused by a client or user who disregards this.
5. The manufacturer designed and developed all of the mechanical and electrical/electronic gadgets in this machine. The gadgets could only be dismantled and serviced by one of the manufacturer's engineers or by engineers authorized by the manufacturer.
6. While operating, avoid using a wet hand on the device.
7. The heating mantle might reach temperatures of 400 degrees Celsius or more. When this surface, particularly the reaction vessel, is in use, it can cause significant harm, including burns from the heated surface.
8. Do not switch the machine on and off frequently.

Maintenance

Ecodyst Scientific, Inc. mantles do not require regularly scheduled maintenance. However, regular inspection is recommended, and damaged mantles should be removed from service **immediately**. Ecodyst Scientific, Inc. mantles should be protected from chemical spillage, mechanical damage, and corrosive atmospheres as far as possible. Below are some regular maintenance and inspection tips that help ensure the operational longevity and efficiency of the heating mantles.

1. If the machine is not in use, unplug from the temperature controller, clean the machine, and keep it dry.
2. Please disconnect the power cord before cleaning the machine.
3. Before exchanging a component for repair, you **MUST** first troubleshoot and seek technical help from the Ecodyst Scientific, Inc. engineering team. Ecodyst Scientific, Inc. further suggests using an original component supplied by the manufacturer.
4. The manufacturer will handle the breakdown of the equipment notwithstanding normal/proper usage throughout the warranty term mentioned on the warranty sheet included in this Operation handbook.
5. Before cleaning, make sure the machine is completely OFF, unplugged from the controller, and **cooled down**. Ecodyst suggests using neutral detergent and a DFT cloth to clean the machine. Avoid the use of abrasive fabric, stinging agents, and organic solutions.
6. The manufacturer is not responsible for breakdowns caused by ignoring the warnings and cautions in their manual.

Spare Parts

Except for fastening components, electrical connections, and cable sets, spare parts for Ecodyst Scientific, Inc. heating mantles are not widely accessible. A full spare mantle is normally required to store additional spare components.

Additional Safety Warnings

1. Upon initial start-up, the controller is likely to give off a smokey or burning smell. This should be expected as it indicates the first use of the machine. If alarmed, kindly, contact Ecodyst for technical direction and advice.
2. Never plug the controller directly into an electrical wall receptacle. It can only be plugged into the receptacle of the approved temperature controller. Failure to heed this will overheat and damage the controller, and likely cause hazardous scenarios up to and including electrical shocks, fire, burns, and even death.

Troubleshooting

Problem	Possible Corrective Action
Mantle not heating	Verify that the temperature settings on the temperature controller are correct.
	Verify that the temperature controller is turned on and operational.
	Verify that the power plug is properly inserted into the controller.
	Confirm that the thermocouple is appropriately positioned (approximately 1/4" submerged) in the solution being heated.
Power failure	Verify that the power cord is correctly inserted into the controller and that the provided electricity is appropriate and controlled.
	Verify that the mantle temperature has not increased excessively, resulting in a temperature overshoot. If it has, wait for the temperature to drop below the high limit temperature before pressing the reset button on the temperature controller to restart it. Also, ensure the setpoint temperature isn't higher than the high limit temperature.

NOTE: For all other problems not indicated above, contact Ecodyst for technical direction and advice.

High Powered Heating Mantle Controllers (HPC Controllers)

1. Brief Operational Guidelines

The basics of operating your temperature controller would be these four steps. The User's Manual serves as a reference and provides a more thorough explanation of the controller's functionality. New users who are not familiar with controllers are advised to thoroughly study the complete handbook. **The controller is set up to operate with heating mantles attached to round-bottomed flasks carrying out "normal" organic processes (i.e., non-polymeric reactions in solvents such as DMF, THF, toluene, etc.).**

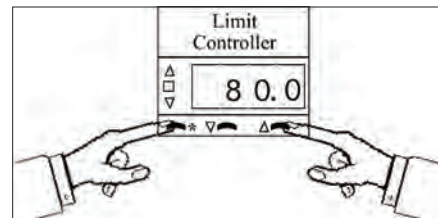
The three steps listed below will assist you in getting started if the controller is utilized with this kind of reaction.

1. To use heaters other than heating mantles, visit section 2
2. Never use the controller for heating oil baths, visit section 3.2
3. For information about unusual, pricey, or safety-critical processes for polymer synthesis, visit Appendix I.

1. Enter the Over Temperature Limit

This meter, labeled "High Limit Controller", is the back-up meter for the setpoint controller. Set this meter about 5° C higher than the temperature entered into the Setpoint Controller in Step 4.

If the reaction reaches this temperature limit for any reason, heating is automatically stopped until being manually reset. See Section 3.3.



To enter a temperature into either of the digital meters, hold the * button and simultaneously press the ↑ key to increase or the ↓ key to decrease the setpoint. The setpoint can be seen at any time by holding in the * button. The setpoint appears as a blinking number in the display.

2. Press the Reset Button

The reset button resets the over-temperature circuit and prepares the controller for use. The probe temperature must be below the temperature of the high limit controller, or the circuit will not reset.

3. Place the thermocouple in the solution being heated

Place at least the first 1/4" of the thermocouple directly in the solution being heated. Thermocouples can be bent without harming them. If you're heating a corrosive liquid, use Teflon-coated thermocouples. The thermocouple adapter should be connected to the controller via a receptacle in the rear of the controller.

4. Enter the setpoint

(i.e., the desired reaction temperature) into the setpoint controller by holding in the * button and simultaneously pressing the ↑ key to increase or the ↓ key to decrease the setpoint. The setpoint can be seen at anytime by holding in the * button, the setpoint appears as a blinking number in the display.

