LAB SOCIETY

G3 / G3X / G3X-R

OPERATIONS MANUAL

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SAFETY WARNINGS

PLEASE READ THIS ENTIRE MANUAL BEFORE OPERATING OR ASSEMBLING THE SYSTEM

ONLY TRAINED OPERATORS WITH A COMPLETE UNDERSTANDING OF ALL COMPONENTS, PROCEDURES, AND RISKS ASSOCIATED WITH USE SHOULD BE AUTHORIZED TO USE THIS EQUIPMENT. ANY MISUSE OF THE EQUIPMENT COULD RESULT IN SEVERE INJURY, INCLUDING BUT NOT LIMITED TO DEATH, DISABILITY, AND PROPERTY DAMAGE.

IT IS THE SOLE RESPONSIBILITY OF THE OPERATOR TO ENSURE ALL RELEVANT SAFETY MEASURES ARE FOLLOWED AND THAT ALL EQUIPMENT IS USED PROPERLY. THIS EQUIPMENT IS FOR LAWFUL USE ONLY!

General Safety During Use:

- Wear appropriate protective clothing and eye protection when working with this equipment.

- Do not use this device in potentially explosive areas or areas with poor ventilation.

- All glassware should be properly supported during assembly and use. Failure to do so may result in broken glass which will NOT be warrantied and may cause a safety hazard.

- Do not operate this equipment near open flames or outdoors.

- Do not pressurize glassware! Glassware is intended for vacuum use only.

- Only trained operators should be utilizing this equipment.

- This manual should be used as reference only. Safety standards and specific operating procedures should be adapted to your laboratory environment.

- Never operate the equipment if it is not working properly. Malfunctions can occur and may result in a safety issue.

TECHNICAL SPECIFICATIONS (TS)

SYSTEM SPECIFICATIONS

2 L (Legacy)

- **Batch Capacity: 1000 mL** *(approx. 1000 g dewaxed oil)*
- **Optimum Capacity: 400 mL - 800 mL**
- **Absolute Max. Capacity: 1200 mL** *(approx. 1200 g dewaxed oil)*
- **Main Body Fraction Flow Rate: 200 g/h - 400 g/h**
- **Batch Duration: 4 - 8 Hours (Estimated)**
  Batch durations are dependent upon primary extraction method, pre-processing methodology and material composition.
- **Benchtop Size: 24" W x 24" D x 30" H** *(not including pump/trap/circulator)*
- **Distillation Head: PDH-1S** *(silvered)*
- **American-Made Glassware and Controllers**

5 L

- **Batch Capacity: 2500 mL** *(approx. 2500 g dewaxed oil)*
- **Optimum Capacity: 900 mL - 1500 mL**
- **Absolute Max. Capacity: 3000 mL** *(approx. 3000 g dewaxed oil)*
- **Main Body Fraction Flow Rate: 400 g/h - 800 g/h**
- **Batch Duration: 4 - 8 Hours (Estimated)**
  Batch durations are dependent upon primary extraction method, pre-processing methodology and material composition.
- **Benchtop Size: 30" W x 30" D x 30" H** *(not including pump/trap/circulator)*
- **Distillation Head: PDH-2S** *(silvered)*
- **American-Made Glassware and Controllers**

12 L

- **Batch Capacity: 6000 mL** *(approx. 6000 g dewaxed oil)*
- **Optimum Capacity: 3000 mL - 4000 mL**
- **Absolute Max. Capacity: 8000 mL** *(approx. 8000 g dewaxed oil)*
- **Main Body Fraction Flow Rate: 1000 g/h - 2000 g/h**
- **Batch Duration: 4 - 10 Hours (Estimated)**
  Batch durations are dependent upon primary extraction method, pre-processing methodology and material composition.
- **Benchtop Size: 43" W x 27" D x 40" H** *(not including pump/trap/circulator)*
- **Distillation Head: PDH-3**
- **American-Made Glassware and Controllers**

20 L

- **Batch Capacity: 10,000 mL** *(approx. 10,000 g dewaxed oil)*
- **Optimum Capacity: 7000 mL - 9000mL**
- **Absolute Max. Capacity: 12,000 mL** *(approx. 12,000 g dewaxed oil)*
- **Main Body Fraction Flow Rate: 2000 g/h - 4000 g/h**
- **Batch Duration: 4 - 10 Hours (Estimated)**
  Batch durations are dependent upon primary extraction method, pre-processing methodology and material composition.
- **Benchtop Size: 45" W x 27" D x 42" H (not including pump/trap/circulator)**
- **Distillation Head: PDH-6**
- **American-Made Glassware and Controllers**

SYSTEM AND ELECTRICAL PARAMETERS

2 L (Legacy)	Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Operation Range
Heating Mantle	120	60	7.4	850	Max. Temp. 260 °C
	230	50	3.7	850	
Stirring Motor	110 – 240	50/60	2		100 – 1000 RPM
Vacuum Monitoring	100 – 240	50/60	0.3		1 mTorr – 760 Torr
Temperature Monitoring	100 – 240	50/60	1		-50 – 1200 °C

5 L	Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Operation Range
Heating Mantle	120	60	10	1150	Max. Temp. 260 °C
	230	50	5	1150	
Stirring Motor	110 – 240	50/60	2		100 – 1000 RPM
Vacuum Monitoring	100 – 240	50/60	0.3		1 mTorr – 760 Torr
Temperature Monitoring	100 – 240	50/60	1		-50 – 1200 °C

12 L	Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Operation Range
Heating Mantle	120	60	15.2	1750	Max. Temp. 260 °C
	230	50	7.6	1750	
Stirring Motor	110 – 240	50/60	2		100 – 1000 RPM
Vacuum Monitoring	100 – 240	50/60	0.3		1 mTorr – 760 Torr
Temperature Monitoring	100 – 240	50/60	1		-50 – 1200 °C

20 L	Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Operation Range
Heating Mantle	120	60	15.2	1750	Max. Temp. 260 °C
	230	50	7.6	1750	
Stirring Motor	110 – 240	50/60	2		100 – 1000 RPM
Vacuum Monitoring	100 – 240	50/60	0.3		1 mTorr – 760 Torr
Temperature Monitoring	100 – 240	50/60	1		-50 – 1200 °C

SYSTEM REQUIREMENTS AND ACCESSORIES

2 L (Legacy) / 5 L / 12 L / 20 L

VACUUM PUMP:

- Pair with: Lab Society LS-RV-12, Lab Society LS-RV-18, Lab Society LS-RV-36, Welch CRVpro 16 (3161-01), Welch CRVpro 24 (3241-01), Welch CRVpro 30 (3301-01)
- Optimal Ultimate Pressure Rating: 20 mTorr
- Free Air Displacement: Min. 5 CFM / Max. 30 CFM

VACUUM/COLD TRAP:

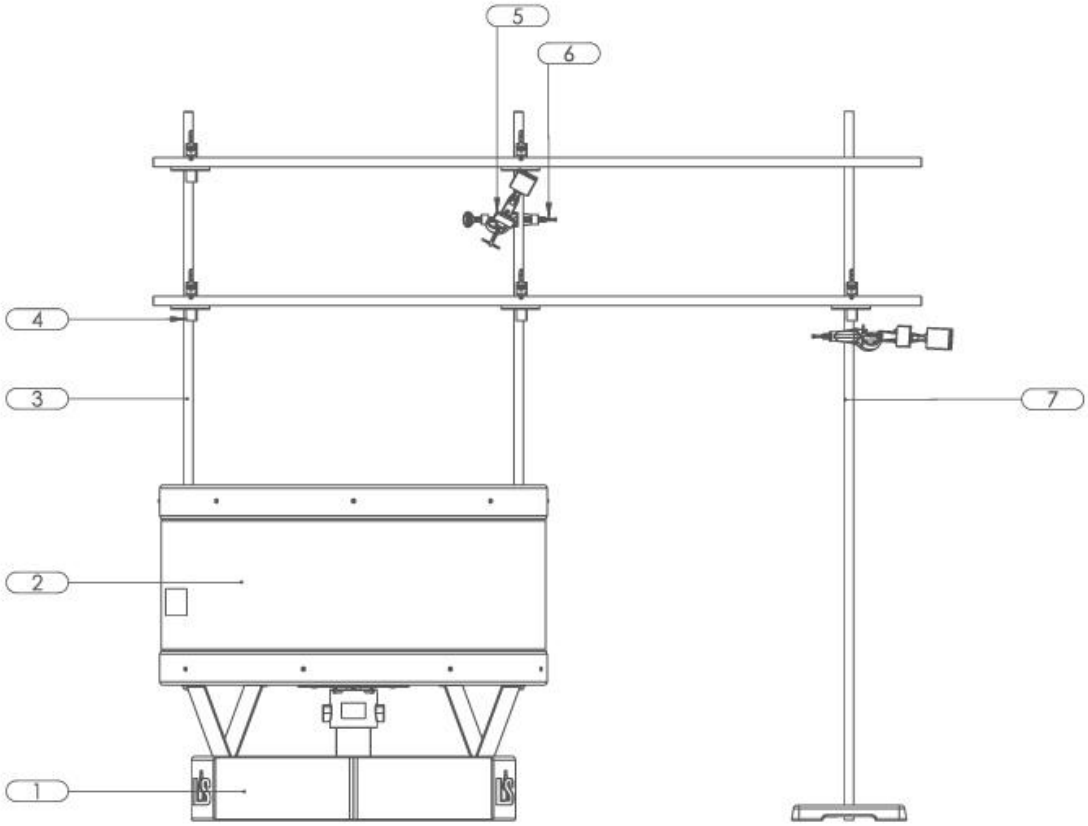
- Glass Cold Trap: Lab Society CTK-C, Lab Society LS-FTK-S, Lab Society LS-DCT-2HE
- Immersion Probe Chiller: PolyScience IP-60, PolyScience IP-80, PolyScience IP-100
- Mechanical Cold Trap: Cascade Sciences MAXTRAP 105, SH Scientific T80 with Stainless-Steel Cold Trap Insert

LIQUID CIRCULATOR:

- Pair with: PolyScience MX07R, PolyScience SD07R, PolyScience AD07R, Huber KISS K-6, Julabo CD-200F
- Chiller Temp. Requirement: 32 °F, 0 °C or below

Compatible with other utilities. Please contact Lab Society for details.

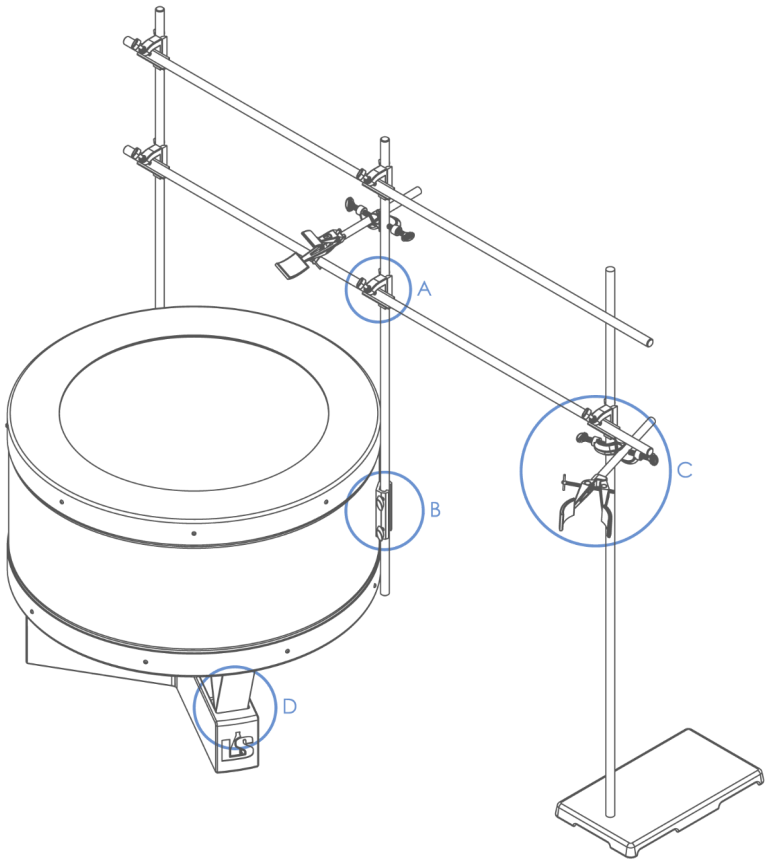
RACK ASSEMBLY DIAGRAM

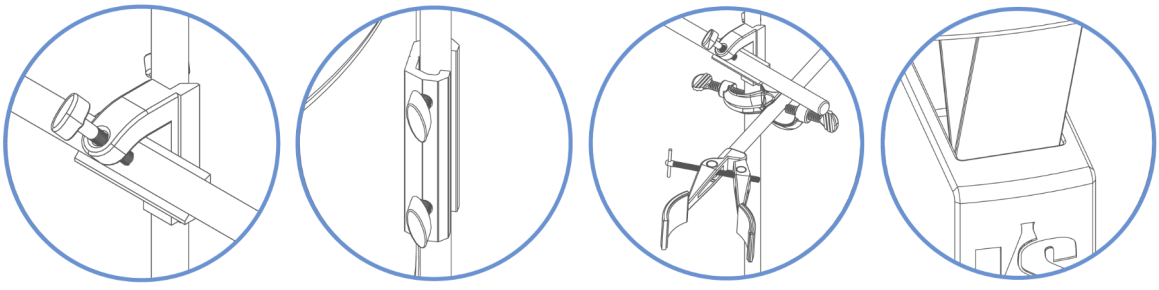


Part #	Lab Society Part Description	SKU
1	Silicone Tripod Mantle Stand	LS-SIL-TMS
2	Heating Mantle System, Stirring Heated Bottom	LS-HMS-20SB, LS-HMS-12SB, LS-HMS-5SB *
3	Steel Rod, 100 cm Length, 12 mm Diameter	CH0657D
4	Boss Head, Right Angle, Gray, Universal	CH0664JM
5	Support Clamp, 2 Prong Extension, Cork Lined	PRCMP08
6	Boss Head, Right Angle, Blue, Premium	PRBH01
7	Superior Blue Ring Stand Set, 11” x 6” Base, 100 cm Rod	CH0653E1RD4

*SKU may change depending on voltage

RACK ASSEMBLY DETAIL





DETAIL A DETAIL B DETAIL C DETAIL D

RACK ASSEMBLY PROCEDURE

*Refer to the **RACK ASSEMBLY DIAGRAM** while assembling the rack and supports. Each # corresponds with the list from the diagram.*

1. Place the silicone tripod mantle stand (Rack Assembly #1) on your work surface. The mantle stand is used to increase the height of the entire system to accommodate new glassware.

2. Place the heating mantle bottom (Rack Assembly #2) on top of the silicone tripod mantle stand with the power plug and the two vertical rod clamps facing backwards.

3. Place a 100 cm steel rod (Rack Assembly #3) in each rod clamp and fix the rod so it touches your work surface. Tighten the right angle clamps.

> **a.** The height of the rods may be adjusted upwards based on desired height of the lattice racking system.

4. Place two right angle clamps or boss heads (Rack Assembly #4) onto each of the 100 cm steel rods you have just attached to the heating mantle bottom. These will serve to laterally attach the 100 cm steel rod cross members to the two vertical steel rods attached to the heating mantle bottom.

5. Assemble the superior blue ring stand set with the 11” x 6” stand base (Rack Assembly #7). Attach two right angle clamps at the same height as the clamps attached to the mantle rods.

> **a.** The two steel rods attached to the heating mantle and the one that is part of the superior blue ring stand set will be used to create the vertical supports for the lattice rack.
>
> **b.** Alternatively, you can use the included premium table clamp, a 100 cm steel rod, and two right angle clamps to create the lattice on the edge of your work table. This is helpful for some setups that require extra space in addition to giving users the ability to swap large flasks on the secondary receiver on the system.

6. Using two 100 cm steel rods, attach all three vertical supports together by placing the 100 cm steel rods into the right angle clamps. This will create a lattice to support the entire system. Evenly space each right angle clamp so that the lattice is level and looks similar to what is shown in the diagram.

a. Use a level to ensure that the lateral rods are level and to ensure the vertical rods are perpendicular to the lateral rods.

7. Attach a premium right angle clamp (Rack Assembly #6) to the middle steel rod of the lattice between the two horizontal steel rods.

a. Place a 2-prong cork lined extension clamp (Rack Assembly #5) into the right angle clamp and tighten. This will be used to support the condenser and may need to be adjusted when assembling the glassware.

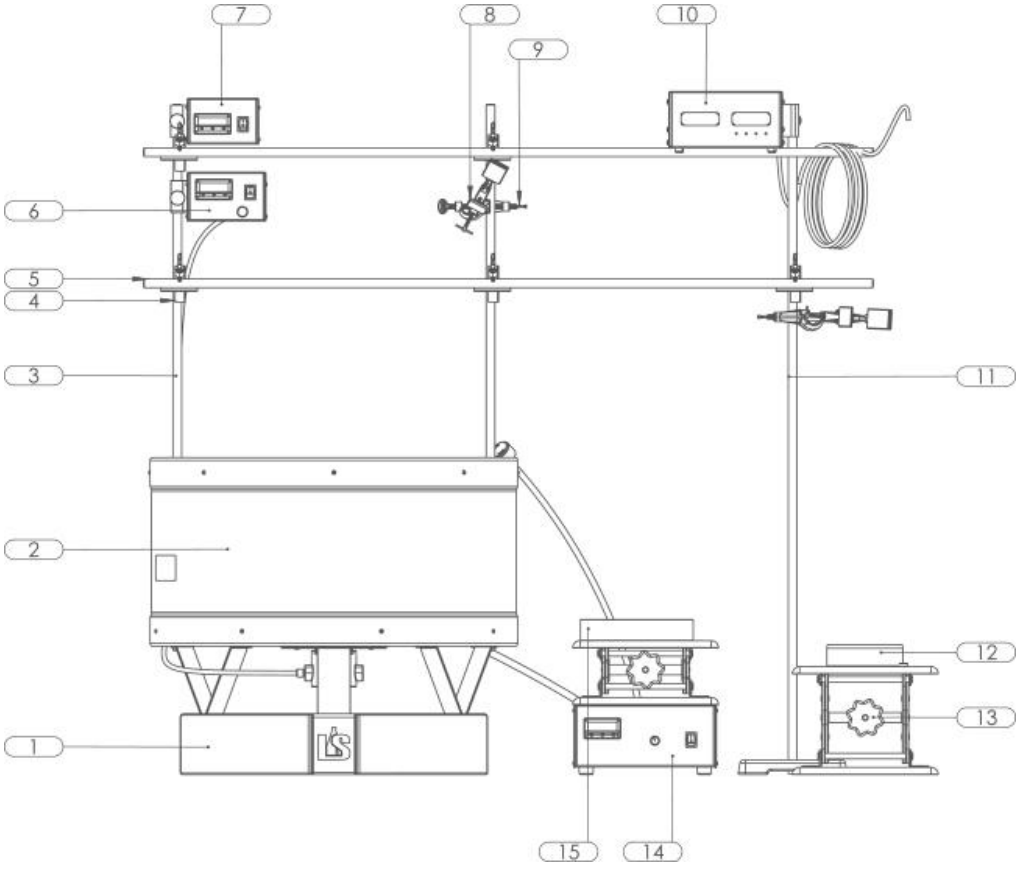
i. Cork-lined clamps are useful when glassware is at high temperatures rather than melting rubberized or plastic lined clamps.

