

Product Information

Kugelrohr Short-Path Distillation Apparatus

Operation Instructions

Z401137 115V Apparatus

Z401145 230V Apparatus

Table of Contents

Safety Information

Intended Use	3
General Usage	3
Warnings	3

General Specifications

Operating Conditions	4
Electrical Ratings	4
Dimensions and Weight	4

Environmental Conditions

Declaration of Conformity	4
---------------------------	---

Installation

Electric Rotary Drive Input and Output Connections	5
Electric Oven Input and Output Connections	5

Electric Rotary Drive Set Up

5

Operation

International Symbols	6
Air Bath Oven	6
Controller Parameters	6
Electric Rotary Drive	7

Preventive Maintenance

General Cleaning Instructions	7
-------------------------------	---

Replacement Parts

8

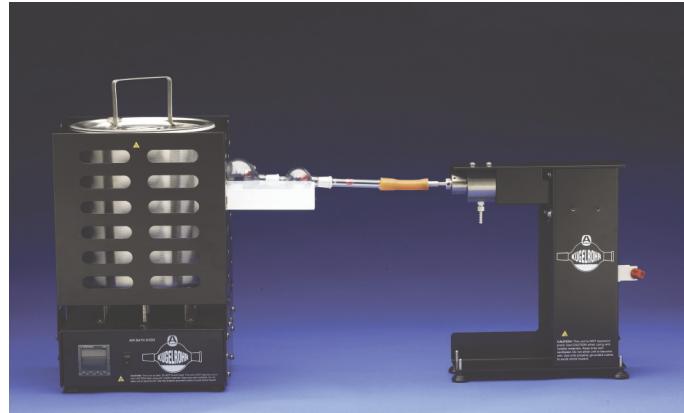
Ordering Procedures

8

Safety Information

Alert Signals

- Warning** – Warnings alert you to a possibility of personal injury.
- Caution** – Cautions alert you to a possibility of damage to the equipment.
- Note** – Notes alert you to pertinent facts and conditions.
- Hot Surface** – Hot surfaces alert you to a possibility of personal injury if you come in contact with a surface during use or for a period of time after use.
- Caution** – Risk of electric shock.



Intended Use

- A. Distillable product is placed in a round-bottom flask (one third full) in the heated air-bath. Controlled temperatures to 250 °C are possible with the Kugelrohr digital temperature controller, which maintains oven temperature automatically to 1 °C.
- B. Distillate collects in the horizontally adjacent receiving flasks outside the air bath.
- C. The oven flask and receiving flasks are turned by the motor drive to speed distillation, ensure even heating and to prevent bumping.
- D. Vacuum line connects the motor drive bearing for distilling at pressures as low as 0.05mm Hg.

Your Kugelrohr has been designed with function, reliability and safety in mind. It is your responsibility to install it in conformance with local electrical codes. For safe operation, please pay attention to the alert signals throughout the manual.

General Usage

Do not use this product for any purpose other than its intended usage.

Warnings

1. This unit is not explosion proof.
2. Use caution when using with volatile materials.
3. Keep area well ventilated.
4. Do not immerse or allow unit to become wet.
5. Do not put any samples or liquid directly into the oven chamber. All chemicals must be in a glass flask.
6. Do not cover the oven with insulating pads or materials.
7. Use only properly grounded outlets to avoid shocks.
8. Do not attempt to modify or repair this unit. For repairs contact your local Sigma-Aldrich representative.
9. Space unit at least 12in. from walls, 48in. from ceilings and 12in. between other apparatuses.
10. Always wear safety glasses and other appropriate protection when operating this equipment.
11. Not for industrial use. The Kugelrohr is designed for use in laboratory environments using safe laboratory practices.
12. Keep oven chamber clean. Use a non-abrasive cleaner. Spills may damage the oven chamber, heater, or thermocouple. Unplug the unit and remove spills promptly. Should the oven chamber or internal parts become damaged by etching or corrosion contact your Sigma-Aldrich representative.
13. The electric rotary drive must be secured to a lattice or other vertical rod to prevent tipping.

General Specifications

Operating Conditions

The Kugelrohr short-path distillation apparatus is designed to be safe under the following conditions:

- Indoor use.
- Position at least 12in. from walls, 48in. from ceilings and 12in. between other apparatuses.
- Mains supply voltage fluctuations not to exceed +/-10% of the nominal voltage.