2. Adjusting the Controller for Stable Control With Different Heaters

It is imperative to **NOTE** that the **Setpoint Controller**, or the meter at the **top**, is the only object of the discussion in Section 2. The reaction's heating is controlled by the setpoint controller. The temperature management of the reaction is unaffected by the High Limit Controller (i.e., the meter on the bottom), which only responds to over-temperature conditions. As shown below, just the setpoint controller must be adjusted.

2.1 Tuning

The controller's most potent function is its capacity to control nearly any heating mantle with a constant temperature. For steady regulation, the controller must be tuned to the heating mantle being used.

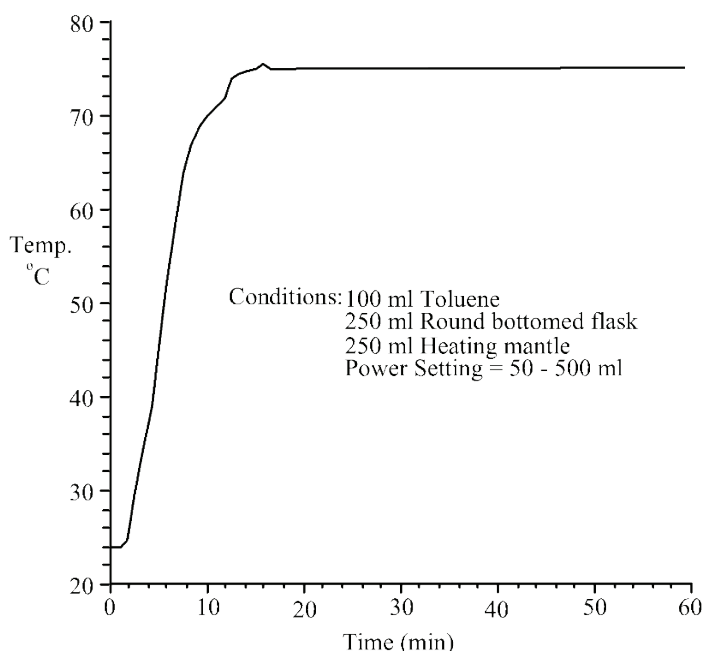
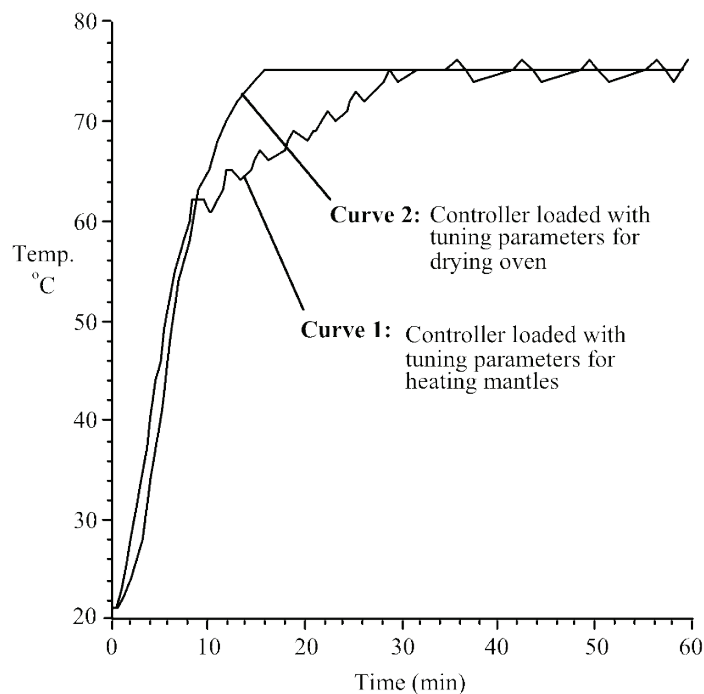
The process of **tuning** involves balancing the heating mantle's heating properties with the controller's control characteristics. When the controller's memory is set up with information on the heating mantle's rate of warming up, rate of cooling off, and efficiency of heat transfer, the heating mantle is said to be tuned to the controller. Think about the distinctions between a hot plate and a filament bulb, **for instance**. A filament bulb instantly starts to heat up when power is supplied, producing both light and heat. Additionally, it instantly shuts off when the electricity is cut off. A hot plate, on the other hand, could take a while to start heating once power is applied and considerably longer to stop heating after electricity is turned off. A hot plate and a heat light may be controlled by your controller to 0.1 degrees Celsius. To achieve this, however, it must be programmed with the time constants that indicate how quickly the heater heats up when the power is switched on and how quickly it starts to cool down when the power is turned off. The **tuning parameters** are the names given to these time constants.

Tuning parameters vary depending on the type of heating mantle. The tuning parameters for the heating mantle that is currently in use must be programmed into the controller for it to heat steadily. Since heating mantles are the most frequently used heaters in research, tuning settings that enhance heating performance for these heaters were put into the controller before shipment. Five of the temperature meter's user-programmable functions are used to control tuning. The user can manually calculate and load the proper value for these 5 functions, or the controller can do it for them using its autotune functionality.

When Should the Controller be Tuned?

Any size heating mantle can be utilized without having to retune the controller if it has been tuned for a certain type of heating mantle. When switching from heating mantles to another form of heater, the controller should be calibrated with values that describe the oven heater's heating properties. Below, the result of adjustments is visible in the plots illustrated. When the controller is adjusted for heating mantles, using it with a heating mantle of any size results in reliable temperature control (Plot 1). However, when the same tuning parameters are employed with another heater, poor control is the outcome (Plot 2, Curve 1). Reliable temperature control is only achieved when the controller is adjusted for the heater (Plot 2, Curve 2).