8. Attach a premium right angle clamp to the far right vertical support rod. This should be just below the lower horizontal rod.

a. Attach another 2-prong cork lined extension clamp to the right angle clamp so that it looks similar to what is shown in the diagram. This will be a secondary support for the glassware and may need to be adjusted during the glassware assembly.

9. Place two lab jacks next to the mantle and add a cork stand or a lab pad to each lab jack. The cork stand or lab pad should always be used between the glassware and lab jack to properly support receiving flasks and avoid metal on glass contact.

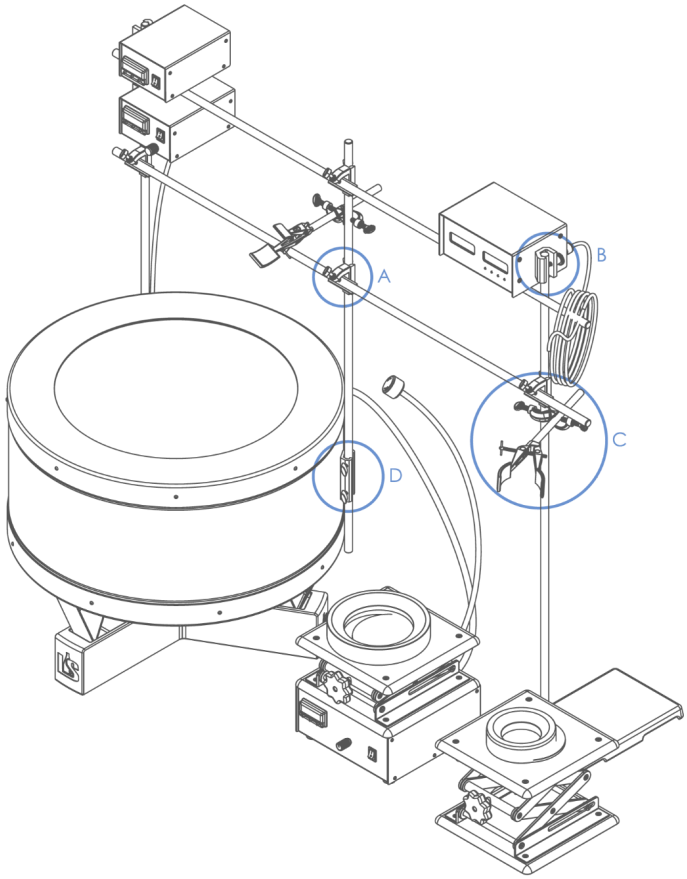
RACK ASSEMBLY WITH ELECTRONICS DIAGRAM

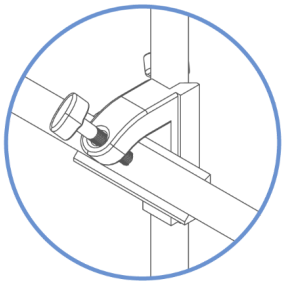


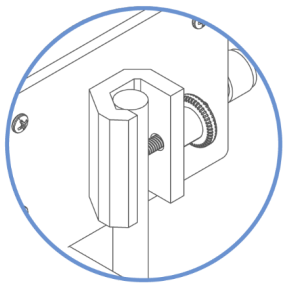
Part #	Lab Society Part Description	SKU
1	Silicone Tripod Mantle Stand	LS-SIL-TMS
2	Heating Mantle System, Stirring Heated Bottom	LS-HMS-20SB, LS-HMS-12SB, LS-HMS-5SB *
3	Steel Rod, 100 cm Length, 12 mm Diameter	CH0657D
4	Boss Head, Right Angle, Gray, Universal	CH0664JM
5	Steel Rod, 100 cm Length, 12 mm Diameter	CH0657D
6	Digital Stir Controller	LS-DSC-1*
7	Digital Temperature Monitor, Single Output	LS-DTM-1*
8	Support Clamp, 2 Prong Extension, Cork Lined	PRCMP08
9	Boss Head, Right Angle, Blue, Premium	PRBH01
10	Precision Vacuum Monitor, Dual Sensor	LS-PVM-2*
11	Superior Blue Ring Stand Set, 11” x 6” Base, 100 cm Rod	CH0653E1RD4
12	Cork Stand, 110 mm or Lab Pad, 4”	JXL-25C or LS-LP-4
13	Lab Jack, Stainless-Steel, 6” x 6”	AE-7-9003
14	Digital Temperature Controller And Monitor	LS-TCM-120-15*
15	Cork Stand, 160 mm or Lab Pad, 4”	JXL-25F or LS-LP-4

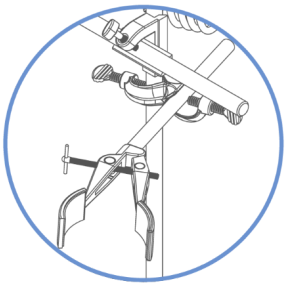
*SKU may differ depending on voltage

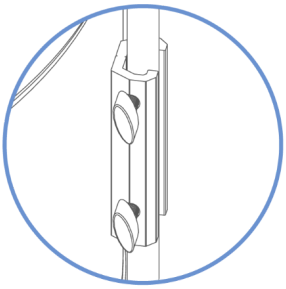
RACK ASSEMBLY WITH ELECTRONICS DETAIL



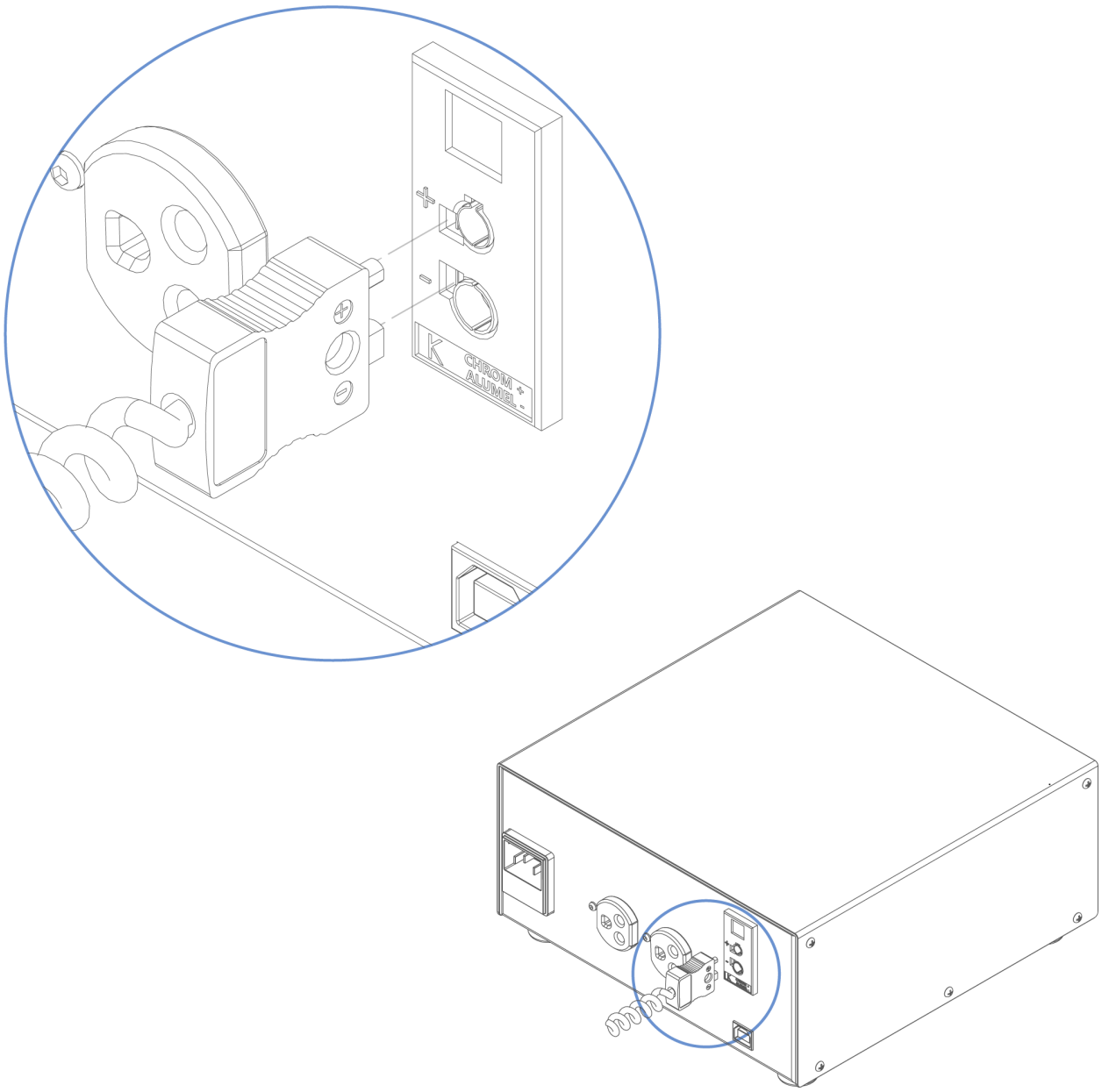

DETAIL A


DETAIL B


DETAIL C


DETAIL D

K-TYPE THERMOCOUPLE PLUG ORIENTATION DETAIL



ELECTRONICS ASSEMBLY & CONNECTIONS PROCEDURE

*Refer to diagram **RACK ASSEMBLY WITH ELECTRONICS** while assembling and connecting the electronics. Each # corresponds with the list from the diagram*

1. Place the digital temperature monitor (Rack Assembly With Electronics #7) on the top side of the far left vertical steel rod and secure the attached clamp to the top edge of the rod. This will monitor the vapor temperature inside the distillation head.

2. Attach the digital stir controller (Rack Assembly With Electronics #6) just below the top horizontal steel rod where the digital temperature monitor is placed. Secure the attached clamp to the vertical steel rod.

3. Place the dual sensor precision vacuum monitor (Rack Assembly With Electronics #10) on the top side of the far right vertical steel rod and secure the attached clamp to the top edge of the rod.

4. Place the digital temperature controller and monitor (Rack Assembly With Electronics #14) below the lab jack closest to the heating mantle.

> **a.** Depending on the configuration of the system, and the size of the receiving flask used, the temperature controller may need to be moved to another area. This is because some receiving flasks are too large and will not fit when the lab jack is sitting on top of the controller.

5. The digital temperature monitor is used to monitor and log the vapor temperature inside the distillation head. It requires a K-Type thermocouple to do this. Plug the male side of the yellow coiled K-Type thermocouple cord into the smaller holes of the K-Type input on the back of the digital temperature monitor (refer to the K-Type Thermocouple Plug Orientation Detail).

> **a.** Place the female end of the yellow coiled K-Type thermocouple cord around the male plug of the black coated K-Type thermocouple. This is the shorter of the two thermocouples included with the system.
>
> **b.** Plug the power supply cord into the back of the device and connect it to an appropriate receptacle. Turn the device on to check that power is properly supplied.
>
> **c.** Ensure the K-Type thermocouple is properly plugged into the receptacle. The + (positive side) is the smaller prong and the - (negative side) is the larger prong.

The thermocouple must be plugged into the smaller female holes of the corresponding K-Type receptacle.

6. The digital stir controller is used to control and log the speed of the stir bar inside the boiling flask during distillation by controlling the rotation of the internal magnet. Connect the female multi-pin locking cord on the stir controller to the male end on the heating mantle bottom.

a. Plug the power supply cord into the back of the device and connect it to an appropriate receptacle. Turn the device on to check that power is properly supplied. Test the stir function by placing a stir bar into the boiling flask and placing the boiling flask into the heating mantle.

7. The digital temperature controller and monitor is used to control and log the temperature of the heating mantle during distillation. It requires a K-Type thermocouple to do this. Plug the male side of the yellow coiled K-Type thermocouple cord into the smaller holes of the K-Type input on the back of the digital temperature controller (refer to the K-Type Thermocouple Plug Orientation Detail).

a. Connect the female end of the yellow coiled K-Type thermocouple cord to the male plug of the stainless K-Type thermocouple. This is the longer of the two thermocouples included with the system.

b. On the back of the heating mantle top and bottom there are twist-lock power supply cords that should be pre-installed. Check to ensure that these cords are locked and installed properly.

c. Both twist-lock power supply cords also have a standard male plug on the other end. These should be plugged into the two standard receptacles on the back of the digital temperature controller and monitor. DO NOT plug these power supply cords into a wall outlet or similar. They MUST be plugged into the back of the digital temperature controller so that the power input can be regulated. Failure to do so can cause catastrophic damage!

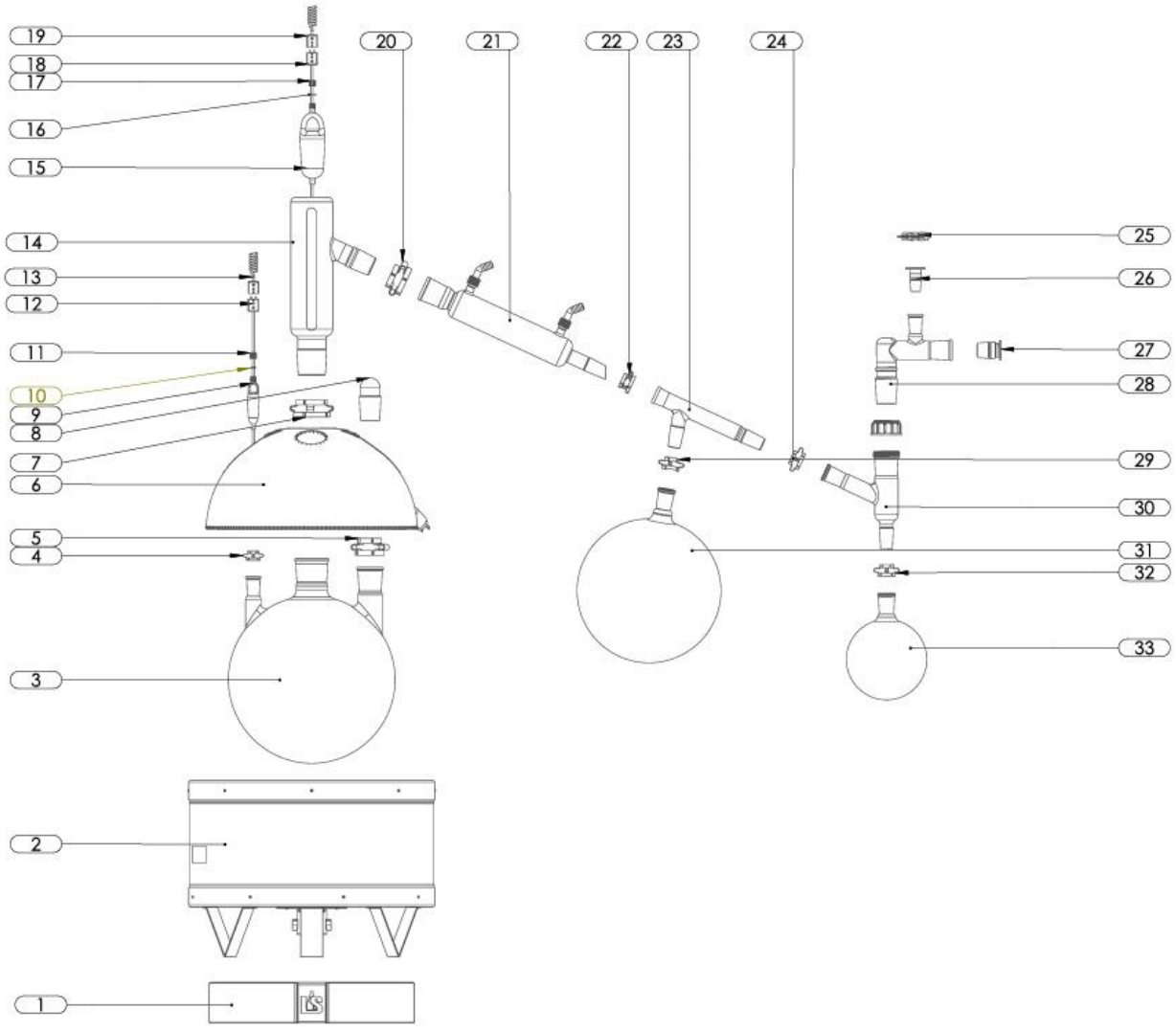
d. Plug the power supply cord into the back of the temperature controller and monitor and connect it to an appropriate receptacle. Turn the device on to check that power is properly supplied.

e. Ensure the K-Type thermocouple is properly plugged into the receptacle. The + (positive side) is the smaller prong and the - (negative side) is the larger prong. The thermocouple must be plugged into the smaller female holes of the corresponding K-Type receptacle.

8. The dual sensor precision vacuum monitor is used to monitor and log the vacuum level at two different locations on the system. To do this, the dual sensor precision vacuum monitor uses two vacuum thermocouples which should be pre-installed to one end of the long gray multi-pin locking cords. Connect both multi-pin locking cords to the back of the dual sensor precision vacuum monitor.

a. Plug the power supply cord into the back of the device and connect to an appropriate receptacle. Turn the device on to check that power is properly supplied.