Oven temperature range:	Ambient to 250°C
Flask size:	10mL to 1000mL
Oven thermocouple:	Type-K
Drive torque at start:	11 in-lbs
Drive torque running:	13 in-lbs
Drive speed:	approx. 20rpm, depends upon power line conditions and flask selection

Electrical Ratings

The Kugelrohr oven requires 120 or 220-240V, 50-60Hz, 350Watts, 1 Phase

The Kugelrohr electric rotary drive requires 120 or 220-240V, 50-60Hz, 100Watts, 1 Phase

Dimensions and Weight

Rotary Drive

L x W x H	4.25in. x 13.5in. x 13.0in. (10.8cm) x (34.3cm) x (33.0cm)
Weight	8.62lbs (3.91Kg)

Air Bath Oven

L x W x H	10.25in. x 10.25in. x 19in. (26.0cm) x (26.0cm) x (48.3cm)
Weight	9.96lbs (4.52Kg)

Environmental Conditions

Operating: 5°C to 40°C; 0% to 90% relative humidity, non-condensing.

Installation Category II (over-voltage) in accordance with IEC 664.

Pollution Degree 2 in accordance with IEC 664.

Altitude limit: 2000m

Storage: 0 °C to 65 °C; 10% to 85% relative humidity

Declaration of Conformity

(for 230V, CE models only)

Barnstead International hereby declares under its sole responsibility that this product conforms with the technical requirements of the following standards

EMC:

EN 61000-3-2	Limits for harmonic current emissions
EN 61000-3-3	Limits for voltage fluctuations and flicker
EN 61326-1	Electrical equipment for measurement, control, and laboratory use; Part I: General Requirements

Safety:

EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use; Part I: General Requirements
EN 61010-2-010	Part II: Particular requirements for laboratory equipment for the heating of materials
EN 61010-2-051	Part III: Particular requirements for laboratory equipment for mixing and stirring

per the provisions of the Electromagnetic Compatibility Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, and per the provisions of the Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC.

The authorized representative located with the European Community is:

Electrothermal Engineering, Ltd.
419 Sutton Road
Southend On Sea
Essex SS2 5PH
United Kingdom

Copies of the Declaration of Conformity are available upon request.

Installation

Electric Rotary Drive Input and Output Connections

Power Entry Module

The power entry module is located to the right of the power switch. One end of the power cord plugs into this module. The power entry module also contains two 2A/250V 5x20mm fast acting fuses in a fuse drawer.

Plastic Clamp

A plastic clamp is attached to the electric rotary drive above the power switch. The clamp must be used to secure the electric rotary drive to any suitable vertical support rod in your laboratory. The clamp may also be moved to two alternate positions on the drive where there is a pair of threaded 8-32 holes. One pair of holes is on the front of the drive just above the Aldrich Kugelrohr logo. The other pair of holes is at the rear of the unit.

WARNING!

The electric rotary drive must be secured to a lattice or other vertical rod to prevent tipping during use.

Rotary Bearing

The rotary bearing is the stainless steel assembly that is attached to the drive with the four screws. The serrated nozzle is where a vacuum source connects. Use a vapor trap to protect your vacuum pump. The smooth, 3/8in. diameter, horizontal nozzle connects to the receiving flask by means of a short length of heavy-walled vacuum tubing. (Make sure the joint is somewhat flexible to allow for slight glassware misalignment.)

Electric Oven Input and Output Connections

In the base of the oven is a Power Entry Module. The power entry module contains two 2A/250V (220-240V model) or 4A/250V (120V model), 5 x 20mm fast acting fuses in a fuse drawer.

The rear of the oven also has a yellow thermocouple jack to accommodate the extendible thermocouple extension cord from the oven thermocouple. The jack is polarized. At the top rear of the oven chamber is a small hole into which the oven thermocouple is installed. The thermocouple's connector is attached to the rear heat guard. The thermocouple is terminated with a male thermocouple jack that attaches to the control box jack with the extendible thermocouple extension cord.

There are two cables that must be connected at the rear of the oven:

1. Use the yellow retractable thermocouple cord to connect the yellow thermocouple connector (located in the center of the heat guard at the rear of the oven) to the round yellow jack at the rear of the oven.
2. Use the black double-ended power cord to connect the receptacle to an appropriate Volt A/C grounded wall receptacle.

Electric Rotary Drive Set Up

1. Adjust the height of the drive to be roughly even with the height of the oven's PTFE bearing.
2. Adjust the feet by turning them to make the drive stable on your bench.