NOTE: Before your controller leaves the factory, Ecodyst Scientific, Inc. makes sure it is already tuned to fit the specifications of the heating mantle you ordered. As a result, your controller doesn't require any more adjustment. Contact us for assistance and technical guidance before making any technical modifications if it does need to be tuned because of a change in the heating mantle.

Plot 1**Plot 2**

It's critical to note that this controller isn't just an **ON/OFF** switch (i.e. ON when below the set point, OFF when above [though it can be made to work this way, see Section 3.10]). It's a **predictive** controller instead. The controller anticipates (calculates) the percentage of power to apply to the heater right now to manage the form of the heating curve minutes in ahead based on the shape (slope) of the heating curve.

The tuning parameters are significant because they act as **constants** in the equation that the temperature meter employs to make its predictions. Poor temperature control will occur if the temperature meter is configured with tuning parameters that incorrectly characterize the heating mantle being utilized. However, temperature control of $\pm 0.1^\circ$ is often attained when the proper parameters are supplied.

Manual Tuning.

Manual tuning is when the values of the 5 tuning parameters are determined manually and then entered into the temperature controller via the push buttons on the front of the controller. Experienced users might prefer to manually tune the controller since this allows customization of the heating process.

NOTE: Before your controller leaves the factory, Ecodyst Scientific, Inc. makes sure it is already tuned to fit the specifications of the heating mantle you ordered. As a result, your controller doesn't require any more adjustment. Contact us for assistance and technical guidance before making any technical modifications.

Autotune

For each type of heater, the temperature controller's Autotune feature automatically determines the tuning settings (such as delay times, heating efficiency, etc.). The tuning parameters are calculated once the autotune process is finished, and the controller stores them in memory for both present and future usage.

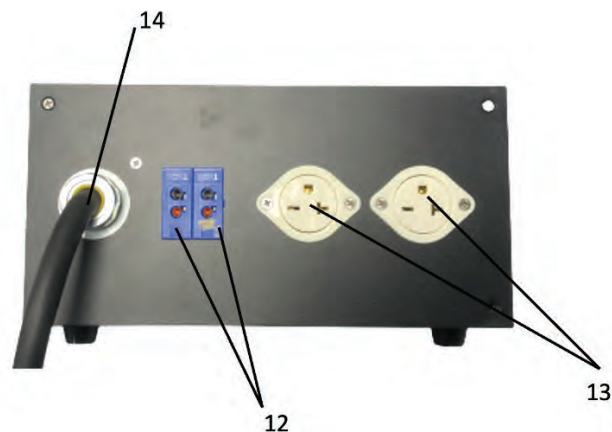
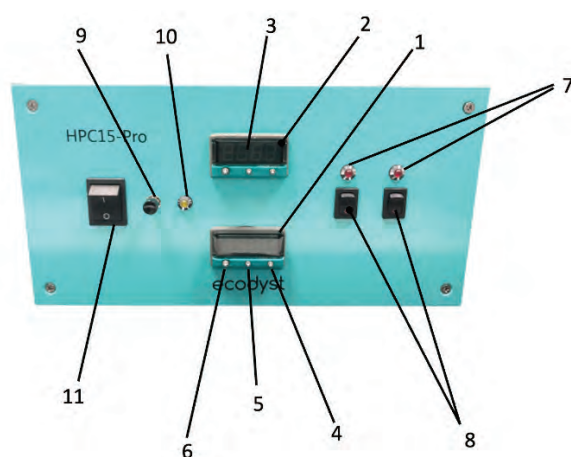
The autotune feature isn't recommended for heating mantles. **Hence the procedure is not included in this manual but can be provided upon request.**

2.2 Sensor Placement

Included in your system parts is a thermocouple. The thermocouple is the sensor used for communicating temperature signals to the controller. Practical common sense should be used to position the sensor. The sensor should be placed such that it can detect the average temperature of the heated medium. In other words, the thermocouple needs to be protected from the heater's direct rays without being too far away for the controller to detect a temperature increase promptly. Your complete system, as designed by Ecodyst, has an architecture that allows you to slide the temperature probe securely into your solution via the lid of the reaction vessel. The thermocouple can then be connected to the controller by plugging it into the receptacle of the temperature sensor port on the controller box.

3. Operations Guide

3.1 Front Panel Description



1. **High Limit Controller**—This controller measures the temperature at which the over-temperature circuit is activated to disconnect power from the receptacles (13). Visit Section 3.3 for more information on Setting the controller for safe connection.
2. **Setpoint Controller**—The setpoint controller is used by the user for regulating the temperature of the reaction to desired or appropriate measures.
3. **Temperature Display**—The process temperature is always shown on the temperature display. The intended temperature is shown as the set point temperature when the '*' button is pressed.
4. **Raises set point** when '*' button (6) is simultaneously pressed.
5. **Lowers set point** when '*' button (6) is simultaneously pressed.

6. **Control Key (*)**—When pressed, the display shows the set point temperature. To decrease or increase the set point, press the **↑** key (4) or **↓** key (5), while simultaneously depressing the control key (*). The display's representation of the set point is a flashing number.
7. **System Lights**—They are used to indicate the ON/OFF status of the heating mantle elements connected through the power receptacle (13).
8. **System Switches**—They are used to turn the elements of the heating mantle ON or OFF by regulating the power which flows to the power receptacle (13).
9. **Reset Button**—On start-up, after a power failure, and when there's an over-temperature the reset button is used to reset and restart the controller.
10. **Reset Light**—The reset light illuminates after a power failure, when there's an over-temperature, and upon start-up to indicate that the reset button must be pushed for power to flow through the system.
11. **Main Switch**—This provides electricity to the digital controller when toggled ON and cuts off the electricity supply when toggled OFF.
12. **Temperature Sensor Input**—This is a receptacle through which the temperature sensor, or thermocouple, in this case, is connected to the controller. Ecodyst recommends that you utilize the thermocouple provided with your entire unit purchase or use a similar one of the same type for the acute efficiency of communication within the system. The correct thermocouple type has the same color plug as the temperature sensor receptacle.
13. **Power Receptacle**—The heating mantle can be connected to the controller via the power receptacles, located on the rear panel of the controller box.
14. **Power Chord**—Serves as a channel through which electricity is supplied to the controller.