G3 KIT DIAGRAM



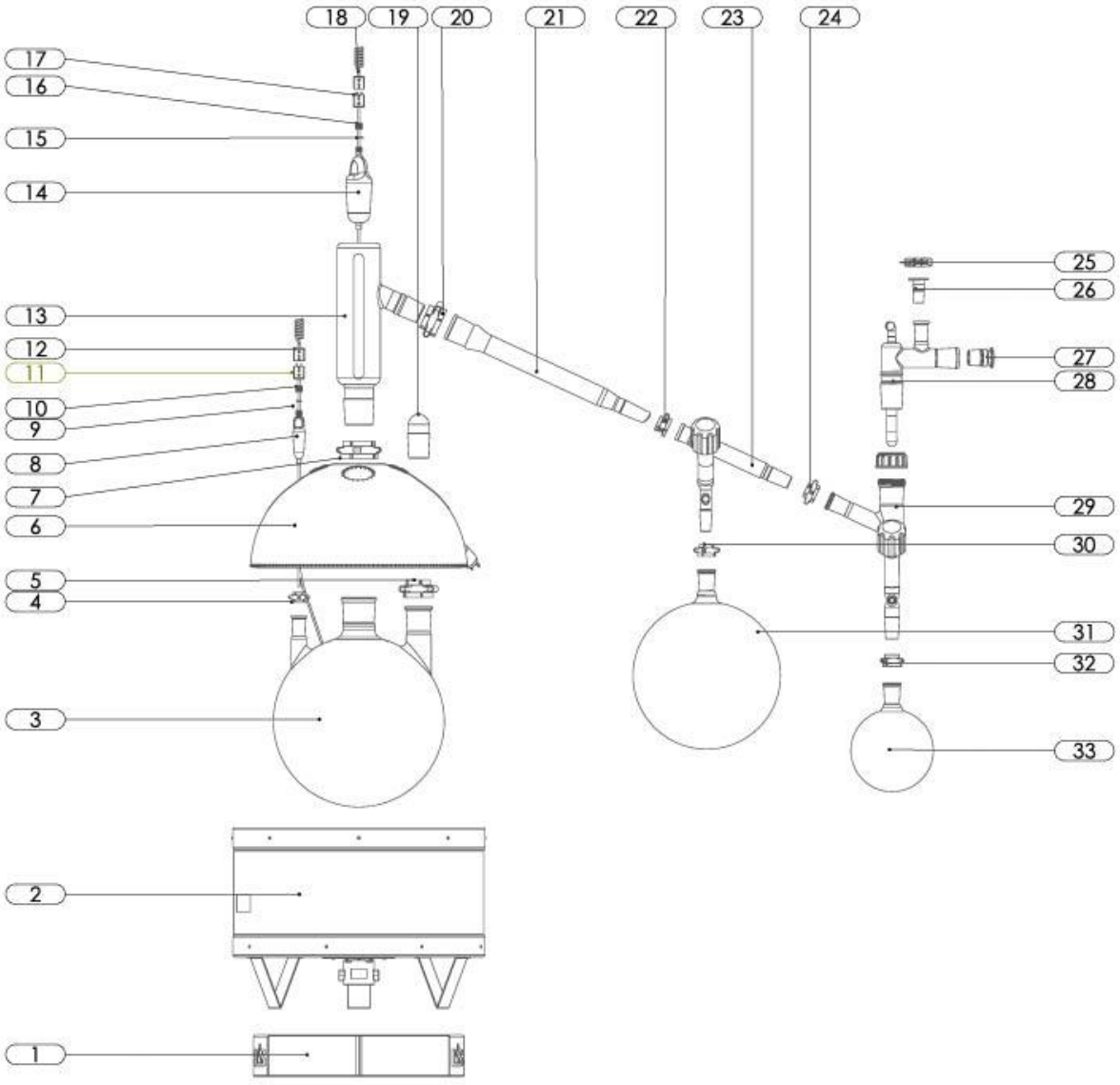
PART LIST ON FOLLOWING PAGE

G3 KITS PARTS LIST

Part #	Lab Society Part Description	SKU (20 L Kit, 12 L Kit, 5 L Kit)
1	Silicone Tripod Mantle Stand	LS-SIL-TMS
2	Heating Mantle System, Stirring Heated Bottom	LS-HMS-20SB, LS-HMS-12SB, LS-HMS-5SB*
3	Round Bottom Flask	LS-RBF-16020, LS-RBF-14512, LS-RBF-13405
4	Keck Clip 24/40 Metal	NBT-M-2440
5	Keck Clip 45/50 Metal (20L Kit Only)	NBT-M-4550
6	Heating Mantle System, Heated Top	LS-HMS-20T, LS-HMS-12T, LS-HMS-5T*
7	Clipox Ground Glass Joint Clip, 60mm (20L Kit Only)	CPX-NS-60
8	Chemglass Hollow Stopper 45/50 (20L Kit Only)	CG-3000-08
9	Thermocouple Adapter - Pinched 24/40	LS-TCA4-24P
10	Viton O-Ring #201 (For #4 Chemthread Caps)	CG-305-201
11	Compression Cap (PPE (BLACK))	CG-352-10
12	Thermocouple Uncoated, K Type, 18 in.	K-1-8-U-18
13	Coiled Extension Cord (Standard to Mini (K-Type))	CC-10-K-SMP
14	Packable Distillation Head	LS-PDH-6, LS-PDH-3V, LS-PDH-2S
15	Thermocouple Adapter - Pinched	LS-TCA4-45P, LS-TCA4-34P, LS-TCA4-24P
16	Viton O-Ring #201 (For #4 Chemthread Caps)	CG-305-201
17	Compression Cap (PPE (BLACK))	CG-352-10
18	Thermocouple PFA-Coated, K Type	K-1-8-T-8, K-1-8-T-8, K-1-8-T-6
19	Coiled Extension Cord (Standard to Mini (K-Type))	CC-10-K-SMP
20	Keck Clip, Metal	NBT-M-4550, NBT-M-3445, NBT-M-2440
21	Liebig Condenser	LS-DC45E-29B, LS-DC34E-29B, LS-DC24E-29B
22	Keck Clip 29/42 Metal	NBT-M-2942
23	Distribution Adapter	LS-DS129-29E
24	Keck Clip 29/42 Metal	NBT-M-2942
25	Aluminum Wing Nut Vacuum Clamp, KF25	DY-AC-KF25
26	KF Inner Adapter, PTFE KF25 to 24/40	BW-KF25-2440
27	KF Inner Adapter, PTFE KF25 to 34/45	BW-KF25-3445
28	90°Adapter	LS-A90-4534
29	Keck Clip 29/42 Metal	NBT-M-2942
30	Distillation Receiver Adapter	LS-DR29-4529
31	Graduated Round Bottom Flask	LS-RBF29-G20**
32	Keck Clip 29/42 Metal	NBT-M-2942
33	Graduated Round Bottom Flask	LS-RBF29-G10**

* SKU may differ depending on voltage
**SKU may differ depending on receiving flask used

G3X KIT DIAGRAM



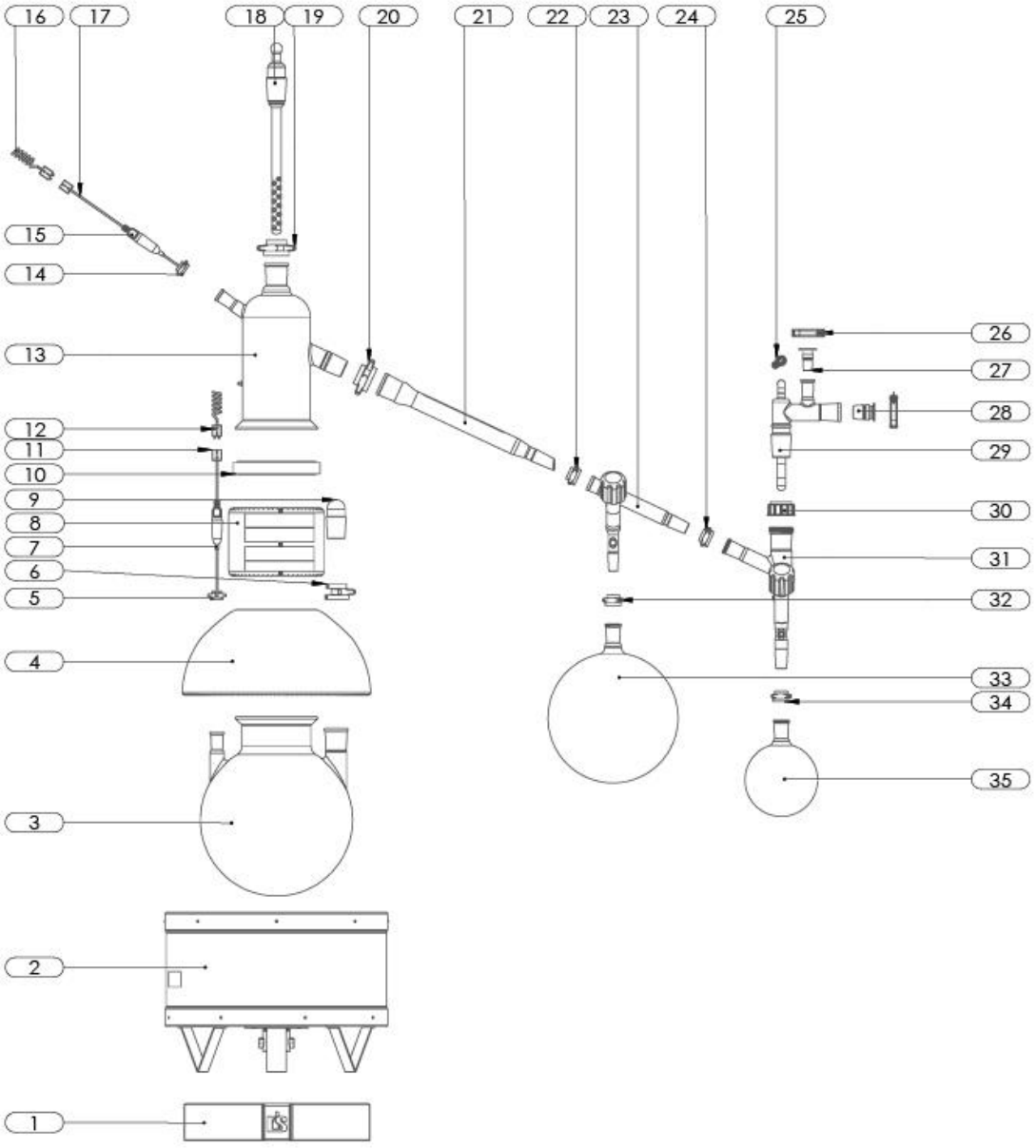
PART LIST ON FOLLOWING PAGE

G3X KITS PARTS LIST

Part #	Lab Society Part Description	SKU (20 L Kit, 12 L Kit, 5 L Kit)
1	Silicone Tripod Mantle Stand	LS-SIL-TMS
2	Heating Mantle System, Stirring Heated Bottom	LS-HMS-20SB, LS-HMS-12SB, LS-HMS-5SB*
3	Round Bottom Flask	LS-RBF-16020, LS-RBF-14512, LS-RBF-13405
4	Keck Clip 24/40 Metal	NBT-M-2440
5	Keck Clip 45/50 Metal (20L Kit Only)	NBT-M-4550
6	Heating Mantle System, Heated Top	LS-HMS-20T, LS-HMS-12T, LS-HMS-5T*
7	Clipox Ground Glass Joint Clip, 60mm (20L Kit Only)	CPX-NS-60
8	Thermocouple Adapter - Pinched 24/40	LS-TCA4-24P
9	Viton O-Ring #201 (For #4 Chemthread Caps)	CG-305-201
10	Compression Cap (PPE (BLACK))	CG-352-10
11	Thermocouple Uncoated, K Type, 18 in.	K-1-8-U-18
12	Coiled Extension Cord (Standard to Mini (K-Type))	CC-10-K-SMP
13	Packable Distillation Head	LS-PDH-6, LS-PDH-3V, LS-PDH-2S
14	Thermocouple Adapter - Pinched	LS-TCA4-45P, LS-TCA4-34P, LS-TCA4-24P
15	Viton O-Ring #201 (For #4 Chemthread Caps)	CG-305-201
16	Compression Cap (PPE (BLACK))	CG-352-10
17	Thermocouple PFA-Coated, K Type	K-1-8-T-8, K-1-8-T-8, K-1-8-T-6
18	Coiled Extension Cord (Standard to Mini (K-Type))	CC-10-K-SMP
19	Chemglass Hollow Stopper 45/50 (20L Kit Only)	CG-3000-08
20	Keck Clip, Metal	NBT-M-4550, NBT-M-3445, NBT-M-2440
21	Jacketless Condenser Tube	LS-HJC45E-29, LS-HJC34E-29, LS-HJC24E-29
22	Keck Clip 29/42 Metal	NBT-M-2942
23	Distribution Adapter, Valved	LS-DS129-29V
24	Keck Clip 29/42 Metal	NBT-M-2942
25	Aluminum Wing Nut Vacuum Clamp, KF25	DY-AC-KF25
26	KF Inner Adapter, PTFE KF25 to 24/40	BW-KF25-2440
27	KF Inner Adapter, PTFE KF25 to 34/45	BW-KF25-3445
28	90° Adapter Vertical Condenser	LS-A90-VC45
29	Distillation Receiver Adapter, Valved	LS-DR29-45V
30	Keck Clip 29/42 Metal	NBT-M-2942
31	Graduated Round Bottom Flask	LS-RBF29-G20**
32	Keck Clip 29/42 Metal	NBT-M-2942
33	Graduated Round Bottom Flask	LS-RBF29-G10**

* SKU may differ depending on voltage
**SKU may differ depending on receiving flask used

G3X-R KIT DIAGRAM



PART LIST ON FOLLOWING PAGE

G3X-R KITS PARTS LIST

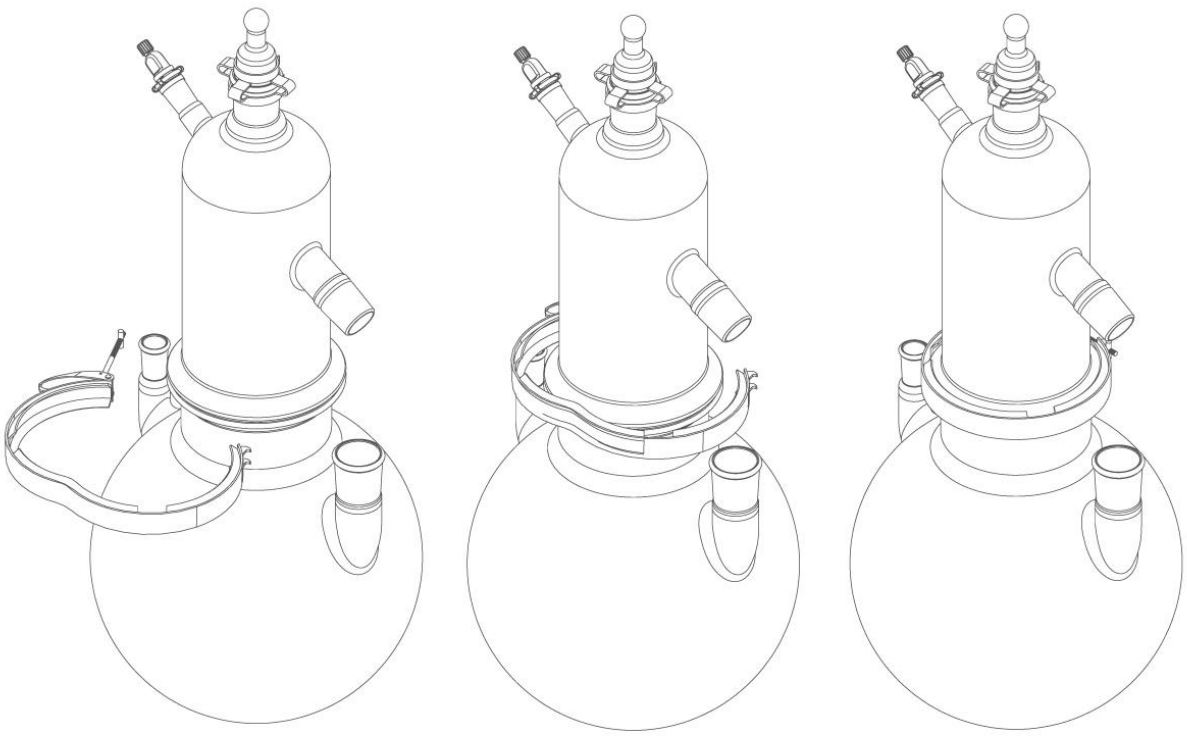
Part #	Lab Society Part Description	SKU (20 L Kit)
1	Silicone Tripod Mantle Stand	LS-SIL-TMS
2	Heating Mantle System, Stirring Heated Bottom	LS-HMS-20SB
3	Round Bottom Flask w/ 150mm Flange	LS-RBF-15R20
4	Heating Mantle System, Heated Top Wide Neck	LS-HMS-20T-W
5	Keck Clip 24/40 Metal	NBT-M-2440
6	Keck Clip, Metal	NBT-M-4550
7	Thermocouple Adapter - Pinched 24/40	LS-TCA4-24P
8	Mantle Insulator, 150mm Diameter	LS-HMS-INS-150
9	Chemglass Hollow Stopper 45/50 (20L Kit Only)	CG-3000-08
10	Stainless Steel Flange Clamp, 150mm	CG-141-04
11	Thermocouple Uncoated, K Type, 18 in.	K-1-8-U-18
12	Coiled Extension Cord (Standard to Mini (K-Type))	CC-10-K-SMP
13	High Efficiency Distillation Head, Silvered	LS-DH-150HE
14	Keck Clip 24/40 Metal	NBT-M-2440
15	Thermocouple Adapter - Pinched 24/40	LS-TCA4-24P
16	Coiled Extension Cord (Standard to Mini (K-Type))	CC-10-K-SMP
17	Thermocouple PFA-Coated, K Type	K-1-8-T-8
18	Thermowell Head Insert	LS-TW45-V300, LS-TW45-C300
19	Keck Clip, Metal	NBT-M-4550
20	Keck Clip, Metal	NBT-M-4550
21	Jacketless Condenser Tube	LS-HJC45E-29
22	Keck Clip 29/42 Metal	NBT-M-2942
23	Distribution Adapter, Valved	LS-DS129-29V
24	Keck Clip 29/42 Metal	NBT-M-2942
25	Rodaviss Joint Cap	CG-182-06
26	Aluminum Wing Nut Vacuum Clamp, KF25	DY-AC-KF25
27	KF Inner Adapter, PTFE KF25 to 24/40	BW-KF25-2440
28	KF Inner Adapter, PTFE KF25 to 34/45	BW-KF25-3445
29	90° Adapter Vertical Condenser	LS-A90-VC45
30	Removable Hose Connection, GL-18	CG-198-04
31	Distillation Receiver Adapter, Valved	LS-DR29-45V
32	Keck Clip 29/42 Metal	NBT-M-2942
33	Graduated Round Bottom Flask	LS-RBF29-G10*
34	Keck Clip 29/42 Metal	NBT-M-2942
35	Graduated Round Bottom Flask	LS-RBF29-G10*

*SKU may differ depending on receiving flask used

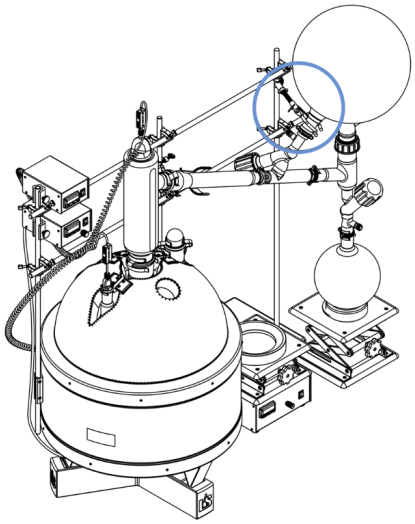
G3X-R FLANGE CLAMP ASSEMBLY DETAIL

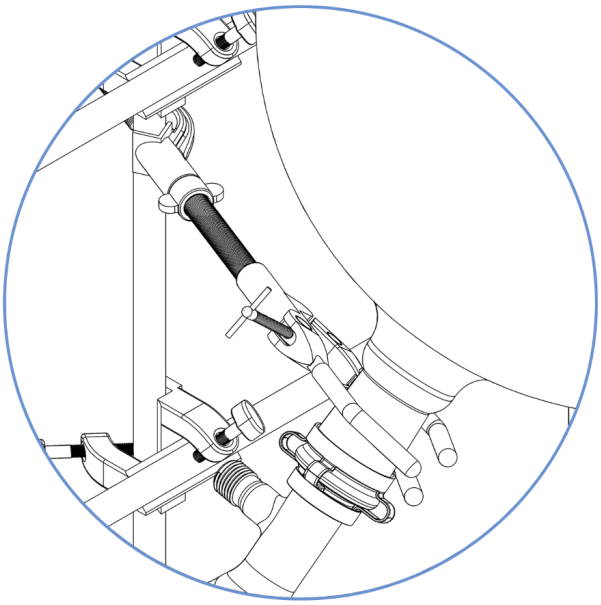
The G3X-R distillation head is secured to the boiling flask using a quick release clamp. The quick release clamp utilizes a tension mechanism to secure the two flange ends together. DO NOT overtighten the clamp, as this will cause glass breakage.