The drive must be clamped to a lattice or other vertical rod with the white screw clamp on the side of the drive. Threaded holes are provided on the front of the drive, above the Aldrich logo, and at the rear of the drive, above the vents, as alternatives to the side mounting position of the screw clamp. Your oven is supplied with two PTFE bearings. The bearing for 14/20 joints has been installed on your oven at the factory. The other bearing is for 24/40 joints and can easily be installed without tools by removing the two wing nuts that secure the bearing.

WARNING!

The electric rotary drive must be secured to a lattice or other vertical rod to prevent tipping during use.

3. Put the solution to distill into the evaporator flask. (Never fill flask more than 1/3 full.)
4. Hold the flask on its side and insert the neck of the flask through the PTFE bearing.
5. While holding the flask, attach the receiving flask(s) to the evaporator flask. (A joint clamp is helpful to hold the flasks together.)
6. Connect the stainless-steel drive tube to the hose connector on the receiving flask with a short length of heavy-walled vacuum tubing. (Make sure that the joint is somewhat flexible to allow for slight glassware misalignment.)
7. Connect your vacuum source to the stainless-steel hose barb that points down from the center of the rotary bearing assembly. Use a vapor trap to protect your vacuum pump.
8. Insert the dial thermometer into the hole in the oven cover and secure the thermometer with the wing nut provided.
9. Place the cover in position on top of the oven.

Operation

International Symbols

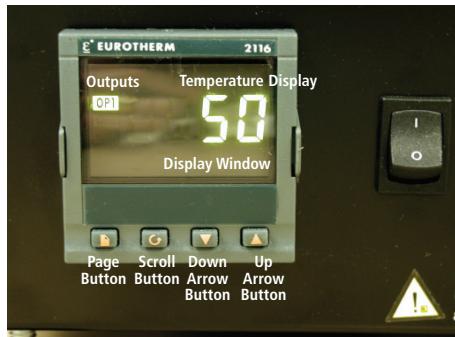
Symbol	Description	Meaning
I	On	power switch is on
O	Off	power switch is off

Air Bath Oven

The air bath oven has a single set point controller that provides a single digital display to indicate the current oven temperature or set point temperature. This temperature controller features sensor break indication and self-tuning capability.

Basic Operation

When the power switch is turned ON it will perform a short self-test and then display the measured value (process value) in the HOME DISPLAY.



Single Setpoint Controller

Buttons and Indicators

OP1 (Output 1): Illuminates when power is being supplied to the heater.

OP2 (Output 2): Illuminates during an alarm situation.

PAGE button: Allows you to select a new list of parameters.

SCROLL button: Allows you to select a parameter within a list of parameters.

DOWN button: Allows you to decrease a value.

UP button: Allows you to increase a value.

NOTE

If at any time you want to return to HOME DISPLAY, simultaneously press the PAGE and SCROLL buttons.

To View or Change the Set Point

To view the set point, press and release the UP or DOWN buttons. If you want to change the set point, continue pressing until the desired set point value is displayed and then release the button. A few seconds after the button is released, the controller will accept the new value and revert to the HOME DISPLAY.

To View the Display Units

From the HOME DISPLAY press the SCROLL button. The display will show the temperature units in °C and then return to the HOME DISPLAY.

To View the % Output Power

From the HOME DISPLAY press the SCROLL button twice. Press and release the UP or DOWN button to view the % output power. This value is a read-only value and cannot be changed.

Controller Parameters

Home display

°C: Temperature units in Celsius. Temperature units cannot be changed without entering the controller configuration.

OP: % output power demand.

IdHi: Deviation high alarm.

AI List

IdHi: Deviation high alarm.

OP: % output power demand.

IdHi: Deviation high alarm.

Atun List

tunE: One shot auto-tune enable.

Pid List

PB: Proportional band (in display units).

ti: Integral time in seconds.

td: Derivative time in seconds.

ACCS List Code:

Access code (Code needed to enter or change the other configuration parameters which are not normally accessible.)

Alarms

The controller will flash an alarm message in the home display if an alarm condition is detected.

2FSH: Measured temperature above full-scale high alarm value.

IdHi: Measured temperature deviation above high alarm value.

S.br: Sensor break: check that sensor is connected correctly.

Ld.F: Heater Circuit fault: indication of either an open or short solid state relay, a blown fuse, missing supply or open circuit heater

L.br: Loop break: check that the heating circuits are working properly.