3.2 Heating Mantle Restrictions

The table below shows each controller along with its corresponding current and voltage.

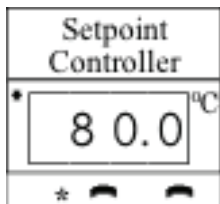
WARNING: Use only resistive loads that may be operated safely at the given voltage and a current lower than the listed current. If not, the controller could be damaged, creating a safety issue.

Model Number	Output Voltage	Maximum Output Current
HPC15-Pro	208-240VAC, 1-ph, 50-60Hz	15 Amps
HPC30-Pro	208-240VAC, 1-ph, 50-60Hz	30 Amps
HPC50-Pro	208-240VAC, 1-ph, 50-60Hz	50 Amps
HPC50-3PH-Pro	208-240VAC, 3-ph, 50-60Hz	80 Amps

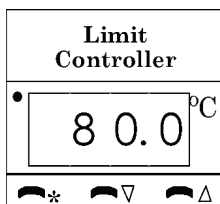
NOTE: Do not connect your controller to low voltage oil baths. If not connected to the controller properly, many oil baths, which are neither 120 nor 240VAC equipment, might cause fires.

3.3 Setting the Controller for Safe Operation

The Ecodyst HPC controllers have two distinct controllers, and it is crucial to comprehend what each controller performs to fully benefit from the safety advantages of the HPC Models.



The primary process controller, indicated by the meter at the top with the name “Setpoint Controller,” oversees all elements of temperature regulation, including heating, cooling, maintaining the temperature, tuning, etc. This controller is programmed with the preferred solution temperature or process temperature.



The heating process is entirely under the control of the meter on top, and is not affected by the meter on the bottom labeled “High Limit Controller”. This device serves as a backup or watchdog for the setpoint controller by keeping track of the reaction or process’s temperature and taking over in the event of a heating fault. In a typical operation, a temperature that is several degrees (≈ 50 C) higher than the temperature put into the setpoint controller is programmed into this controller. The setpoint controller loses power if the process reaches the temperature set by the High Limit controller. Until the temperature drops and the entire controller is manually reset by pressing the reset button, it is powerless.

With the HPC controllers, experiment setup is quite easy. The following instructions highlight how this can be done:

- Connect the **power chord (14)** of the controller to an electrical outlet.
- Connect the dual element thermocouple to the controller via the **temperature sensor input (12)**.
- Place the dual element thermocouple in the process to be heated and turn the controller on.
- Turn ON the controller using the **main switch (10)**.
- Push the **reset button (9)** to start the power flow through the system.
- Enter the desired temperature into the setpoint controller (i.e., the meter on the top) (for example 60° C) then a slightly higher temperature into the High Limit controller (for example 65° C). Press the **reset button (9)**.
- The process is heated to 60 °C by the setpoint controller, which will hold the temperature there until it is adjusted. Only when the process temperature reaches a high limit set temperature, for whatever reason, does the High Limit controller kick in. At that point, power to the entire system is cut off until the process temperature drops below the setpoint, and the reset button (9) is pressed.
- The High Limit controller’s functionality may be checked at any time by entering a temperature lower than the process temperature lower than the readout on the High Limit Controller. This should trigger the over-temperature safety circuit and turn on the **reset light (10)** whenever there is an over-temperature situation.

The HPC controller's architecture, in which the two controllers' capacity to sense temperature and act independently of one another, gives it special safety benefits. This highlights the safety advantages of this structure when considering how the controller reacts to various kinds of heating failures. The over-temperature protection circuit is engaged and cuts off all power to the heater if the High Limit controller fails to close. If it fails open, the setpoint controller's ability to regulate temperature and keep the process at the correct temperature is unaffected. If the setpoint controller malfunctions, the heater will get unchecked maximum power, which is the most severe failure state. The heating mantle's power is permanently cut off when the over-temperature safety circuit is turned on by the High Limit controller. The process just cools to room temperature if the setpoint controller fails to operate. Since each controller has its thermocouple, the aforementioned situations emerge from a failure with either thermocouple. For the highest level of safety during unattended operations, the HPC controller offers comprehensive, 100 percent redundant control over the heating process.

3.4 Heating Mantle Restrictions

Each controller has a certain type of temperature sensor input that can only be used with that temperature sensor (thermocouple or RTD). The thermocouple type must match the receptacle type on the rear of the controller for the proper temperature to be shown. Blue indicates a type T thermocouple, Yellow is a type K, and Black is a type J thermocouple. The thermocouple plug's color must match the receptacle on the controller's rear. The high limit and setpoint controllers are both wired to the thermocouple socket. Therefore, the controllers display an error message and halt heating if the thermocouple breaks or becomes detached. If a dual-element thermocouple isn't available, two single-element thermocouples may be substituted.

3.5 Heating Equipment

Two factors need to be considered when heating equipment (in this instance, the heating mantle):

- 1.Placement of the temperature sensor (Section 2.2) and,
- 2.The appropriate power setting.

NOTE: Before leaving the factory, your purchased controller would be tuned to the appropriate power setting of the heating mantle it was purchased with. Any questions or help needed with technical knowledge should be directed to our team before any technical modifications are done to your system.