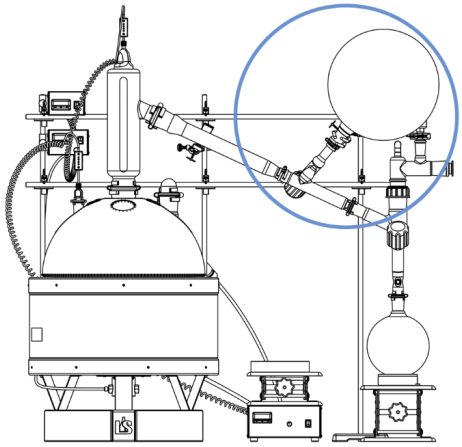
Before placing the flange O-ring on the flask, and clamping the distillation head and the flask together, a small amount of vacuum grease should be spread evenly across the surface of the boiling flask flange and indented section where the O-ring sits. The O-ring may be stiff prior to the first use. It is recommended to lightly stretch the O-ring so it becomes more malleable prior to putting it on the boiling flask. Once the O-ring is sufficiently soft, place the O-ring into the groove of the boiling flask flange, and then place the distillation head on top. Secure the two pieces using the quick release clamp.

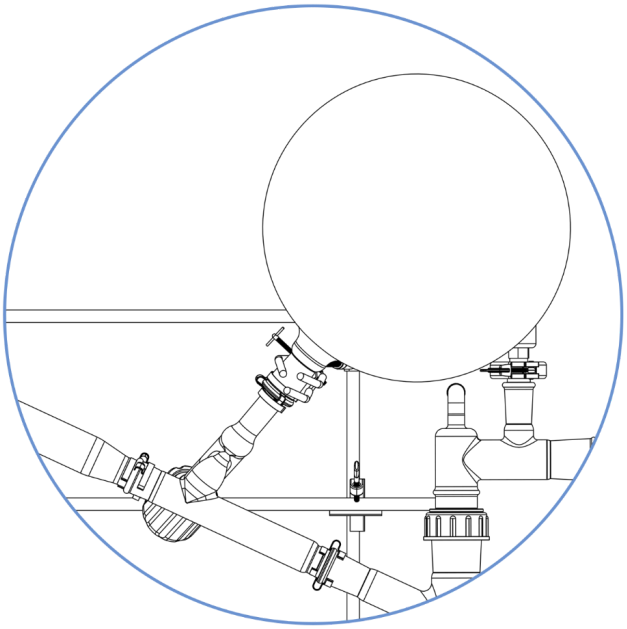


INITIAL SETUP FOR COLLECTING PRIMARY FRACTION(S)



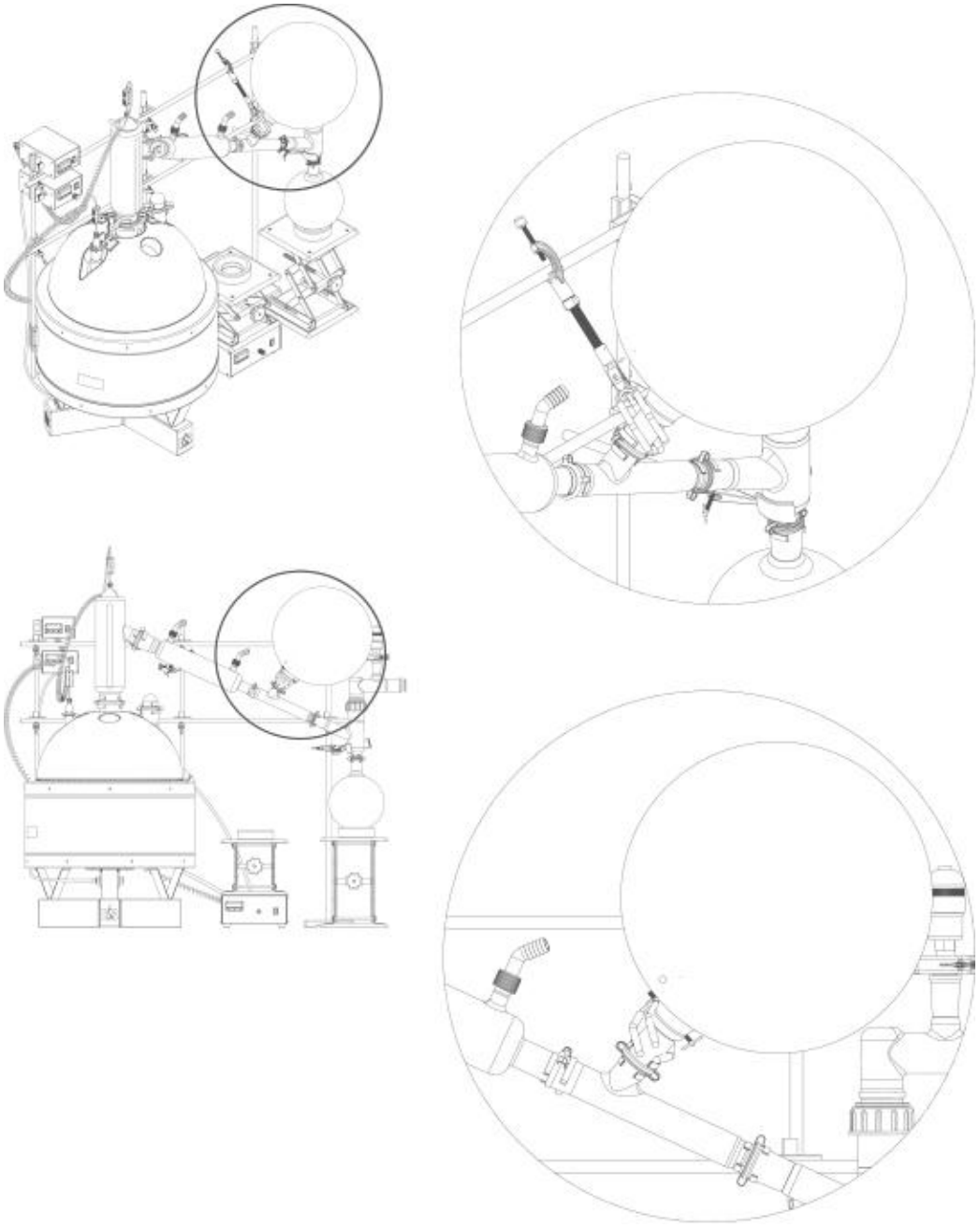






WITH ALTERNATE GLASSWARE

(LS-DS129-29E)



WITH ALTERNATE GLASSWARE

(LS-DS229-29E)

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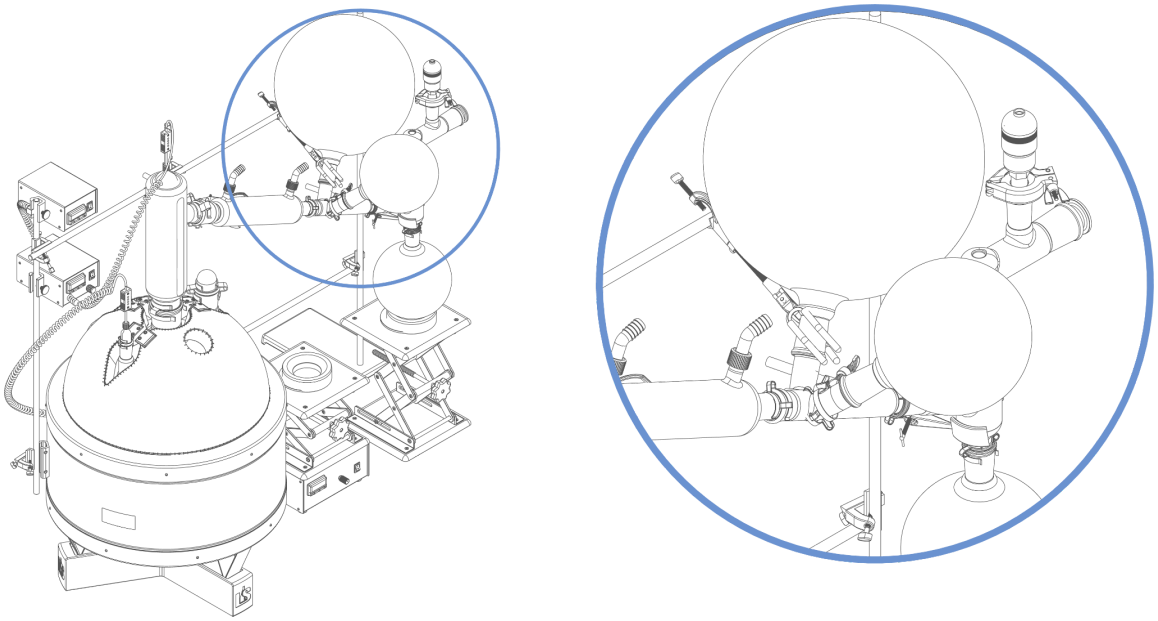

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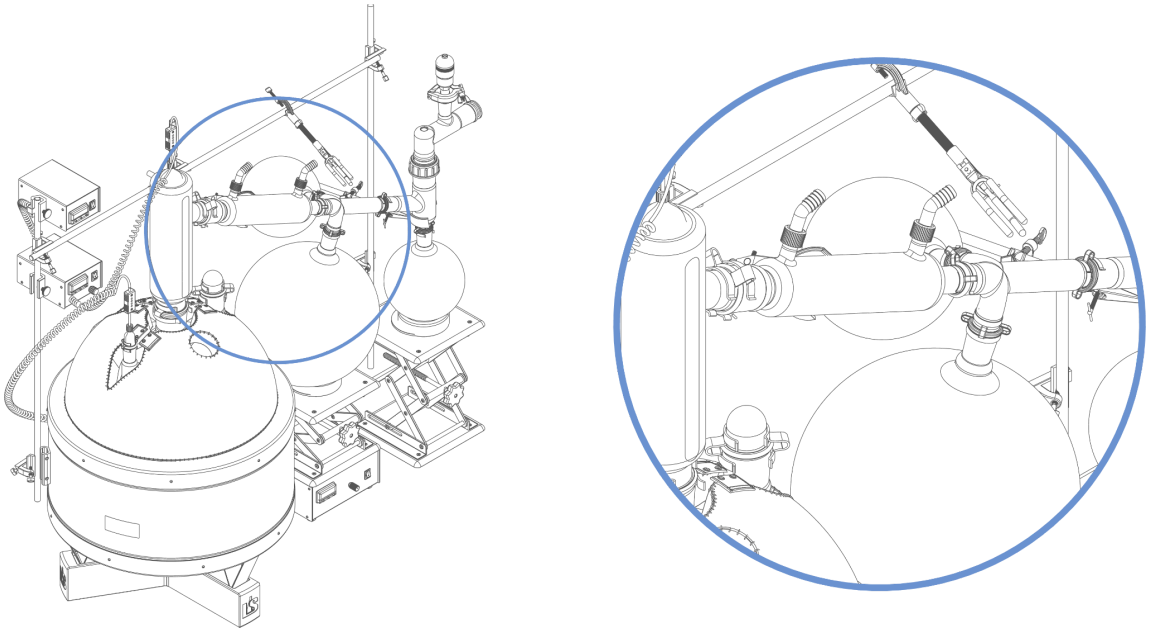
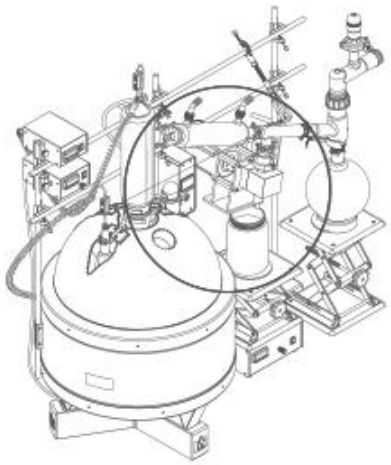
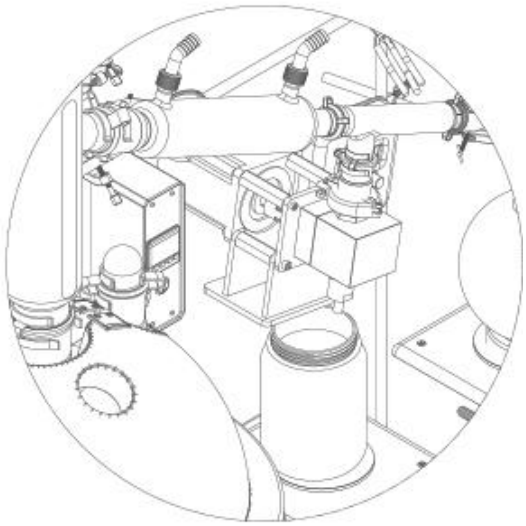
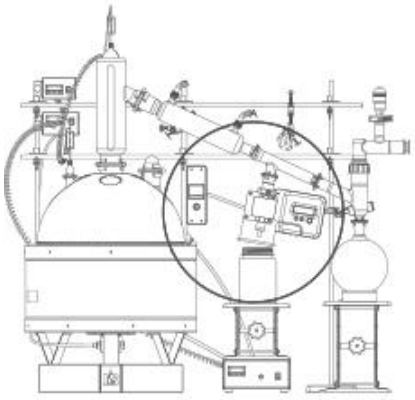
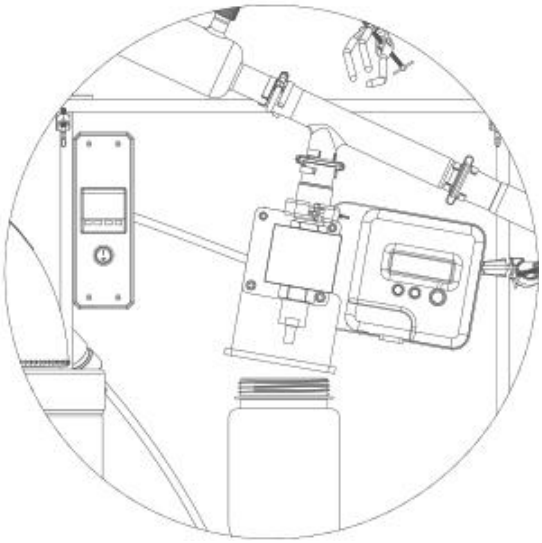


WITH GEAR PUMP



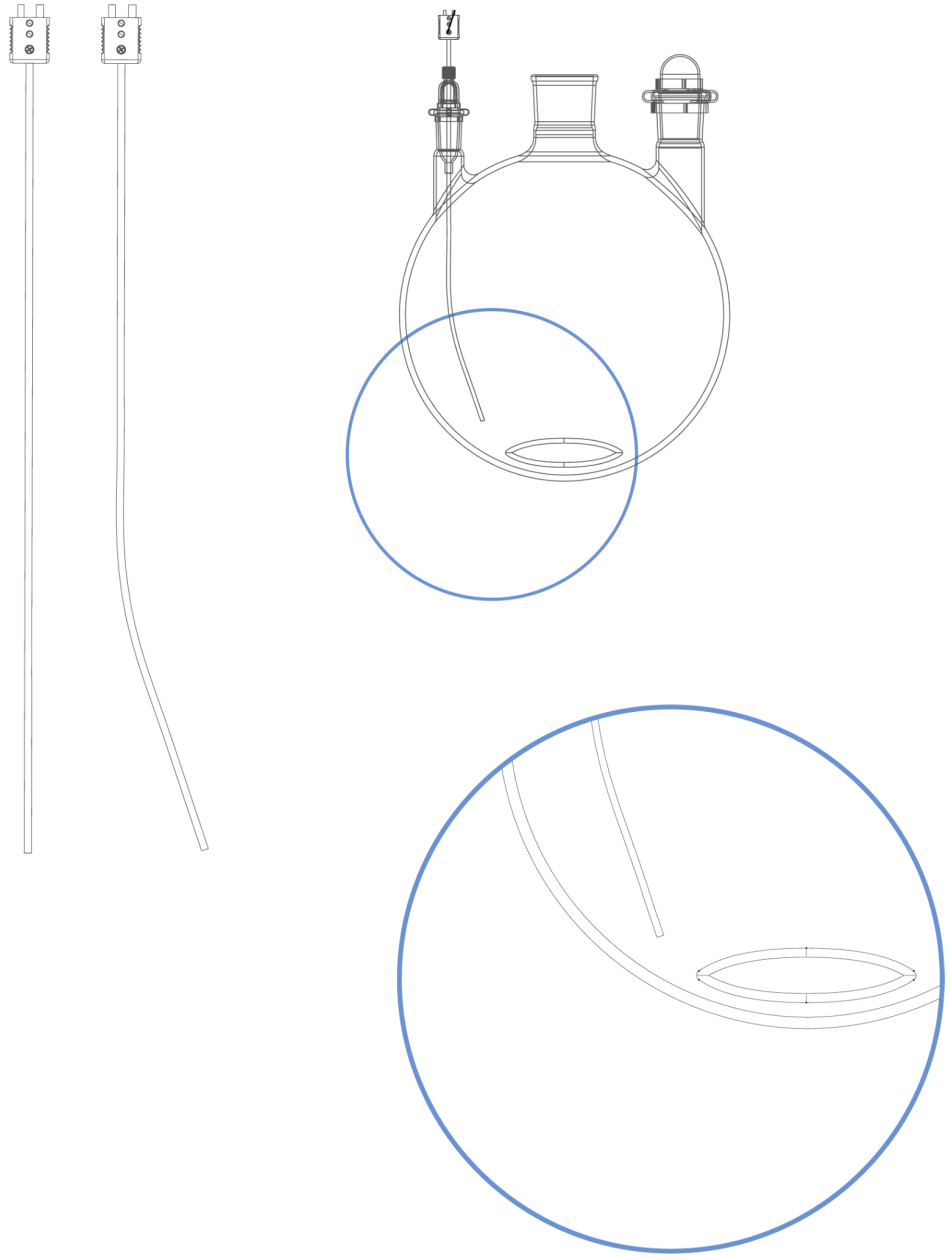






THERMOCOUPLE PROBE PLACEMENT IN BOILING FLASK

All thermocouples can be bent for proper boiling flask placement. Thermocouples should be as close to the bottom as possible without touching the stir bar or the glass.