NOTE

The following alarm messages are factory default settings and may vary if you have changed the configuration of your controller:

IdHi: =50°C

2FSH = 270°C

Sensor Break Protection

This controller provides sensor break protection in the event the thermocouple opens. If an open thermocouple condition occurs, the digital display will blink "S.Br" and the power to the heating element will be shut OFF (Cycle light will extinguish).

Over-Temperature Indication

The OP2 light will illuminate during any alarm condition when the temperature of the oven has deviated beyond the limit. The "Deviation High" alarm is the only alarm value that can be changed. To change it, press the SCROLL button until "IdHi" appears on the display. Press the UP or DOWN button to select the value you desire. We recommend a value of 20° above your working temperature.

Tuning

This controller incorporates a self-tuning feature that determines the optimum control parameters for the best temperature accuracy with your load and set point. Use this feature the first time you use your oven and each time you change either your set point or the type of load you are heating. It is recommended that you use this feature to provide the best temperature accuracy the controller can attain. To use the tuning feature:

1. Adjust the set point to your desired value.
2. Press the PAGE button until display reads, "Atun".
3. Press the SCROLL button. Display will read, "tunE".
4. Press the UP or DOWN button to select, "on".
5. Simultaneously press the PAGE and SDCROLL buttons to return to the HOME DISPLAY. The display will alternately flash between "cancel" and the HOME DISPLAY while tuning is in progress.
6. The controller will then turn the heating on and off to induce an oscillation. When the measured value reaches the required set point the first cycle will end.
7. Tuning will be complete after two oscillation cycles and then the tuner will turn itself off.
8. Normal control function will resume after the controller calculates tuning parameters.

Electric Rotary Drive

1. Plug the drive into a grounded wall receptacle using the supplied power cord.

The voltage and wattage required for your drive is marked on the sticker next to the power entry module. There are two fuses in the entry module. If they burn out, check that your power source matches the unit's power requirements and replace fuses with same type and rating.

2. To start the rotary drive, switch the power on. Drive will turn at a steady speed.

Each time the drive is turned off you may hear a momentary scraping sound. This sound is caused by the motor's brake and is normal. After extended use, the drive's ability to hold high vacuums may be reduced. The bushings may be purchased from Sigma-Aldrich.

Preventive Maintenance

- Disconnect power by unplugging units before performing any maintenance or service.
- Look for etched or corroded surfaces inside the oven including the heater coil and the thermocouple. If these conditions are present contact Sigma-Aldrich for repair information.
- Look for damaged power cords. If cord is damaged replace immediately.
- Look for wear or deformation of the PTFE bearing. If wear or deformation is observed, replace immediately.
- Always use a grounded power outlet.
- Clean spills promptly.
- Do not immerse unit for cleaning.

General Cleaning Instructions

Wipe exterior with a slightly dampened cloth containing a mild soap solution. Please see Technical Bulletin AL-219, Cleaning Procedures for Kugelrohr Vacuum Drive Unit. Replacement gasket seal, Z565911.

Replacement Parts

WARNING! Replace fuses with same type and rating.

Kugelrohr Air Bath Oven

Part No.	Description
CN71X80P	Controller
SWX185	Switch
ELX24	Heating Element (120V model)
ELX25	Heating Element (220-240V model)
CS1154X5	Canister
CV1154X3	Canister Lid
TC1154X1	Thermocouple
8505	Thermocouple Extension Cord
FZX81	Fuse, 4A/250V (120V model)
FZX79	Fuse, 2A/250V (220-240V model)
CEX239	Power Entry Module (120V model)
CE894X1A	Power Entry Module (220-240V model)
CRX72	Cord (120V model)
CRX70	Cord (220-240V model)
BRX58	PTFE Bushing kit
TY1154X1	Tray
MEX179	Mechanical Thermometer
FNX157	Fastener for Mechanical Thermometer
TU1154X1	Latex Vacuum Tube
FTX25	Feet
CA1245X1	Capacitor Assembly (220-240V model only)

Kugelrohr Electric Drive

Part No.	Description
SWX185	Switch
FTX25	Food
710-0019	Power Entry Module
CRX72	Cord (120V model)
CRX70	Cord (220-240V model)
FCX110	Pole Clamp
MT1245X1	Motor (120V model)
MT1245X2	Motor (220-240V model)
CUX23	Coupling between Bushing Assembly and Motor
5120-25	Fuse, 2A/250V (Type T)

Ordering Procedures

Please refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

When service or replacement parts are needed, please contact our Technical Services at 800-231-8327 or sigma-aldrich.com/techinfo.