3.6 Do's and Don'ts When Using Your Controller

The controller, heating mantle, and thermocouple form a closed loop feedback system. When the controller is connected to a heating mantle, the feedback loop should not be broken at any point

Do's	Don'ts
<p>Always use a flask and heating mantle that are the proper size for the volume being heated.</p> <p>Use the smallest heating mantle and flask that can handle the reaction. By doing this, it is made sure that the heating mantle's heating capacity roughly matches the volume being heated. Additionally, it enables the system to dissipate surplus heat to reduce temperature overshoots.</p>	<p>Never remove the thermocouple from the solution while the controller is still turned on.</p>
<p>The thermocouple should always be immersed properly in the solution.</p> <p>The thermocouple's first 1/4" should be inserted completely into the solution. Use a thermocouple with Teflon coating while heating a corrosive combination.</p>	<p>Controlling an exothermic process using the controller is never a good idea. There is no cooling capability in the controller. If an exotherm is anticipated, it has to be regulated differently.</p>
<p>Avoid exposing the controller to corrosive gases and liquids. The environment under a research hood is detrimental to all electronics. Keep the controller away from corrosive vapors by positioning it outside the hood.</p>	

3.7 Resetting the Controller for Use with Heating Mantles

NOTE: Your controller has been tuned to match the capacity of the heating mantle attached to your purchased system. The power ratings and capacities of heating mantles may vary. In any event, that you may want to increase or decrease the size of your heating mantle, Ecodyst Scientific, Inc. recommends that you first communicate with our service team for technical and engineering advice before adapting the controller to any new heating mantle other than the one included in your original purchase.

Instead of autotuning the controller with your new heating mantle of choice, Ecodyst Scientific, Inc. advises that the controller be manually adjusted by following the steps below if you wish to use your controller with other heating mantles after it has been set for a different size or style of the heating mantle.

Procedure

Perform when using **heating mantles** with round bottom flasks. [This procedure takes about 2 minutes to perform]

1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word "tunE" appears in the display, then release both keys.
2.	Press the ↑ key once and the word "bAnd" will appear in the display. First hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value "10" appears in the display, then let go of all the keys.
3.	Press the ↑ key once and the word "int.t" will appear in the display. First hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value "10" appears in the display, then let go of all the keys.
4.	Press the ↑ key once and the word "dEr.t" will appear in the display. First hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value "50" appears in the display, then let go of all the keys.
5.	Press the ↑ key once and the word "dAC" will appear in the display. First hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value "3.0" appears in the display, then let go of all the keys.
6.	Press the ↑ key once and the word "CyC.t" will appear in the display. First hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value "30" appears in the display, then let go of all the keys.
7.	Press and hold in both the ↓ and ↑ keys until the temperature appears in the display, then release both keys.

3.8 Changing the Temperature Display Resolution

The controller is programmed to display temperature with 0.1°C resolution. The controller can also display 1°C resolution by following the procedure below (the display can also be changed to read in °F, call for information). There are two reasons to change the display resolution:

- A. To enter a setpoint faster (the display scrolls 10x faster in 1° mode than in 0.1° mode).
- B. To display temperatures above 999.9° which is very rare.

1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word “tunE” appears in the display, then release both keys.
2.	Press the ↓ key once and “LEVL” appears in the display. First hold in the ‘*’ key, then while holding in the ‘*’ key press the ↑ key until “2” appears in the display then let go of all the keys.
3.	Press the ↑ key repeatedly until the word “diSP” appears in the display. First hold in the ‘*’ key, then while holding in the ‘*’ key press the ↓ or ↑ key until the value “1” [not “0.1”] appears in the display, then let go of all the keys.
4.	Press and hold in both the ↓ and ↑ keys until the temperature appears in the display, then release both keys.

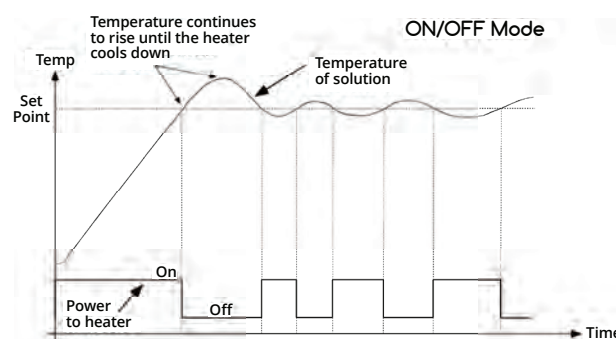
3.9 Fusing

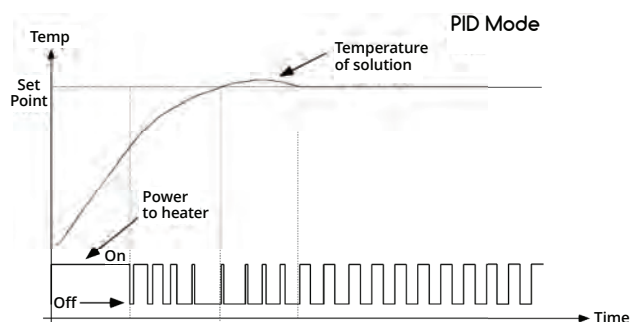
A stack of fuses built for solid-state equipment is housed inside the controller to protect it. None of the fuses is user replaceable, thus an expert electrician should replace them all. FUSES MUST BE REPLACED WITH THE EXACT EQUALS if they need to be changed. Stores that sell electrical supplies may have fuses.

3.10 Changing Between PID and ON/OFF Operating Modes

The PID (Proportional, Integral, Derivative) or ON/OFF operating modes are the two heating options for the controller. They differ in how they provide electricity to the heater.