System Assembly Procedures (SA)

Note: Pre-processing steps are necessary for optimizing short path distillation yields, potencies, and speeds. For best results, starting material should be properly prepared (dewaxed, decarboxylated, de-volatilized) prior to distillation.

1. Vacuum-grease the joints and connect the glassware.
    a. Using a tool like a toothpick, or similar, apply rice grain sized dabs of the vacuum grease around the perimeter of the top one third of the male joint (the area of the joint most distant from the tip).
        i. Less is more, you do not need to use much vacuum grease for a proper seal.
        ii. Ensure both male and female joints are clean and devoid of lint, particulate from a paper towel, vacuum grease from previous uses, or any other contaminant that will preclude a solid seal.
    b. Place the male joint all the way inside the female joint and gently rotate 360° back and forth to evenly spread the vacuum grease around the joint.
        i. A seal that looks clear, with no streaks, is desired.
        ii. No squeaking from glass rubbing on glass should be heard.
            1. If squeaking continues, apply small amounts of additional vacuum grease.
        iii. The vacuum grease should not travel past one half to two thirds down the male joint after being spread. The vacuum grease will be pulled further down the joint during the distillation and may contaminate the system if too much is used.
            1. If too much vacuum grease is used, clean the joint and apply new vacuum grease.
2. For systems with non-detachable condensers:
    a. Attach the head to the boiling flask and attach a support clamp at the condenser.

b. After the head is supported, attach the receiving adapter and then collection flasks.

c. Place a lab jack or stand with a cork ring or lab pad under the collection flasks to further support the weight of the system.

3. For systems with detachable condensers:

a. Pre-assemble the condenser with the distillation receiver and receiving flasks.

i. Make sure to use sufficiently large receiving flasks to fully contain the amount of oil expected to be collected during the distillation.

b. Attach the distillation head to the boiling flask and ensure the head is oriented vertically.

c. Attach the condenser.

i. Use a clamp that is mounted to a frame to support the condenser and ensure the vertical orientation of the system.

ii. O-ring joints will seal for deep vacuum, but may release small amounts of atmosphere during a run. This atmospheric pressure will not significantly impact vacuum/vapor pressure levels.

iii. To reduce the chance of atmospheric pressure interfering, the O-ring joint may be vacuum-greased similarly to ground-glass joints.

d. Place a lab jack or stand with a cork ring or lab pad under the collection flasks to further support the weight of the system.

4. Thermocouple probe placement for boiling flask:

a. For the boiling flask thermocouple, insert the straight probe into the adapter as above and then bend the probe near the tip, and again slightly further from the tip, so that the thermocouple is in the lowest possible position in the boiling flask without touching the magnetic stir bar or the glass.

i. If the tip of the thermocouple is touching the glass, the wrong temperature will be used for the feedback mechanism of the controller.

ii. If the stir bar touches the probe, adjust slightly so this does not occur.

b. Once the proper bending/placement of the probe is achieved, vacuum-grease the thermocouple O-ring and seal the thermocouple adapter to the boiling flask, adjust as necessary, and then hand-tighten the threaded connection. DO NOT OVERTIGHTEN!

c. Insert the male plug on the thermocouple to the female port of the coiled thermocouple extension cord and the male plug of the coiled thermocouple extension cord to the female thermocouple port on the temperature controller.

5. Thermocouple probe placement for distillation head:

a. Place a straight thermocouple through a cap with the threaded opening pointed towards the end of the thermocouple and then through the O-ring.

i. Lubricate the O-ring with a small amount of vacuum grease.

b. Insert the thermocouple in the threaded top of the appropriately sized thermocouple adapter.

c. Adjust the thermocouple so the base of the probe is at a level even with the bottom of the outlet to the condenser.

d. Seal the cap to the probe by rotating clockwise until hand-tight. DO NOT OVERTIGHTEN!

e. Insert the male plug on the thermocouple to the female port of the coiled thermocouple extension cord, and the male plug of the coiled thermocouple extension cord to the female thermocouple port on the temperature monitor.

6. Connect hoses between the following components as ordered:

a. Vacuum pump (use hose clamp) → barb reducer (use 2x hose clamp) → glass cold trap (hose clamps) → distillation vacuum port (hose clamp)

b. Vacuum gauge (hose clamp) → barb on distillation head (hose clamp)

i. Transducer should be oriented vertically with the barb pointing down to prevent contamination.

c. Outlet of the recirculator (hose clamp) → lower condenser GL-18 barb on distillation head (hose clamp) [condenser inlet line]

d. Upper condenser GL-18 barb (hose clamp) → inlet of the recirculator (hose clamp) [condenser outlet line]

7. For systems running full-bore and using a single high-efficiency glass cold trap:

a. Attach the condenser to the distillation head and support as above.

b. Attach a single or multi-arm inline adapter after the condenser.

i. Attach receiving flasks to the adapters.

1. Make sure to use sufficiently large receiving flasks to fully contain the amount of oil expected to be collected during the distillation.

2. Rotate the swing arm adapter 180° so the flask is above the adapter and its opening is facing downward.

a. Use a three-prong clamp attached to the lab frame to support the flask and keep it from rotating back down.

b. This allows a path for the first fraction(s) to run past the collection flask without contamination of the flask.

c. Assemble the distribution receiver adapter and 90° adapter assembly.

i. Place the split, black ring above the ground glass section of the 45/50 male Rodaviss joint on the 90° adapter in a recession in the glass.

1. Make sure the beveled edge of the black ring points down towards the tip of the joint so it will fit around the inside of the top of the red cap.

ii. Place the male joint through the hole in the red Rodaviss cap with the threads pointing down toward the top of the joint.

iii. Lubricate the O-ring with a minimal quantity of vacuum grease and place it over the male end of the joint.

iv. Vacuum-grease the male joint as above and place it inside the female 45/50 joint.

v. Rotate the pieces as above to evenly spread the vacuum grease and seal the joint.

vi. Rotate the Rodaviss cap clockwise to seal to hand-tightness.

1. The Rodaviss cap does not help seal the joint. It is solely a mechanism to aid in the release of the joint during disassembly. DO NOT OVERTIGHTEN!

d. Attach the above assembly to the swing arm adapter.

e. Use a clamp attached to the lattice rack frame to help support the assembly/system and ensure a vertical orientation.

f. Add a collection flask to the male joint.

i. Use an appropriately sized collection flask to contain all the volatiles expected to be collected during the distillation.

g. Immediately place a lab jack or stand with a cork ring or lab pad under the collection flasks to further support the weight of the system.

h. Connect the vacuum transducer to the KF25 to 24/40 adapter with a centering ring and KF25 clamp.

i. Lightly lubricate the O-ring with vacuum grease.

i. Connect the vacuum transducer to the vacuum monitor by inserting the male plug in to the number 1 female position and twist to lock.

j. Lightly vacuum-grease the 24/40 male end of the adapter and firmly seat it in the vertical female joint of the 90° adapter piece of the assembly.

i. Rotate the adapter to evenly spread the vacuum grease and seal the joint.

k. Lightly vacuum-grease the lower male joint of the glass high-efficiency cold trap and then add an appropriately sized receiving flask.

i. Rotate the receiving flask to evenly spread the vacuum grease and seal the joint.

ii. Use a keck clip to secure the joints together.

l. Vacuum-grease the male 34/45 joint of the glass high-efficiency cold trap and seat it in the female joint of the 90° adapter piece of the assembly.

i. Rotate the glass high-efficiency cold trap to evenly spread the vacuum grease and seal the joint.

ii. Use a keck clip to secure the joints together.

m. Immediately place a lab jack or stand with a cork ring or lab pad under the collection flasks to further support the weight of the system.

n. Attach the chain clamp to the body of the glass high-efficiency cold trap.

o. Use a clamp attached to the lattice rack frame to secure the chain clamp and support the glass high-efficiency cold trap assembly.

p. Lightly vacuum-grease the 34/45 to KF25 PTFE adapter and seat it inside the female joint of the glass high-efficiency cold trap.

q. Attach a KF25 tee to the inlet of the vacuum pump using a centering ring and KF25 clamp.

r. Attach a vacuum transducer to the top of the tee with a centering ring and KF25 clamp.

i. Connect the vacuum transducer to the vacuum monitor by pressing in the male plug in the number 2 female position and twist to lock.

ii. Attach a KF25 valve to the KF25 tee using a centering ring and KF25 clamp.

iii. Lightly lubricate the O-ring with vacuum grease.

s. Connect the 34/45 to KF25 PTFE adapter to the KF25 valve using an appropriately sized bellows hose.

i. Use a centering ring and KF clamp to connect the bellows to both the PTFE adapter and the KF25 valve.

ii. Lightly lubricate the O-rings with vacuum grease.

8. For systems running full-bore and using dual inline glass cold traps:

a. Attach the condenser to the distillation head and support as above.

b. Attach a single or multi-arm inline adapter after the condenser.

- **i.** Attach receiving flasks to the adapters.
  1. Make sure to use sufficiently large receiving flasks to fully contain the amount of oil expected to be collected during the distillation.
  2. Rotate the swing arm adapter 180° so the flask is above the adapter and its opening is facing downward.
     - **a.** Use a three-prong clamp attached to the lab frame to support the flask and keep it from rotating back down.
     - **b.** This allows a path for the first fraction(s) to run past the collection flask without contamination of the flask.

c. Assemble the lattice rack frame that will support the dual inline cold traps.

- **i.** Attach the steel rod cross sections to the existing lattice rack using clamps.

d. Assemble the angled glass cold trap and the high efficiency glass cold trap.

- **i.** Vacuum-grease the lower joints of each glass trap and add an appropriately sized collection flask to the male joint.
  1. Rotate the joint connection to spread the vacuum grease evenly.
  2. Secure the ground glass joints with a keck clip.
- **ii.** Vacuum-grease the male ground glass joint of the swing arm adapter and then attach the angled glass cold trap.
  1. Rotate the joint connection to spread the vacuum grease evenly.
  2. Secure the ground glass joints with a keck clip.
  3. Place a lab jack or stand with a cork ring or lab pad under the angled glass cold trap for support.
- **iii.** Attach a chain clamp to the angled glass cold trap and secure it to the lattice rack using a clamp.

iv. Vacuum-grease the male joint of the high-efficiency glass cold trap.

1. Place a lab jack or stand with a cork ring or lab pad under the high-efficiency glass cold trap for support.

2. Attach the high-efficiency glass cold trap to the angled glass trap and rotate the ground glass joint connection to spread the vacuum grease evenly.

3. Secure the ground glass joints with a keck clip.

v. Attach a chain clamp to the high-efficiency glass cold trap and secure it to the lattice rack using a clamp.

vi. Vacuum-grease the KF25 to 24/40 PTFE adapter and add it to the upper joint at the top of the angled glass cold trap.

1. Rotate the joint connection to spread the vacuum grease evenly.

2. Secure the ground glass joint connection with a keck clip.

vii. Vacuum-grease the KF25 to 34/45 PTFE adapter and add it to the outer joint on the side of the high-efficiency glass cold trap.

1. Rotate the joint connection to spread the vacuum grease evenly.

2. Secure the ground glass joint connection with a keck clip.

e. Connect the vacuum transducer to the KF25 to 24/40 adapter on the top of the angled glass cold trap with a centering ring and KF25 clamp.

i. Lightly lubricate the O-ring with vacuum grease.

f. Connect the vacuum transducer to the vacuum monitor by inserting the male plug into the number 1 female position and twist to lock.

g. Attach a KF25 tee to the inlet of the vacuum pump using a centering ring and KF25 clamp.

h. Attach a vacuum transducer to the top of the tee with a centering ring and KF25 clamp.

i. Connect the vacuum transducer to the vacuum monitor by pressing in the male plug into the number 2 female position and twist to lock.

ii. Attach a KF25 valve to the KF25 tee using a centering ring and KF25 clamp.

iii. Lightly lubricate the O-ring with vacuum grease.

i. Connect the 34/45 to KF25 PTFE adapter to the KF25 valve using an appropriately sized bellows hose.

i. Use a centering ring and KF25 clamp to connect the bellows to both the PTFE adapter and the KF25 valve.

ii. Lightly lubricate the O-rings with vacuum grease.

9. For systems running full-bore and using a stainless insert with the mechanical chiller as a cold trap:

a. Attach the condenser to the distillation head and support as above.

b. Attach a single or multi-arm inline adapter after the condenser.

i. Attach receiving flasks to the adapters.

1. Make sure to use sufficiently large receiving flasks to fully contain the amount of oil expected to be collected during the distillation.

2. Rotate the swing arm adapter 180° so the flask is above the adapter and its opening is facing downward.

a. Use a three prong clamp attached to the lab frame to support the flask and keep it from rotating back down.

b. This allows a path for the first fraction(s) to run past the collection flask without contamination of the flask.

c. Assemble the distribution receiver adapter and 90° adapter assembly.

i. Place the split, black ring above the ground glass section of the 45/50 male Rodaviss joint on the 90° adapter, in a recession in the glass.

1. Make sure the beveled edge of the black ring points down toward the tip of the joint, so it will fit around the inside of the top of the red cap.

ii. Place the male joint through the hole in the red Rodaviss cap with the threads pointing down toward the tip of the joint.

iii. Lubricate the O-ring with a minimal quantity of vacuum grease and place it over the male end of the joint.

iv. Vacuum-grease the male joint as above and place it inside the female 45/50 joint.

v. Rotate the pieces as above to evenly spread the vacuum grease and seal the joint.

vi. Rotate the Rodaviss cap clockwise to seal to hand-tightness.

1. The Rodaviss cap does not help seal the joint, it is solely a mechanism to aid in the release of the joint during disassembly. DO NOT OVERTIGHTEN!

d. Attach the above assembly to the swing arm adapter.

e. Use a clamp attached to the lattice rack frame to help support the assembly/ system and ensure a vertical orientation.

f. Add a collection flask to the male joint.

i. Use an appropriately sized collection flask to contain all the volatiles expected to be collected during the distillation.

g. Immediately place a lab jack or stand with a cork ring or lab pad under the collection flasks to further support the weight of the system.

h. Connect the vacuum transducer to the KF16 to 24/40 adapter with a centering ring and KF16 clamp.

i. Lightly lubricate the O-ring with vacuum grease.

i. Connect the vacuum transducer to the vacuum monitor by inserting the male plug in to the number 1 female position and twisting to lock.

j. Lightly vacuum-grease the 24/40 male end of the adapter and firmly seat it in the vertical female joint of the 90° adapter piece of the assembly.

i. Rotate the adapter to evenly spread the vacuum grease and seal the joint

k. Vacuum-grease the PTFE 45/50 to KF25 adapter and place in the horizontal 45/50 opening on the 90° adapter assembly.

i. Rotate the adapter to evenly spread the vacuum grease and seal the joint

l. Connect the 90° KF25 elbow and/or bellow to the PTFE 45/50 to KF25 adapter with centering ring(s) and KF25 clamp(s).

i. Lightly lubricate the O-ring(s) with vacuum grease.

m. Connect the KF25 straight tube to the KF25 bellow with a centering ring and KF25 clamp.

n. Assemble the cold trap by lightly greasing the O-ring, placing it on the can portion of the trap in the groove, and inserting the top portion of the trap.

i. Ensure the top portion of the trap is seated well with the O-ring and the base.

ii. Attach four clamps in a diamond pattern along the lips of the trap and tighten.

1. Only go to hand-tightness with the bolts.

o. Attach a KF25 valve to the tall KF25 inlet of the cold trap using a centering ring and KF25 clamp.

i. Lightly lubricate the O-ring with vacuum grease.

p. Connect the KF25 straight tube to the KF25 valve on the cold trap using a centering ring and KF25 clamp.

i. Lightly lubricate the O-ring with vacuum grease.

q. Connect a 90° KF25 elbow and/or bellow to the KF25 outlet of the cold trap with centering ring(s) and KF25 clamp(s).

i. Lightly lubricate the O-ring(s) with vacuum grease.

r. Connect a 90° KF25 elbow to the KF25 bellow with a centering ring and a KF25 clamp.

i. Lightly lubricate the O-ring with vacuum grease.

s. Connect the middle arm of a KF25 tee to the 90° KF25 elbow with a centering ring and KF25 clamp.

i. Orient the tee so that the arm is horizontal and the long portion is vertical.

ii. Attach a vacuum transducer to the top of the tee with a centering ring and KF25 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

iii. Attach the bottom of the tee to the inlet of the vacuum pump with a centering ring and KF clamp. Conical reducer and additional centering ring and KF clamp may be required.