The simplest heating mode, ON/OFF, turns the controller ON when the temperature is below the specified value and OFF when it is above. This mode’s drawback is a significant overshoot of the set point (5–30°) during initial warm-up and subsequent temperature fluctuation around the set point. The heater only switches off after exceeding the set point, which causes the temperature to climb until the heater cools down as the cause of the overshoot. For heaters that transmit heat quickly (for example, filament bulbs), this technique works effectively. It is horrible for heaters that transmit heat slowly (for example, vacuum ovens), but it is tolerable for heaters like heating mantles ($\approx 5^\circ$ overshoot)





In PID mode, the controller keeps track of the initial warm-heating up's curve shape and reduces power to the heater before the set point is reached, ensuring that the solution achieves the set point with the least amount

of overshoot possible. [Note that the heater shuts off intermittently before reaching the set point temperature.] The second benefit of PID mode is that it modifies the percentage of time the heater is on to exactly maintain the specified setting. PID mode has the benefit of providing consistent temperature control with any heater, including heat lamps and vacuum ovens. The downside is that ON/OFF mode doesn't require any tuning, whereas the controller must be correctly tuned to the heater being used. Instructions for switching the controller to ON/OFF mode are provided below because both heating modes have advantages (simplicity vs. precision) (though PID mode will probably give better results 95% of the time). The process described in Section 3.7 can be used to return the controller to PID mode.

Procedure

The procedures below can be used to switch the controller to ON/OFF mode. But by following the steps in Section 3.7, the controller may be returned to PID control. In addition, adhere to the instructions in Appendix, Section II to completely reset the controller to factory settings.

1.	Press and hold in both the ↑ and ↓ keys on the front of the temperature meter until the word "tunE" appears on the display, then let go of the buttons.
2.	Press ↑ until the word "CyC.t" appears in the display.
3.	While holding in the * key, press the ↓ key until the word "on.of" appears in the display. NOTE: if the display shows the letter "A" when the * keys is held in, press the ↑ key until "on.of" is in the display, then let go of all the keys.
4.	Press the ↓ key until the word "bAnd" appears in the display. While holding in the * key, press the ↓ key until the value "0.1" appears in the display, then let go of all the keys.
5.	Press and hold in both the ↑ and ↓ keys on the front of the controller until the temperature is displayed, then release both keys.

NOTE: Your controller has been configured to provide the operating capabilities and functionality required by the system you ordered. While this information has been provided, it should be consumed simply for informational purposes. Any requirement for technical tweaks should be directed to Ecodyst's technical team who would offer necessary advice and guidance before any technical changes are made to the controller.

3.11 Troubleshooting

Problem	Cause	Corrective Action
Large overshoot of the set point (> 3σ) during initial warm-up or unstable temperature control.	The thermocouple might not be correctly placed in the solution being heated.	Properly immerse at least ¼" of the thermocouple directly into the solution being heated.
	The controller is not tuned for the process being heated.	Tune the controller as outlined in Section 2.
	The solution level is below the heating element level	Turn off the upper element.
The controller comes on but does not heat.	An internal power fuse has blown	Must be serviced by a qualified electronics technician.
	The over temperature protection circuit is engaged.	Set the limit controller to a temperature higher than that shown on the setpoint controller, then press the reset button (see Section 3.3).
Controller blinks: "inPt" "FAiL"	The temperature sensor is unplugged, excessively corroded or broken.	Clean or replace broken sensor.
Controller blinks: "-AL-"	The process temperature is hotter than the alarm temperature.	Correct the over temperature condition.
Controller blinks: "PArk"	Controller has been placed in "Park" mode.	<ol style="list-style-type: none"> 1. Hold in both the ↑ and ↓ keys on the front of the temperature meter until "tunE" appears in the display. 2. First hold in the "*" key, then while holding in the "*" key press the ↓ key until "oFF" appears. 3. Hold in the ↑ and ↓ keys until the temperature appears in the display.
The displayed temperature is incorrect.	The controller has not warmed-up.	The display temperature reads low when the controller is first turned on, but will self-correct as it warms up. The controller can be used immediately since it will warm up during the initial stages of heating.
Thermocouples display negative temperatures, but are not calibrated for them	Wrong type of thermocouple is plugged into controller.	Thermocouples are color-coded. Thermocouple plug and thermocouple receptacle must be the same color (see Section 3.6).
	Corroded thermocouple connections.	Clean plug on thermocouple and receptacle on controller with sandpaper or steel wool.
	Corroded thermocouple.	If the temperature-measuring end of the thermocouple is corroded, discard thermocouple.

Problem	Cause	Corrective Action
	Temperature display offset needed.	<p>To enter a controller display offset:</p> <ol style="list-style-type: none"> 1. Turn on controller. Allow unit to warm up for 30 minutes. 2. Record displayed temperature. 3. Press both the \uparrow and \downarrow keys on the front of the temperature meter until "tunE" appears, then let go of the keys. 4. Press the \downarrow key until "LEVL" appears. 5. First hold in the "*" key, then while holding in the "*" key press the \uparrow key until "3" is showing in the display, then let go of all keys. 6. Press the \uparrow key until "ZEro" is showing in the display. 7. Note the current display offset (this is the number blinking in the display). 8. Calculate the new offset temperature using the equation: $\text{New Display} = \text{Current display offset} - \text{Displayed temperature} + \text{Correct Offset blinking in display temperature}$ 9. First hold in the "*" key, then while holding in the "*" key press the \uparrow or \downarrow keys until the new offset temperature is showing, then let go of all the keys. 10. Press the \uparrow and \downarrow keys until the temperature is displayed.

4. Temperature Storage

The controller is equipped with the ability to automatically record the minimum and maximum temperatures.

4.1 Automatic Storage of Min/Max Temperature

The controller will automatically record the minimum and maximum temperatures of a process by following the procedure below. These temperatures are updated continuously after the routine is started and cleared by turning the controller off. This procedure must be started every time you want to record temperatures.

Procedure to Start Temperature Logging	
1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word “tunE” appears in the display, then release both keys.
2.	Press the ↓ key once and the word “LEUL” appears in the display. While holding in the * key press the ↑ key until the value “3” appears in the display, then release all keys.
3.	Press the ↑ key until the word “ChEy” appears in the display. While holding in the * key press the ↑ key until “on” appears in the display, then release all keys.
4.	Hold in both the ↓ and ↑ keys until the temperature appears in the display, and release both keys. Automatic temperature logging is now on and will remain on until the controller is turned off or logging is turned off manually by repeating this procedure except in Step 3 pressing the ↑ key until the word “off” appears.

Procedure to read minimum temperatures	
1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word “tunE” appears in the display, then release both keys.
2.	Press the ↓ key once and the word “LEUL” appears in the display. While holding in the * key press the ↑ key until the value “3” appears in the display, then release all keys.
3.	<p>Press the ↑ key until the word “rEAd” appears in the display. The “rEAd” screen displays 3 parameters.</p> <ol style="list-style-type: none"> 1. Variance (the difference between the highest and lowest logged temperatures) Hold in the * key and the display will alternate between “UAro” and number of degrees of variance. 2. High Temperature (the highest temperature since the logging option was turned on). While holding in the * key press the ↑ key once and the display will alternate between “hi °” and the highest recorded temperature. 3. Low Temperature. While holding in the * key press the ↑ key once and the display will alternate between “Lo °” and the lowest recorded temperature. <p>The High and Low temperatures can be examined as often as you like since updating and monitoring continues until the monitor is stopped by turning the controller off.</p>
4.	Press and hold in both the ↓ and ↑ keys until the temperature appears in the display, then release both keys.

5. Safety Procedures

1. Never plug any other device in the outlet (power receptacle) of the machine.
2. Ecodyst recommends that users do not manipulate the program of the machine unless given prior guidance through our technical team.
3. To avoid machine damage, liquid spills on or around the machine should be prevented at all costs. The warranty does not cover accidental events or liquid damages.
4. The machine shouldn't be operated in environments prone to corrosive spills.
5. Operating the machine in an environmental temperature above 75°C can cut back on its efficiency tremendously.
6. The machine should be placed on a stable platform, most preferably, the **controller support shelf** included in your purchase.
7. Nothing should be stacked on top of the machine.
8. All technical and electrical repairs or tweaks should only be done by a professional, after counsel from the Ecodyst technical team.
9. The machine should only be connected to the appropriate load, thus matching the electrical specifications provided.
10. The machine shouldn't be operated in explosive or combustible environments.
11. The machine shouldn't be operated in environments prone to corrosive spills.

6. Appendix

I. Safety Considerations and Accurate Temperature Control

For usage with heaters other than heating mantles or for safety-critical and unusual organic reactions (particularly polymeric reactions), the user must do either of the following:

1. Carefully watch the response to ensure the tuning parameters are adequate for the current application, or
2. Autotune the controller for the application. Before starting any high-value or safety-critical reaction, call Ecodyst to discuss your application with an engineer.

If the controller is adjusted to the application being heated, your ECODYST controller can regulate practically any application to $\pm 0.1^\circ\text{C}$. Because the tuning settings for your application may not be properly adjusted, the user must watch a fresh reaction to ensure the controller's functionality. A brief tutorial on tuning is provided here, with a more extensive description provided in Section 2.1.

Tuning is the process of matching the controller's control properties to the heating characteristics of the process being regulated. To regulate heating, the controller employs a PID (Proportional, Integral, Derivative) algorithm. Each term in the PID equation has a constant that scales the equation to the heating process. These constants (together with two other related words) are known as the "tuning constants," and they are generally written in units of time since they reflect delay periods, rate of heat transfer durations, and rate of error accumulation. Each constant's relative value is determined by the physical properties of the process being heated. Even with the self-adaptive algorithms of the controller, the tuning constants must be somewhat near to a correct set otherwise the controller will not give steady temperature control (section 2.1).

When a controller is shipped, the default set of tuning constants loaded into the controller are those appropriate for heating *typical* organic reactions (i.e., small molecule chemistry in low boiling ($< 160^\circ\text{C}$) organic solvents) using heating mantles, since this is the most common application for Ecodyst controllers. Because Ecodyst **cannot forecast the application** for which the controller will be used, the researcher must be aware that the tuning constants entered into the controller may not be a set that results in stable temperature management. **It is the obligation of the researcher to monitor the temperature regulation of a reaction.** If your Ecodyst controller fails to heat consistently during a process, you have two options.

In any event that you need technical assistance with operating our machine, or have questions about an application, please contact us; we are always eager to assist our customers.

II. Resetting the Controller to Original Factory Settings

Ecodyst manufactures the most technologically suitable temperature controller for your system, which should provide you with constant faultless control. If you are having trouble with your controller, a smart place to start is by putting the original factory settings into the setpoint controller (i.e., the meter on the top). If you continue to have issues with your controller, our Engineering staff will assist you in resolving the issue. An Ecodyst controller's factory settings are as follows: 0.1°C resolution, PID control with tuning parameters for a heating mantle, thermocouple type to match the thermocouple initially put on the controller, and a thermocouple offset entered at the time of original calibration.

Procedure

Only the setpoint controller should be reset using this approach. None of the High Limit controller's settings should be modified.