1. Lightly lubricate the O-ring with vacuum grease.

t. Connect the vacuum transducer to the vacuum monitor by pressing in the male plug in the number 2 female position and twist to lock.

u. Connect the inlet of the mist filter to the outlet of the pump with a centering ring and KF clamp.

i. Lightly lubricate the O-ring with vacuum grease.

10. For G3X Systems:

a. Assembly is the same as for full-bore systems, except the swing arm and distillation receiver adapters have isolation valves.

i. The isolation valves have GL-14 caps that must be secured to the valve body.

1. Place the cap over the glass thread and turn clockwise until the cap is secure.

a. The cap is to be on finger tight, do not over-tighten or the glass thread may break.

ii. The isolation valves have two O-rings that must be lightly lubricated. The following procedure applies to both valves:

1. Turn the valve handle counterclockwise until it can be removed from the valve body.
2. Remove the two upper O-rings from the PTFE body that are closest to the black handle and lightly lubricate them with a minimal quantity of vacuum grease.
    a. Do not lubricate the odd-shaped O-ring adjacent to the angled section of the PTFE.
3. Place the O-rings back in their respective grooves on the PTFE body of the valve.
4. Place the valve handle back into the threaded, female, glass port on the distillation receiver adapter.
5. Turn the valve handle clockwise until the apparatus is fully closed.
    a. The valve is to be finger-tight. Do not over-tighten or the glass may break
    b. The angled portion of the PTFE body will be pointed down when the system is closed.
6. Turn the valve handle counterclockwise one-half turn (180°) to open the system for operation.
    a. The angled portion of the PTFE body will be pointed up when the system is open.

iii. Attach a 29/42 joint receiving flask to the swing arm below the isolation valve.

1. Make sure to use sufficiently large receiving flasks to fully contain the amount of oil expected to be collected during the distillation.
2. Rotate the swing arm adapter 180° so the flask is above the adapter and its opening is facing downward.
    a. Use a three prong clamp attached to the lab frame to support the flask and keep it from rotating back down.

b. This allows a path for the first fraction(s) to run past the collection flask without contamination of the flask.

iv. Assemble the distribution receiver adapter and vertical condenser adapter assembly.

1. Place the split, black ring above the ground glass section of the 45/50 male Rodaviss joint on the vertical condenser adapter, in a recession in the glass.

   a. Make sure the beveled edge of the black ring points down toward the tip of the joint, so it will fit around the inside of the top of the red cap.

2. Place the male joint through the hole in the red Rodaviss cap with the threads pointing down toward the tip of the joint.

3. Lubricate the o-ring with a minimal quantity of vacuum grease and place it over the male end of the joint.

4. Vacuum-grease the male joint of the vertical condenser as above and place it inside the female 45/50 joint of the distillation receiver adapter.

5. Rotate the pieces as above to evenly spread the vacuum grease and seal the joint.

6. Rotate the Rodaviss cap clockwise to seal to hand-tightness.

   a. The Rodaviss cap does not help seal the joint; it is solely a mechanism to aid in the release of the joint during disassembly. DO NOT OVERTIGHTEN!

v. Attach the above assembly to the swing arm adapter.

vi. Use a clamp attached to the frame to help support the assembly/system and ensure a vertical orientation.

vii. Attach a 29/42 joint collection flask to the male joint of the distillation receiver adapter.

1. Use an appropriately sized collection flask to contain all the volatiles expected to be collected during the distillation.

viii. Immediately place a lab jack or stand with a cork ring or lab pad under the collection flasks to further support the weight of the system.

ix. Connect the vacuum transducer to the KF16 to 24/40 adapter with a centering ring and KF16 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

x. Connect the vacuum transducer to the vacuum monitor by inserting the male plug in to the #1 female position and twisting to lock.

xi. Lightly vacuum-grease the 24/40 male end of the adapter and firmly seat it in the vertical female joint of the 90° adapter piece of the assembly.

1. Rotate the adapter to evenly spread the vacuum grease and seal the joint.

xii. Vacuum-grease the PTFE 45/50 to KF25 adapter and place in the horizontal 45/50 opening on the 90° adapter assembly.

1. Rotate the adapter to evenly spread the vacuum grease and seal the joint.

xiii. Connect the 90° KF25 elbow and/or bellow to the PTFE 45/50 to KF25 adapter with centering ring(s) and KF25 clamp(s).

1. Lightly lubricate the O-ring(s) with vacuum grease.

xiv. Connect the KF25 bellow to the 90° KF25 elbow with a centering ring and KF25 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

xv. Connect the KF25 straight tube to the KF25 bellow with a centering ring and KF25 clamp.

xvi. Assemble the cold trap by lightly greasing the O-ring, placing it on the can portion of the trap in the groove, and inserting the top portion of the trap.

1. Ensure the top portion of the trap is seated well with the O-ring and the base.
2. Attach four clamps in a diamond pattern along the lips of the trap and tighten.
    a. Only go to hand tightness with the bolts.

xvii. Attach a KF25 valve to the tall KF25 inlet of the cold trap using a centering ring and KF25 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

xviii. Connect the KF25 straight tube to the KF25 valve on the cold trap using a centering ring and KF25 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

xix. Connect a 90° KF25 elbow and/or bellow to the KF25 outlet of the cold trap with centering ring(s) and KF25 clamp(s).

1. Lightly lubricate the O-ring(s) with vacuum grease.

xx. Connect a KF25 bellow to the 90° KF25 elbow with a centering ring and KF25 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

xxi. Connect a 90° KF25 elbow to the KF25 baffle with a centering ring and a KF25 clamp.

1. Lightly lubricate the O-ring with vacuum grease.

xxii. Connect the middle arm of a KF25 tee to the 90° KF25 elbow with a centering ring and KF25 clamp.

1. Orient the tee so that the arm is horizontal and the long portion is vertical.
2. Attach a vacuum transducer to the top of the tee with a centering ring and KF25 clamp.
    a. Lightly lubricate the O-ring with vacuum grease.

3. Attach the bottom of the tee to the inlet of the vacuum pump with a centering ring and KF clamp. Conical reducer and additional centering ring and KF clamp may be required.

    a. Lightly lubricate the O-ring with vacuum grease.

xxiii. Connect the vacuum transducer to the vacuum monitor by pressing in the male plug in the number 2 female position and twist to lock.

xxiv. Connect the inlet of the KF mist filter to the outlet of the pump with a centering ring and KF clamp.

1. Lightly lubricate the O-ring with vacuum grease.

b. There are two possible condenser configurations for the G3X series: jacketed and unjacketed.

i. The jacketed condenser has an inlet and outlet port for fluid from a heater/chiller.

ii. The unjacketed condenser does not have an inlet and outlet to be connected to a heater/chiller.

1. This condenser may be run by itself or with optional heating mantle for utilizing hot condenser technique. In either case, the groove on the body of the condenser should be facing up when assembled.

iii. When the jacketed condenser is used, the inlet and outlet connections are connected with tubing to a recirculating heater/chiller.

1. Outlet of the recirculator (hose clamp) → lower condenser GL-18 barb on condenser (hose clamp) [condenser inlet line]

2. Upper condenser GL-18 barb (hose clamp) → inlet of the recirculator (hose clamp) [condenser outlet line]

c. The vertical condenser is connected with tubing to a chiller.

i. Outlet of the recirculator (hose clamp) → top condenser GL-18 barb on the condenser (hose clamp)

ii. Bottom condenser GL-18 barb (hose clamp) → inlet of the recirculator (hose clamp)

iii. The chiller must use a heat transfer fluid, NOT just water, as the vertical condenser operates best when set below 0 °C.

1. If water without a heat transfer fluid is used at set points below 5 °C, the water will freeze, possibly causing damage to the chiller, transfer lines, and/or glassware.

iv. Preferably the chiller for the vertical condenser will be set to -20 °C.

11. **For systems running full-bore and utilizing the outlet gear pump in place of receiving flasks:**

a. NOTE: The outlet gear pump has not been peer reviewed.

b. Refer to the outlet gear pump manual and PID temperature controller manual for specific operation notes and parameters.

c. The distribution adapter with the inner bottom ball joint must be used.

d. Attach the distribution adapter with the inner bottom ball joint to the condenser and follow the appropriate system assembly procedure above.

i. Once the system assembly has been completed, place a lab jack under the inner bottom ball joining of the distribution adapter.

ii. Place the outlet gear pump on the lab jack.

iii. Vacuum-grease the inner bottom ball joining of the distribution adapter.

iv. Begin raising the lab jack so that the outer socket joint of the outlet gear pump meets the inner bottom ball joint of the distribution adapter. If additional height is needed, the lab jack may be placed on the temperature controller and monitor.

v. Secure the ball joint connection using a pinch clamp. Tighten the pinch clamp so that the joint connection will not come apart during operation.

vi. Place a sufficiently sized beaker or other container below the outlet of the gear pump to collect the first fraction. Multiple containers will need to be utilized to collect all fractions.

e. Plug the outlet gear pump power supply into a proper receptacle.

f. Plug the PID temperature controller power supply into a proper receptacle.

i. Connect the PID temperature controller to the outlet gear pump using the supplied K-type thermocouple connection.

VACUUM TEST PROCEDURE

1. For first time assemblies, troubleshooting, and/or system checking, pull vacuum on the system without any loaded material to test for leaks. The vacuum gauge should read well below 100 mTorr or close to zero if there are no leaks.

a. If there are leaks, release vacuum and address leaks; recomplete above steps until the system is tight.

b. IMPORTANT NOTE: ALL PTFE fittings, PTFE/stainless-steel valves, rubber hose, silicone hose, O-rings, and even ground glass joints will have marginal, small vacuum leaks. Porous materials like ground glass joints, rubber, silicone, and/or PTFE may also store small pockets of atmosphere in between uses which may take some movement to release. Some of these materials may even off-gas in deep vacuum situations.

OPERATIONAL PROCEDURES (OP)

1. For normal operation, dewaxed oil and a stirring bar are placed into the boiling flask before assembly of the system. If the system is assembled and oil has not been placed into the boiling flask, remove the thermocouple adapter and clean the male and female joints of vacuum grease.
    a. Utilizing a funnel or careful pouring technique, pour the decarboxylated, dewaxed product into the boiling flask through one of the openings of a female joint.
        i. Filling up to 50% of the volume of the boiling flask with oil is customary unless an advanced operator is running the system.
    b. Drop a magnetic stir bar into the solution (respective to flask size).
    c. Re-insert the thermocouple adapter, vacuum-grease, and ensure proper seal.
        i. As above, pay close attention so the tip of the thermocouple does not touch the glass or get hit by the spinning stir bar.
2. With the system fully assembled, properly sealed, and the material near ambient temperature, turn on the vacuum gauge(s).
3. Start the vacuum pump and allow pump-down to begin before chilling the cold trap and turning on the recirculating chiller for the condenser. This ensures that water passes through to the gas ballast of the pump rather than condensing or freezing inside of the vacuum system.
    a. For glass cold traps utilizing dry ice:
        i. For maximum surface area, fill the internal dewar condenser to approximately one third full with isopropyl alcohol or other buffer fluid.
            1. Dry ice should be crushed and then slowly added so that it entirely fills the internal dewar condenser.
            2. DO NOT overfill the internal dewar condenser or the dry ice and isopropyl slurry will spill over.
            3. Always add the isopropyl alcohol prior to adding dry ice.

ii. Once the trap or traps are sufficiently filled with the dry ice/isopropyl alcohol slurry, allow to fully chill for at least 15 minutes before moving on to the next steps. An observable drop in vacuum should be seen on the vacuum monitor as the slurry begins to chill.

iii. Add more dry ice as needed.

b. For refrigerated mechanical cold traps:

i. After the vacuum is pumping, turn on the refrigerated cold trap and the recirculating chiller for the condenser. An observable drop in vacuum should be seen on the vacuum monitor as the trap begins to chill.

4. Once the system has reached adequate vacuum depth (below 1000 mTorr, preferably below 500 mTorr), the system is ready to begin operation.

a. If desired vacuum depth is not reached, adjust connections with gentle rotation and pressure to ensure proper seals.

i. If this does not fix the problem, stop the vacuum, vent the system, then clean, vacuum-grease, and reassemble the system.

5. For most decarboxylated/devolatized products/extracts, the following procedures may be utilized:

a. Prior to initiating power to the mantles, ensure that the temperature controller is set to approximate ambient temperatures.

b. Utilizing the voltage regulation knob, set the knob to an appropriate setting based on the amount of product to maximum volume ratio. It is best to be conservative with the knob - as the user may increase voltage if heating efficiency is not optimal. Setting the voltage too high will cause over-ramping. Once the controller has been set to a voltage setting and begins ramping, the knob should not be turned backwards.

i. A partially filled boiling flask should see a start at 20% - 40%. A system filled to one half volume should be set to 100%.

c. For the first set point, set the controller to 120 °C. This will allow the system to quickly ramp through the volatile fractions (with most of which being removed in the decarboxylation step) towards the heads fraction.

i. When using a cow distribution adapter, the volatile fraction is collected in the first receiving flask.

ii. When using a full-bore system, the volatile fraction runs through the swing arm adapter and to the collection flask attached to the distillation receiver adapter.

d. Once the oil in the boiling flask is reading a temperature of 60 °C - 70 °C, start the stir controller and set to approximately 350 RPM.

i. Below this temperature the oil is typically too viscous to start stirring.

e. If the system appears to be stabilized (no excessive vapors pouring through the system, low vapor pressures), then upon reaching approximately 100 °C vapor temperature (temp at the head), the controller's set point should be increased to approximately 160 °C (40 °C increase in set point).

f. If the system appears to be stabilized (no excessive vapors pouring through the system, low vapor pressures), then upon reaching approximately 160 °C, increase the set point to 175 °C.

i. At this point, the heads fraction (high boiling-point volatiles with low boiling point oil-like constituents) will be underway. This fraction should be fully collected prior to switching to the main collection flask. Vapor temperatures for these fractions will likely range from 90 °C to 160 °C.

1. Allow some of the heads fraction to flow all the way to the previous fraction's collection flask to clean the path of any volatile fraction.

a. This ensures that the heads fraction will be free of/minimize the smell from the volatile fraction.

2. When using a cow distribution adapter:

a. Lower the lab stand to allow rotation of the cow.

b. Rotate the cow a partial turn to allow the heads fraction to collect in the second receiving flask.

c. Raise the lab stand to support the flask and the system.

3. When using a full-bore system that has a swing arm with dual collection flasks:

   a. Loosen the three prong clamp to allow the swing arm to rotate.

   b. Rotate the swing arm down so the heads fraction will flow in the opening to the smaller of the collection flasks.

   c. Raise the lab stand to support the collection flask and the system.

4. When using a full-bore system that has a swing arm with a single collection flask:

   a. Allow the heads fraction to flow past the swing arm adapter and in the collection flask attached to the distillation receiver adapter.

5. When using a G3X system, the heads fraction can be collected in two manners.

   a. Most preferably:

      i. When the heads fraction has begun to flow and has reached the collection flask attached to the distillation receiver adapter, turn the valve handle clockwise one-half turn (180°) to close the path to the receiving flask.

      ii. Slowly turn the GL-14 fitting counterclockwise to allow the collection flask to return to atmospheric pressure.

         1. DO NOT fully open the fitting swiftly, rapid pressure change is not desired.

      iii. Lower the lab stand to allow removal of the collection flask.

iv. Remove the collection flask, cap with a 29/42 stopper, and set aside.

v. Wipe the vacuum grease from the male 29/42 joint of the distillation receiver adapter.

vi. Lightly vacuum-grease the 29/42 male joint of the adapter and firmly seat it in the 29/42 female joint of a clean collecting flask.

1. Rotate the flask to evenly spread the vacuum grease and seal the joint.

vii. Raise the lab stand to fully support the collection flask and the system.

viii. SLOWLY turn the valve handle counterclockwise one-half turn (180°) to SLOWLY reduce the pressure in the collection flask to that of the system.

1. Rapid changes in pressure are not desirable and may lead to implosion of the collection flask, leading to possible injury.

b. Alternatively:

i. Loosen the three prong clamp to allow the swing arm to rotate.

ii. Rotate the swing arm down so the heads fraction will flow in the opening to the collection flask.

iii. Raise the lab stand to fully support the collection flask and the system.

ii. The setpoint ramping temperatures should now be slowed to approximately 5 °C increments as collection temperatures are variable based on the azeotropic profile of the boiling solution and the apparent vacuum pressure.

1. The fractions will generally first be very fluid, then thicken and become cloudy/opaque in nature.

g. When the distillate starts to thicken and clear (become more translucent), and the vapor temperature begins to approach 170 °C, switch the collection flasks by rotating the distillation receiver or "cow" and also switch the water source from cold to warm (approximately 35 °C to 50 °C) to allow for thicker constituents to flow readily into collection vessels. If the head or collection joints become clogged, use a heat gun to subtly ease the distillate passage. Be sure not to get too close or overheat the glass as this can cause breakage.

i. Collection temperatures typically range from 165 °C to 220 °C depending on content and vacuum pressure. DO NOT exceed 230 °C set point during a run, as this will cause the PFA-coated thermometer probe to lose its chemical/heat resistance and possibly burn out the mantle.

ii. Fractionating utilizing this technique can be monitored via the vapor temperature – when the temperature increases, a new fraction is ready to evaporate. When the vapor temperature decreases, the given fraction has been collected (or the system needs more energy (higher flask temperature) to continue the run.

h. When the distillate exiting the condenser becomes "ideal" or completely clear, free of visible contaminants - AND - the vapor temperature is between 165 °C and 185 °C, the user should switch to the main fraction collection flask in order to preserve end-product quality and potency.

i. Allow some of the main body fraction to flow all the way to the previous fraction's collection flask to clean the path of any heads fraction.

1. This ensures that the main body fraction will be as pure as possible and be free of/minimize the smell from the heads fraction.

ii. When using a cow distribution adapter:

1. Lower the lab stand to allow rotation of the cow.
2. Rotate the cow a partial turn to allow the heads fraction to collect in the third receiving flask.

3. Raise the lab stand to support the flask and the system.

iii. When using a full-bore system that has a swing arm with dual collection flasks:

1. Lower the lab stand to allow rotation of the swing arm.
2. Rotate the swing arm so the main body fraction will flow in the opening to the larger of the collection flasks.
3. Raise the lab stand to support the collection flask and the system.

iv. When using a full-bore system that has a swing arm with a single collection flask:

1. Loosen the three prong clamp to allow the swing arm to rotate.
2. Rotate the swing arm down so the main body fraction will flow in the opening to the collection flask.
3. Raise the lab stand to fully support the collection flask and the system.

v. When using a G3X system and the preferred method from the previous section:

1. Loosen the three prong clamp to allow the swing arm to rotate.
2. Rotate the swing arm down so the main body fraction will flow in the opening to the collection flask.
3. Raise the lab stand to fully support the collection flask and the system.

vi. When using a G3X system and the alternate collection method from the previous section:

1. When the main body fraction has begun to flow and has reached the collection flask attached to the swing arm adapter, turn the valve handle clockwise one-half turn (180°) to close the path to the receiving flask.

2. Slowly turn the GL-14 fitting counterclockwise to allow the collection flask to return to atmospheric pressure.
    a. DO NOT fully open the fitting swiftly, rapid pressure change is not desired.
3. Lower the lab stand to allow removal of the collection flask.
4. Remove the collection flask, cap with a 29/42 stopper, and set aside.
5. Wipe the vacuum grease from the male 29/42 joint of the distillation receiver adapter.
6. Lightly vacuum-grease the 29/42 male joint of the adapter and firmly seat it in the 29/42 female joint of a clean collecting flask.
    a. Rotate the flask to evenly spread the vacuum grease and seal the joint.
7. Raise the lab stand to fully support the collection flask and the system.
8. SLOWLY turn the valve handle counterclockwise one-half turn (180°) to SLOWLY reduce the pressure in the collection flask to that of the system.
    a. Rapid changes in pressure are not desirable and may lead to implosion of the collection flask leading to possible injury.

i. Switching to collect the tails fraction is a somewhat subjective activity.
    i. With some products/resins, there is a very distinct color shift from the yellow/orange of the main body to red in the tails. The potency of these fractions is generally quite similar. Color is usually the deciding factor in switching to collecting the tails.
    ii. With other products/resins, there is a more subtle shift in color (if any at all) from yellow to orange. The potency of the main body and tails is generally quite similar.

iii. If another distillation is to be performed on the collected distillate, it is easy to collect the main body and tails in the same flask (to minimize transfer loss).

iv. If this is the final distillation, crystallization is to be performed, or if more segregated fractions are desired, the collection flask is switched to tails.

1. If desired, heads and tails can be combined in one flask since they can be redistilled together.

v. When using a cow distribution adapter:

1. Lower the lab stand to allow rotation of the cow.
2. Rotate the cow a partial turn to allow the tails fraction to collect in the same flask that contains the heads fraction.
3. Raise the lab stand to support the flask and the system.

vi. When using a full-bore system that has a swing arm with dual collection flasks:

1. Lower the lab stand to allow rotation of the swing arm.
2. Rotate the swing arm so the tails fraction will flow in the same flask that contains the heads fraction.
3. Raise the lab stand to support the collection flask and the system.

vii. When using a full-bore system that has a swing arm with a single collection flask:

1. Lower the lab stand to allow rotation of the swing arm.
2. Rotate the swing arm so the opening to the flask containing the main body is no longer in the flow path of the tails fraction.
    a. Ensure that the opening of the main body flask is not angled in such a way as to allow the main body to flow out of the collection flask.

3. The tails fraction now flows through the swing arm adapter, without mixing with the main body fraction, to be collected in the flask attached to the distillation receiver adapter.

4. Raise the lab stand to fully support the main body collection flask and the system.

viii. When using a G3X system and the preferred method from the previous section:

1. Lower the lab stand to allow rotation of the swing arm.

2. Rotate the swing arm to the opening so the flask containing the main body is no longer in the flow path of the tails fraction.

    a. Ensure that the opening of the main body flask is not angled in such a way as to allow the main body to flow out of the collection flask.

        i. The isolation valve may be turned one half turn clockwise (180°) to isolate the main body collection flask and prevent its backflow through the valve body.

            1. The main body collection flask may be left in place until breakdown, or may be removed.

            2. If the flask is to be removed, slowly turn the GL-14 fitting counterclockwise to allow the collection flask to return to atmospheric pressure.

                a. DO NOT fully open the fitting swiftly, rapid pressure change is not desired.

            3. Remove the collection flask, cap with a 29/42 stopper, and set aside.

            4. Leave the isolation valve closed for the remainder of the run.

3. The tails fraction now flows through the swing arm adapter, without mixing with the main body fraction, to be collected in the flask attached to the distillation receiver adapter.

4. Raise the lab stand to fully support the main body collection flask and the system.

ix. When using a G3X system and the alternate collection method from the previous section:

1. Before the tails fraction has reached the main body collection flask attached to the swing arm adapter, turn the valve handle clockwise one-half turn (180°) to close the path to the receiving flask.

2. Slowly turn the GL-14 fitting counterclockwise to allow the collection flask to return to atmospheric pressure.

    a. DO NOT fully open the fitting swiftly, rapid pressure change is not desired.

3. Lower the lab stand to allow removal of the collection flask.

4. Remove the collection flask, cap with a 29/42 stopper, and set aside.

5. Wipe the vacuum grease from the male 29/42 joint of the distillation receiver adapter.

6. Lightly vacuum-grease the 29/42 male joint of the adapter and firmly seat it in the 29/42 female joint of a clean collecting flask.

    a. Rotate the flask to evenly spread the vacuum grease and seal the joint.

7. Raise the lab stand to fully support the collection flask and the system.

8. SLOWLY turn the valve handle counterclockwise one-half turn (180°) to SLOWLY reduce the pressure in the collection flask to that of the system.

a. Rapid changes in pressure are not desirable and may lead to implosion of the collection flask leading to possible injury.

9. The tails fraction will now collect in the clean collection flask.

x. When using an outlet gear pump in place of receiving flasks:

1. Before distillation, the gear pump should be turned on and heated to a minimum of 70 °C. Do not begin operation until the pump has reached operating temperature.

2. Begin the distillation process as normal. Once the glass area above the ball joint begins to fill with distillate, turn the gear pump on to a sufficient speed and begin collection fractions into a beaker or other appropriate container.

3. Swap the collection container as needed to separate additional fractions.

4. For specific parameters and operation, please refer to the outlet gear pump manual.

j. After the user is satisfied with collected distillate, and the reaction has stopped (vapor temperature decreasing, little-to-no reflux, low boiling quantity), turn the temperature controller to the “Off” position, while leaving the unit on to monitor temperature.

k. If the oil to be distilled has not been properly decarbed/devolatilized, or if the material is unknown to the operator (has not performed a run with the material), then slower ramps with smaller jumps between set points are more prudent, especially leading up to the volatile/head fractions.

i. Non-decarboxylated material has the tendency to foam (from the evolution of CO^2 during the process) or “muffin up.” If this is not controlled or stopped, the oil will foam through the whole system, contaminating it and necessitating disassembly and cleaning before the run may be completed.

1. Turn the heating controller to 0% output.

2. Minimally vent the system by slightly rotating a GL fitting that sees vacuum until air enters the system, bleeding in a

little atmosphere, to reduce the muffin, then closing the fitting.

a. Extra care must be taken to balance the system pressure and the muffining effect.

i. DO NOT leave the system unattended during a muffining event.

b. Eventually the system will be able to stay fully sealed without muffining.

3. After the system stabilizes and no longer muffins, turn the heating controller back to the appropriate output percentage and continue the run as normal.

l. If the operator is familiar with distilling the source oil or knows it has been properly decarbed/devolatilized, then the temperature may be ramped more aggressively to save time.

SHUTDOWN PROCEDURES

1. Once the flask temperature reaches at or below 160 °C, the vacuum connection should be closed off, or the pump may be turned off and pressure may be released into the system utilizing an inert-gas backfill system, or by unscrewing one of the vacuum fittings on the distillation head slowly.

a. Ideally, a valve between the cold trap and vacuum pump should be utilized to avoid any potential contamination via pump oil or cold trap collections.

b. Utilizing inert gas will ensure minimal oxidation of collected products, and will reduce atmospheric water/oxygen contamination in the system.

c. Other controllers/pumps/regulators may also be shut off at this point.

2. Upon reaching normal atmospheric pressure, remove the main distillate collection flask, volatile collection flask, and any remaining collection flasks AND clean the joints with lab wipes to remove any residual vacuum grease.

a. If utilizing inert gas backfill, the bubbler/check valve will “pop” when reaching atmospheric pressure, eliminating the possibility of positive pressure inside the glass system.

3. Carefully disassemble the system and set the glassware on a table to finish cooling.

a. Use cork rings to hold the round bottom flasks.

b. The condenser still has water in it and the lines connected to it.

I. Turn the GL fitting of the condenser outlet a partial turn counterclockwise to allow the condenser and the lines to drain back to the heater/chiller or bucket containing the liquid pump.

ii. Once most of the fluid has drained, disconnect the GL fittings.

iii. After disconnecting the water lines from the condenser, use a three prong clamp attached to the lab frame to hold the lines.

1. Place the water lines within the prongs and turn the handle of the clamp clockwise to tighten the prongs around the two water lines.

2. The elevated position of the water lines will keep them from spilling any liquid.

iv. Alternatively, after the condenser used during the run has been disconnected from the water lines, the lines may be connected to a clean condenser to hold them in place.

V. A three prong clamp or a cork clamp attached to the lab stand is then used to secure the condenser in place.

1. The condenser is placed within the open prongs of the clamp and then the handle is turned clockwise to close around the body of the condenser.

c. The condenser still contains some fluid that may or may not contain heat transfer fluid.

i. Carefully pour the contents of the condenser back in the reservoir of the heater/chiller or in the bucket containing the liquid pump.

4. The main body collection flask may be attached to a lab stand with a cork clamp tightened around the neck of the flask.

a. Place an appropriately sized container to hold the distillate on the base of the lab stand.

b. Rotate the clamp so that the opening of the round bottom flask is pointed towards the receiving container.

c. Use a heat gun to gently warm the oil in the flask so that it may flow in the new container.

i. Do not overheat the glass or oil.

1. Use only enough heat to decrease the viscosity of the oil.

2. No smoke should be generated. Stop heating if the oil starts smoking.

d. A retort ring attached to a lab stand may be used to empty the collection flask.

i. Place a container to hold the distillate on the base of the lab stand.

ii. Set the collection flask upside down with its mouth pointing down and through the retort ring.

iii. Use a heat gun to GENTLY warm the oil in the flask so that it may flow in the new container.

1. Do not overheat the glass or oil.

    a. Use only enough heat to decrease the viscosity of the oil.

    b. No smoke should be generated. Stop heating if the oil starts smoking.

CLEANING PROCEDURE

1. After the system has been disassembled and the glassware has cooled to room temperature, the glassware must be cleaned after each run to prevent cross-contamination between batches.

2. Using clean lab wipes, carefully remove the vacuum grease from all joints: male and female.

a. Simply rotate the lab wipe around the joint while applying light pressure to remove the vacuum grease.

b. Once the lab wipe gets saturated with vacuum grease, it is no longer useful for cleaning and a new lab wipe must be utilized.

3. If a heat transfer fluid was used in the recirculating heater/chiller, flush through the jacket section of the condenser according to fluid manufacturer's recommendations.

4. Once the glass is free of any vacuum grease and heat transfer fluid, it may be placed in a bath of ethanol or isopropanol.

a. A bucket with a lid or a rectangular container with a lid are used for the bath.

i. Ensure the material of construction is chemically compatible with the cleaning solvent.

ii. Container must be sufficiently tall to allow for the glassware to be fully submerged.

iii. The container is stored in a fume hood or appropriate location for an alcohol containing vessel.

b. Soaking in the alcohol bath helps loosen or remove oil from hard to clean sections of the glassware.

i. Glassware can either be cleaned directly after a short soaking or left to soak and be cleaned at a later time.

5. After soaking, individual pieces of glassware are removed from the soaking container.

a. Carefully pour any alcohol contained within the glassware back in to the container.

6. Use a wash bottle containing the same type of alcohol as used in the soaking container to introduce clean alcohol to the glassware. Do not use dirty alcohol from the soaking container.

a. Swirl the alcohol to help remove any remaining oil and remnants of dirty alcohol from the soaking process.

b. Wipe the outside of the glassware with a lab wipe wetted with clean alcohol.

c. Complete this process over the soaking vessel so that any alcohol may drain back in it and be contained.

d. Carefully pour any alcohol remaining in the glassware back in the soaking vessel.

e. Repeat as necessary until the glassware is free of oil.

7. Some extractions will contain water soluble materials that may char or cake on the glassware (usually just the boiling flask) during the distillation process. These materials are generally not soluble in alcohols, though warm water will usually see them readily dissolved. Most often the material is sugar from the plant.

a. Add warm/hot water to the boiling flask and swirl to remove the water soluble material.

i. Pour the dirty water to waste.

ii. Repeat until the glassware is devoid of char or any other water solubles.

8. Place the glassware on a drying rack to air dry.

a. Arrange the glass so that any remaining liquid may gravity drain.

9. Once completely dried, the glassware may be reassembled or stored for future use.

WARRANTY INFORMATION

PRODUCT RETURNS

Return of Non-Defective Products: A non-defective product may be returned to Lab Society within thirty (30) days of the invoice date for a refund of the original purchase price, regardless of brand, with the following amendments/fees:

1. Lab Society will refund neither the original shipping cost nor the shipping and handling fees incurred from the product's return.

2. Any non-defective returns are subject to a 20% restocking fee, which percentage is taken from the final purchase price less any shipping or handling charges.

3. Quantity purchases of 5 systems or more are not eligible for return, unless defective.

4. Opened software, parts, and special order merchandise are not eligible for return.

5. Lab Society maintains full discretion in decisions regarding a product's fitness for return.

6. For glassware returns, please see specific policies below.

Return of Defective Products: A defective Non-Lab Society brand product may be returned to Lab Society within thirty (30) days of the invoice date for a refund of the original purchase price, and defective Lab Society brand products may be returned for up to one (1) year, with the following amendments/fees:

1. Any items purchased that are broken upon delivery, not working, defective, or incorrect may be returned, with return shipping paid by Lab Society.

2. Additional fees may be incurred under special circumstances, such as for shipping damages or negligence.

3. Lab Society maintains full discretion in decisions regarding a product's defectiveness and fitness for return.

4. For glassware returns, please see specific policies below.

Return of Glassware: Glass products are shipped with extra care; however, accidents do sometimes happen during shipment. In the case of broken glassware upon delivery, please contact us within ten (10) days of receiving the product for a return or replacement. If return shipping is required, Lab Society will cover the shipping costs. If glassware is broken post-delivery, during usage, or due to poor storage, any standard warranty is void.

Return Instructions for all Products: To return a product, please contact our Help Desk via help@labsociety.com for a Return Merchandise Authorization (RMA) number and follow the instructions below. In your email, please include your name, address, phone number, and order number or proof of purchase. If returning a defective or broken product, please also include a description and pictures of the problem(s).

The RMA is valid for 10 days from date of issuance. **Returns will not be accepted without an RMA, and Lab Society will not offer warranty service without this number.** Please keep the RMA number and reference it when calling back to check on the status of your return.

All equipment should be packed in its original box or a well-protected box. Specific packing instructions apply to certain items and proper packaging is crucial, so please contact the help desk via help@labsociety.com to ensure proper packaging and shipment of products. Fees may apply for products damaged during shipment due to improper return packaging. Lab Society will not be responsible for damage or loss of any product during return shipment, and it is recommended that you self-insure your return. It is very important that you write the RMA number clearly on the outside of the package. Ship the equipment with a copy of your bill of sale or other proof of purchase, your name, address, phone number, description of the problem(s), and the RMA number you have obtained to:

LAB SOCIETY

RMA#_____

4699 Nautilus CT. South

#503

Boulder, CO. 80301

Once received, Lab Society will inspect the returned products to determine whether a refund is due, at which time the client/customer will be notified. Any refunds will be issued in the same form as payment was originally received. Please note that some manufacturers have different return procedures and restrictions on returns.

LAB SOCIETY LIMITED WARRANTY

The warranty available to you depends on whether the product is a Lab Society brand product or is subject to a third party manufacturer's warranty. Regardless of the brand or manufacturer, Lab Society stands behind the products it sells, and is here to assist you with any warranty claims.

Should you encounter a concern with a product, we want to know about it, and we will work with the manufacturer to make it right. Please note that any warranty services or questions must be accompanied by the order number from the transaction through which the warranted product was purchased. For assistance, please contact the Help Desk at help@labsociety.com, or reach us via phone at:

Technical Support: 1-720-684-6857 x 7

Customer Service: 1-720-684-6857 x 4

Lab Society Brand Products: Lab Society branded products carry a manufacturer's warranty and are covered against defects in materials and workmanship for up to one year from the date of purchase. If you find that our products do not function as warranted during the warranty period, please obtain warranty service by contacting Lab Society Customer Service at the phone number below. Lab Society will work with you to either replace, repair or refund any Lab Society branded product.

LAB SOCIETY MAKES NO OTHER WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR CONFORMITY TO ANY REPRESENTATION OR DESCRIPTION. LAB SOCIETY IS NOT LIABLE FOR ANY LOSS, COST, EXPENSE, INCONVENIENCE OR DAMAGE THAT MAY RESULT FROM USE OR INABILITY TO USE A LAB SOCIETY PRODUCT. UNDER NO CIRCUMSTANCE SHALL LAB SOCIETY BE LIABLE FOR ANY LOSS, COST, EXPENSE, INCONVENIENCE OR DAMAGE EXCEEDING THE PURCHASE PRICE OR VALUE OF THE EQUIPMENT. THE WARRANTY AND REMEDIES SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, ORAL OR WRITTEN, EXPRESS OR IMPLIED. NO RESELLER, AGENT OR EMPLOYEE IS AUTHORIZED TO MAKE ANY MODIFICATION, EXTENSION OR ADDITION TO THIS WARRANTY.

The above Limited Warranty is subject to the following conditions and exclusions:

1. This warranty extends only to products distributed and/or sold by Lab Society. It is effective only if the products are purchased and operated within the United States.