1.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word "tunE" appears in the display, then release both keys.								
2.	Press the ↓ key until "LEVL" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until "3" appears in the display. Let go of all the keys.								
3.	Press the ↑ key until "rSEt" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the word "All" appears in the display. Let go of all the keys.								
4.	<p>Press and hold in both the ↓ and ↑ keys until the word "inPt" appears in the display, then release both keys.</p> <p>The value that needs to be entered depends of the type of thermocouple receptacle your controller was shipped with.</p> <p style="text-align: center;">Determine the thermocouple type below.</p> <table> <thead> <tr> <th>Color of thermocouple receptacle (Fig 1; #7)</th><th>Value to enter:</th></tr> </thead> <tbody> <tr> <td>Blue (type T)</td><td>"tc 1"</td></tr> <tr> <td>Yellow (type K)</td><td>"tc 2"</td></tr> <tr> <td>Black (type J)</td><td>"tc 3"</td></tr> </tbody> </table> <p>First hold in the '*' key, then while holding in the '*' key press the ↑ key until the value from the table above appears in the display. Let go of all the keys. NOTE: Many of the patterns for this parameter look similar, be careful to select the exact pattern shown above.</p>	Color of thermocouple receptacle (Fig 1; #7)	Value to enter:	Blue (type T)	"tc 1"	Yellow (type K)	"tc 2"	Black (type J)	"tc 3"
Color of thermocouple receptacle (Fig 1; #7)	Value to enter:								
Blue (type T)	"tc 1"								
Yellow (type K)	"tc 2"								
Black (type J)	"tc 3"								
5.	Press the ↑ key once and "unit" will appear in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "o C" appears in the display. Let go of all the keys.								
6.	Press the ↑ key once and the word "SP1.d" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "SSd" appears in the display. Let go of all the keys.								
7.	Press in both the ↓ and ↑ keys until the temperature appears in the display (the word "PArk" also appears), then release both keys.								
8.	Press and hold in both the ↓ and ↑ keys on the front of the temperature meter until the word "tunE" appears in the display, then release both keys.								
9.	Press the ↑ key once and the word "bAnd" will appear in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "10" appears in the display. Let go of all the keys.								

10.	Press the ↑ key once and the word "int.t" will appear in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "10" appears in the display. Let go of all the keys.
11.	Press the ↑ key once and the word "dEr.t" will appear in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "50" appears in the display. Let go of all the keys.
12.	Press the ↑ key once and the word "dAC" will appear in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "3.0" appears in the display. Let go of all the keys.
13.	Press the ↑ key once and the word "CyC.t" will appear in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the value "30" appears in the display. Let go of all the keys.
14.	Press the ↑ key until the word "SPrn" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the word "OFF" is displayed. Let go of all the keys.
15.	Press the ↓ key until the word "LEVL" appears in the display.
16.	First hold in the '*' key, then while holding in the '*' key press the ↑ key until "2" appears in the display. Let go of all the keys.
17.	Press the ↑ key until "SP2.A" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↑ key until the word "Dvhi" appears in the display. Let go of all the keys.
18.	Press the ↑ key until "diSP" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value "0.1o" appears in the display. Let go of all the keys.
19.	Press the ↑ key until "Lo.SC" appears in the display. Next, hold in the '*' key, then while holding in the '*' key hold in the ↓ key until the number in the display stops changing (this will be "0" or "-50" or "-199.9" depending on thermocouple type). Let go of all the keys.
20.	Press the ↓ key until the word "LEVL" appears in the display.
21.	First hold in the '*' key, then while holding in the '*' key press the ↑ key until "3" appears in the display. Let go of all the keys.
22.	Press the ↑ key until "SPAn" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value _____ appears in the display. Let go of all the keys.
23.	Press the ↑ key until "ZEro" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ key until the value _____ appears in the display. Let go of all the keys.
24.	Press the ↓ key until the word "LEVL" appears in the display.
25.	First hold in the '*' key, then while holding in the '*' key press the ↓ key until "1" appears in the display. Let go of all the keys.
26.	Press the ↑ key until "SEt.2" appears in the display. Next, hold in the '*' key, then while holding in the '*' key press the ↓ or ↑ keys until the value 10.0 is entered.
27.	Press and hold in both the ↓ and ↑ keys until the temperature appears in the display, then release both keys. The word "PArk" in the display will go away when a set point is entered.

Post Operations

Cleaning

Recommended to clean condenser glass after use and replace tubing as needed.

Maintenance

The unit is maintenance-free. Any necessary repair must be performed by an authorized Ecodyst distributor. Please contact Ecodyst or your local Ecodyst distributor.

Troubleshooting

Loss of Vacuum	Assess and tighten clamps on various components Check vacuum seal on rotary evaporator
Ice Build Up on Condenser	Ensure EcoChyll is not left on for long periods without Condensing

Transportation and Storage

- Store and transport the unit and its components only if they were emptied and cleaned in the original packing material.
- Alternatively store and transport the unit in a container which prevents damages during transportation.
- Seal the packing carefully against unauthorized or mistaken opening.
- Store the unit in a dry place.

Support

Questions /Repair Work

If any aspect of installation, operation or maintenance remains unanswered in the present manual, please contact us. For repairs, please call Ecodyst or your local authorized Ecodyst distributor.

Contact Details



1010 Goodworth Dr. Apex, NC 27539

(919) 717-4061

info@ecodyst.com

www.ecodyst.com

 [@ecochoyl](https://www.instagram.com/ecochoyl)  [in](https://www.linkedin.com/company/ecodyst)    [@ecodyst](https://www.twitter.com/ecodyst)

Invented for scientists by scientists.