2. This warranty only covers products purchased for your own use and not for resale.

3. This warranty covers only normal use of the equipment. Lab Society shall not be liable under this warranty for (i) misuse, abuse, neglect, improper shipping or installation; (ii) acts of God, including disasters such as fire, flood, or lightning; (iii) service or alteration by anyone other than an authorized Lab Society representative; or (iv) negligent or improper use, including but not limited to explosion, implosion, fires, overheating, over tightening, improper electrical current, or other non-recommended practices or operations not within manufacturer specifications.

4. You must retain your bill of sale or other proof of purchase to receive warranty service.

5. No warranty extension will be granted for any replacement part(s) furnished to the purchaser in fulfillment of this warranty.

6. Lab Society accepts no liability for problems caused by after-market software or hardware modifications or additions.

7. Although Lab Society makes every effort to make sure all information provided to you is correct, Lab Society will not be held responsible for typographical errors on sales receipts, repair tickets, or on our website.

8. SPECIAL TERMS REGARDING SOFTWARE: This warranty does not cover any third party software or virus related problems. Lab Society makes no warranty either expressed or implied regarding third-party (non- Lab Society) software. Lab Society and its affiliates accepts no responsibility for any software programs, data or information stored on any media or any parts of any products returned for repair to Lab Society. All pre-installed software programs are licensed to customers under non-Lab Society software vendor's term and conditions provided with the packages. Lab Society does not offer technical support for any software including installed OS or other programs. Lab Society is not responsible for giving any technical support concerning the installation or integration of any software or component the customer did not pay Lab Society to install. Technical support should be pursued through channels offered by the software's individual technical support. Lab Society accepts no liability for problems caused by after-market software or hardware modifications or additions. Lab Society is not

responsible for loss of data or time, even with hardware failure. Customers are responsible for backing up any data for their own protection. Lab Society is not responsible for any loss of work (“down time”) caused by a product requiring service.

Non-Lab Society Brand Products: Products sold by Lab Society that do not carry the Lab Society brand are subject to the original manufacturer’s warranty terms in effect at the time of purchase, if any. Please consult the manufacturer for further information about their warranty terms prior to purchase.

LAB SOCIETY MAKES NO WARRANTY OR REPRESENTATION, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO ANY OTHER MANUFACTURER’S PRODUCT OR DOCUMENTATION, ITS QUALITY, PERFORMANCE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR CONFORMITY TO ANY REPRESENTATION. LAB SOCIETY IS NOT LIABLE FOR ANY LOSS, COST, EXPENSE, INCONVENIENCE OR DAMAGE THAT MAY RESULT FROM USE OR INABILITY TO USE A NON- LAB SOCIETY BRAND PRODUCT.

CERTIFICATIONS

2 L (Legacy) / 5 L / 12 L / 20 L

• **Complete System:** Peer-Reviewed, GMP Compliant pg. 42

• **Heating Mantles**: CSA pg. 46

-CAN/CSA C284101, C22.2 No. 88

• **Temperature Controller:** NRTL, QPS, CE, Constructed with 100% UL and CSA listed parts pg. 47

-UL 61010-1; 61010-2-201

-CAN/CSA 61010-1, C22.2

• **Temperature Monitor:** CE, Constructed with 100% UL and CSA listed parts pg. 48

• **Stir Controller:** CE, Constructed with 100% UL and CSA listed parts pg. 48

• **Vacuum Monitor:** RoHS / CE / NRTL pg. 49

• **External Power Supply:** UL pg. 50

• **External Power Supply for Vacuum Monitor:** CE pg. 51

• **Glassware:** Meets ASTM specification E438, type 1, class A, Kimble Kimax or Schott Duran Glass

G3/G3X

PEER REVIEW

Visit www.labsociety.com/PEERREVIEWED for the most up to date list.

INFINITY ENGINEERING

Engineering Peer Review

Lab Society Certified 5-L Distillation System

Report Number:	EPR1900066
Revision:	1
Revision Date:	May 13th, 2020
Prepared for:	Lab Society
Model Number:	5L G3/G3X

Based upon the following codes:

IFC 2018 – International Fire Code
NFPA 1, 2018 – Fire Code
NFPA 70, 2017 – National Electrical Code
NFPA 30, 2017 – Flammable and Combustible Liquids Code
ASME BPVC (Boiler and Pressure Vessel Code), Section VIII, Div. 1, 2019

Infinity Engineering
841 Washington Blvd.
Montebello, CA 90640
213-926-5961

Usama Tohid P.E.
usama@infinityengineering.info

PACE
NERC
EFOR
MAT 2

May 13th, 2020

INFINITY ENGINEERING

Engineering Peer Review

Lab Society Certified 12-L Distillation System

Report Number:	EPR1900068
Revision:	2
Revision Date:	May 13th, 2020
Prepared for:	Lab Society
Model Number:	12L G3/G3X

Based upon the following codes:

IFC 2018 – International Fire Code
NFPA 1, 2018 – Fire Code
NFPA 70, 2017 – National Electrical Code
NFPA 30, 2017 – Flammable and Combustible Liquids Code
ASME BPVC (Boiler and Pressure Vessel Code), Section VIII, Div. 1, 2019

Infinity Engineering
841 Washington Blvd.
Montebello, CA 90640
213-926-5961

Usama Tohid P.E.
usama@infinityengineering.info

INFINITY ENGINEERING

Engineering Peer Review

Lab Society Certified 20-L Distillation System

Report Number:	EPR1900070
Revision:	1
Revision Date:	May 14th, 2020
Prepared for:	Lab Society
Model Number:	20L G3/G3X

Based upon the following codes:

IFC 2018 – International Fire Code
NFPA 1, 2018 – Fire Code
NFPA 70, 2017 – National Electrical Code
NFPA 30, 2017 – Flammable and Combustible Liquids Code
ASME BPVC (Boiler and Pressure Vessel Code), Section VIII, Div. 1, 2019

Infinity Engineering
841 Washington Blvd.
Montebello, CA 90640
213-926-5961

Usama Tohid P.E.
usama@infinityengineering.info

Ethanol, Heptane, Hexane Use Only
Document# EPR1900070 Rev.1

May 14th, 2020

Certificate of Compliance

Certificate: 80022080 **Master Contract:** 600806

Project: 80022080 **Date Issued:** October 22, 2019

Issued To: **Lab Society**
4699 Nautilus Ct S #503
Boulder, CO, 80301
United States

Attention: Randy Tomlinson

The products listed below are eligible to bear the CSA Mark shown

Issued by: Jeannette Pado

Jeannette Pado

PRODUCTS
CLASS - C284101 - HEATERS Industrial and Laboratory

Electrically heated Mantles for Chemicals:

PART F: Heating Tops for Three-Neck Flasks (with side openings), Series LS, 120V ac max, 1000W max.

PART R: Mantles for Spherical Flasks, Series LS, 120V ac max, 1540W max.

APPLICABLE REQUIREMENTS

CSA Standard C22.2 No 88 - 1958 (reaffirmed 2017) - Industrial Heating Equipment

DQD 507 Rev. 2019-04-30 Page 1

QPS Evaluation Services Inc
Testing, Certification and Field Evaluation Body
Accredited in Canada, the USA, and Internationally

File
LR1576-1

CERTIFICATE OF COMPLIANCE
(ISO TYPE 3 CERTIFICATION SYSTEM)

Issued to	J-KEM Scientific Inc.
Address	6970 Olive Blvd., St. Louis, MO, 63130, USA
Project Number	LR1576-1
Product	Temperature Controller
Model Number	TCM-1
Ratings	120V, 60Hz, 2000W 220-240V, 60Hz, 2000W
Applicable Standards	CAN/CSA C22.2 No. 61010-1-12 Third Edition; Update No. 1: July 2015; Update No. 2: April 2016; Amd 1: November 2018 UL 61010-1 Third Edition CAN/CSA C22.2 No. 61010-2-201:18 UL 61010-2-201
Factory/Manufacturing Location	J-KEM, 6970 Olive Blvd., St. Louis, MO, 63130, USA

Statement of Compliance: The product(s) identified in this Certificate and described in the Report covered under the above referenced project number have been investigated and found to be in compliance with the relevant requirements of the above referenced standard(s). As such, they are eligible to bear the QPS Certification Mark shown below, in accordance with the provisions of QPS's Service Agreement.

CERTIFIED
ELECTRICAL SAFETY

Issued By: Andrew Saunders

Signature: Date: September 17, 2020

81 Kelfield St., Units 7-9, Toronto, ON M9W 5A3 Tel: 416-241-8857; Fax: 416-241-0682
www.qps.ca

EU DECLARATION OF CONFORMITY

CE

This certifies that the following product(s):

Digital Temperature Controller	**LS-TCM-1. 120Vac and 230 Vac versions**
Digital Temperature Controller	**LS-TCM-S. 120Vac and 230 Vac versions**
Digital Temperature Monitor	**Model LS-DTM-1. 120Vac, 230Vac, and 24Vdc versions**
Dual Channel Digital Temperature Monitor	**Model LS-DTM-2. 120Vac, 230Vac, and 24Vdc versions**
Digital Stirmantle Controller	**Model LS-DSC-1. 120Vac, 230Vac, and 24Vdc versions**

(Product Identification)

Complies with the essential requirements of *Low Voltage Directives 2006/95/EC, Electromagnetic Compatibility Directives (2004/108/EC) and EC-Marking* requirements accordingly. This declaration is the sole responsibility of the manufacturer based on test results received from EMC Testing Laboratory, USA, and applies to all specimens manufactured in accordance with manufactures' technical manufacturing drawings. Assessment of compliance of the product with the requirements regarding electrical safety and electromagnetic compatibility was based on the following harmonized standards:

LVD: 2006/95/EC
EN 601010-1
EMC: 2004/108/EC
EN 61326-1

Test reports include, but are not limited to:

Safety Standard, EN 601010-1. Report # 98-148C2
RF Emissions Measurements, EN 61326-1. Report # 98-148A
Immunity Measurements, EN 61326-1. Report # 98-148B

This declaration is the responsibility of the manufacturer / Importer

J-KEM Scientific,. Inc.
858 Hodiamont Ave.
Saint Louis. Missouri, 63112 USA

Manufacturer:

Signature

Robert Elliott

Full Name: Robert Elliott
Position: President
Date: September 11, 2020

DigiVac
Precise Practical Personal

Certificate of Conformity

Products: PVM-2

The Dual Bullseye® (PVM-2) is a rugged, dual-screen, dual-sensor vacuum measurement instrument designed specifically for the demands of laboratory use.

This product complies with the following standards:

Environment: CE compliant

Safety Standards: EN 61010-1 (1993)

EMC Emissions:

- FCC 47 CFR Part 15 Class A emissions requirements (USA)
- FCC 47 CFR Part 15 Class B emissions requirements (USA) (conducted emissions only)
- EN 55011:2007/A2:2007 Group 1 Class A ISM emissions requirements (E
- EN 55011:2007/A2:2007 Group 1 Class B ISM emissions requirements (EU) (conducted emissions only)Safety Standards: EN 61010-1 (1993)

EMC Emissions and Immunity:

- EN 61326:2006 EMC requirements for Electrical equipment for measurement, control and laboratory use – General Use
- EN 60601-1-2:2009 EMC requirements for Medical Use Equipment Non-Life supporting partial to include:
  - EN 61000-4-4 Electrical Fast Transients
  - EN 61000-4-5 AC Surge
  - EN 61000-4-6 CRFI
  - EN 61000-4-11 Dips and Interrupts

Attested to by the hands and seals:
Tim Collins, President
The DigiVac Company
Matawan NJ, USA
Date of Issue: March 22, 2019

IEC IECEE CB SCHEME	Ref. Certif. No.
	DK-73750-UL

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product	AC/DC Switching Adaptor
Name and address of the applicant	MEAN WELL Enterprises Co., Ltd. No.28, Wuquan 3rd Rd., Wugu Dist., New Taipei City 248 Taiwan
Name and address of the manufacturer	Mean Well Enterprises Co., Ltd. No.28, Wuquan 3rd Rd., Wugu Dist., New Taipei City 248 Taiwan
Name and address of the factory *Note: When more than one factory, please report on page 2*	Mean Well Enterprises Co., Ltd. No.28, Wuquan 3rd Rd., Wugu Dist., New Taipei City 248, Taiwan ☒ Additional Information on page 2
Ratings and principal characteristics	See Page 2
Trademark (if any)	MEAN WELL
Type of Customer's Testing Facility (CTF) Stage used	
Model / Type Ref.	GST40Ax, GST60Ax See Page 2
Additional information (if necessary may also be reported on page 2)	☒ Additional Information on page 2
A sample of the product was tested and found to be in conformity with	IEC 62368-1(ed.2)
As shown in the Test Report Ref. No. which forms part of this Certificate	1706035-CB issued on 2018-06-04

This CB Test Certificate is issued by the National Certification Body

☐ UL (US), 333 Pfingsten Rd IL 60062, Northbrook, USA
☒ UL (Demko), Borupvang 5A DK-2750 Ballerup, DENMARK
☐ UL (JP), Marunouchi Trust Tower Main Building 6F, 1-8-3 Marunouchi, Chiyoda-ku, Tokyo 100-0005, JAPAN
☐ UL (CA), 7 Underwriters Road, Toronto, M1R 3B4 Ontario, CANADA

For full legal entity names see www.ul.com/nobnames

Date: 2018-06-08

Signature:

Jan-Erik Storgaard

1/2

GlobTek, Inc.

your power partner

186 Veterans Drive, Northvale, NJ 07647 USA www.globtek.com https://www.globtek.com/iso-certificates/

Delivering leading edge, innovative power solutions for over 30 years since 1984

EC Declaration of Conformity

CE

For the following equipment: Regulated Switchmode AC-DC Power Supply AC Adaptor
(Product Name)

GT-41134-06VV-x.x-Q
(Model Designation)

GlobTek, Inc. USA, 186 Veterans Drive, Northvale, NJ USA 07647
(Manufacturer Name and Address)

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to and applying the following standards:

- Electromagnetic Compatibility Directive (2014/30/EU)
  - EMI (Electro-Magnetic Interference)
    - EN 55032:2015/AC:2016 Class B
      - Harmonic Flicker EN 61000-3-2:2014
      - Voltage Flicker EN 61000-3-3:2013
  - EMS (Electro-Magnetic Susceptibility) EN 55024:2010 and EN55024:2010/A1:2015
- Low-Voltage Directive (2014/35/EU)
  - Information Technology Equipment EN 60950-1: 2006 (2nd Edition) A11:2009; A1:2010; A12:2011+A2:2013
  - Audio/video, information and communication technology equipment EN/IEC 62368-1:2014 (2nd Edition)
- RoHS 2.1 / RoHS 3 Directive 2011/65/EU + Amendment (EU) 2015/863
  - EN 50581:2012 (RoHS Standard)
  - BS EN IEC 63000:2018, Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
- Energy-Related Products Directive 2009/125/EC
  - Ecodesign requirements for no load condition electric power consumption and average active efficiency of external power supplies (EU)2019/1782
    - Subject power supply is exempt from this regulation per (EU) 2019/1782, as this power supply is solely intended for use in applications exempted in (EU) 2019/1782 Article 1.2 or not listed in Annex 1 of the regulation.

This declaration is valid for products with date code February 2020 and later. The power supply described above is considered as a component and operated in combination with an end use system. The purchaser of this power supply should conduct system level EMC/EMS testing to verify system level conformance.

The following manufacturer is responsible for this declaration:
GlobTek, Inc USA
186 Veterans Drive, Northvale, NJ USA 07647
(Company Name and Address)

Person responsible for making this declaration:
Hans Moritz, QA Manager
(Name, Surname)

This declaration of conformity is issued under the sole responsibility of the manufacturer

Northvale, NJ USA January 29th, 2020 Hans Moritz

(Place) Date On Behalf of GlobTek Inc. Signature

IEC IECEE CB SCHEME	Ref. Certif. No.
	DK-73750-UL

Model Details:
GST40Ax, GST60Ax (x = 05, 07, 09, 12, 15, 18, 24, 48)

Factories:
Mean Well (Guangzhou) Electronics Co., Ltd Huadu Branch
No.11 Jingu South Road, Huadong Town, Huadu District, Guangzhou,
China

SuZhou Mean Well Technology Co., Ltd.
No. 77, Jian-min Road, Dong-qiao, Pan-yang Ind. Park, Huang-dai Town, Xiang-cheng District, Suzhou, Jiangsu 215152,
P.R. China

Ratings:
Input:
Models GST40Ax: 100-240 Vac, 50/60 Hz, 1.0 A
Models GST60Ax: 100-240 Vac, 50/60 Hz, 1.4 A
Output:
Model GST40A05: 5 Vdc, 5.0 A, 25 W max.
Model GST40A07: 7.5 Vdc, 5.34 A, 40 W max.
Model GST40A09: 9 Vdc, 4.45 A, 40 W max.
Model GST40A12: 12 Vdc, 3.34 A, 40 W max.
Model GST40A15: 15 Vdc, 2.67 A, 40 W max.
Model GST40A18: 18 Vdc, 2.22 A, 40 W max.
Model GST40A24: 24 Vdc, 1.67 A, 40 W max.
Model GST40A48: 48 Vdc, 0.84 A, 40 W max.
Model GST60A05: 5 Vdc, 6.0 A, 30 W max.
Model GST60A07: 7.5 Vdc, 6.0 A, 45 W max.
Model GST60A09: 9 Vdc, 6.0 A, 54 W max.
Model GST60A12: 12 Vdc, 5.0 A, 60 W max.
Model GST60A15: 15 Vdc, 4.0 A, 60 W max.
Model GST60A18: 18 Vdc, 3.33 A, 60 W max.
Model GST60A24: 24 Vdc, 2.5 A, 60 W max.
Model GST60A48: 48 Vdc, 1.25 A, 60 W max.

Additional Information:
Additionally evaluated to EN 62368-1:2014/A11:2017
National Difference specified in the CB Test Report

Additional information (if necessary)

UL

- ☐ UL (US), 333 Pfingsten Rd IL 60062, Northbrook, USA
- ☒ UL (Demko), Borupvang 5A DK-2750 Ballerup, DENMARK
- ☐ UL (JP), Marunouchi Trust Tower Main Building 6F, 1-8-3 Marunouchi, Chiyoda-ku, Tokyo 100-0005, JAPAN
- ☐ UL (CA), 7 Underwriters Road, Toronto, M1R 3B4 Ontario, CANADA

For full legal entity names see www.ul.com/nobnames

Date: 2018-06-08

Signature:
Jan-Erik Storgaard

LAB SOCIETY

G3 / G3X / G3X-R

ONLY FROM LAB SOCIETY