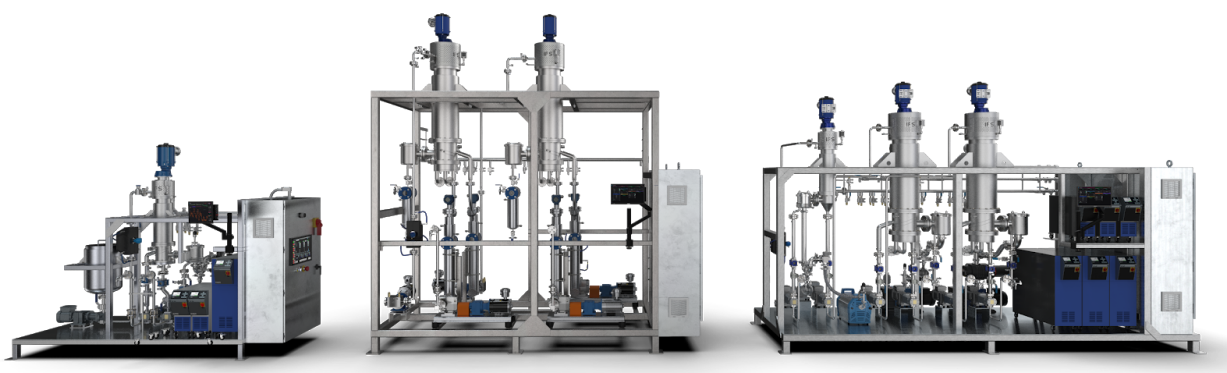


CANNABEAST Product Line

Supplemental Specification Sheet



Applicable Products

Single Stage 0.2m²

Single Stage 0.6m²

2-Stage 0.2m²

2-Stage 0.6m²

3-Stage 0.6m²



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1. System Highlights

- Completely jacketed stainless steel process piping
- Good Manufacturing Practices (GMP) forward design
- Inline sight glasses
- Jacketed feed tank, 8-Gallon
- Manual isolation valves
- Material contact surfaces: 316L stainless steel

2. New Features for 2020

- Coriolis Flow Meters for reliable, high-viscosity fluid flow monitoring (replacing geared flow meters) with custom cast thermal jackets.
- Digital pressure transmitters for gear pumps (replacing analog gauges)
- Standardized insulated cold trap jumper hoses and insulated external cold trap coils
- Fully welded hot oil lines
- Factory Acceptance Testing (FAT) standard
- Various Feed Tank options (3-Stage only)
- Various Human-Machine Interface (HMI) options
- Various vacuum system options



3. System Throughputs & Specifications

The following table summarizes speed data and pass data for each of the distillation units. Pass speed is calculated by dividing the average feed by the minimum required passes to create a viable end product. Output fractions is the number of continuous fractions produced by a given unit at any moment during operation.

System	Flow Rates (LPH)				Stage/Pass Data	
	Min. Feed	Max Feed	Avg. Feed	Pass Speed	Min. Passes	Output Fractions
Single Stage 0.2	5	20	15	7.5	2	2
Single Stage 0.6	10	60	40	20	2	2
2-Stage 0.2	5	20	15	15	1	3
2-Stage 0.6	10	60	40	40	1	3
3-Stage 0.6	10	60	40	40	1	4

Thin film distillation units are typically designed in two (2) ways: with a “short path” (internal condenser), or with an external condenser. Short paths minimize the distance that vapor travels from evaporation to condensation. External condensers are effective for higher vapor pressure compounds, and are useful for degassing. The following table explains which evaporator types are utilized on each respective system:

System	Evaporator Type		
	Stage 1	Stage 2	Stage 3
Single Stage 0.2	Short Path 0.2	-	-
Single Stage 0.6	Short Path 0.6	-	-
2-Stage 0.2	Short Path 0.2	Short Path 0.2	-
2-Stage 0.6	Short Path 0.6	Short Path 0.6	-
3-Stage 0.6	Ext. Condenser 0.2	Short Path 0.6	Short Path 0.6



4. System Pricing Table

The following table summarizes pricing of each unit in respect to the various Human-Machine Interface (HMI) and Vacuum System (VS) options:

Single Stage 0.2			
HMI Option	VS-1 Retail	VS-2 Retail	
EliteLab Core HMI	\$283,877.25	\$298,102.25	
LS-TFD-1S.2-PLC	\$327,627.25	\$341,852.25	
LS-TFD-1S.2-PLCA	\$402,627.25	\$416,852.25	
Single Stage 0.6			
HMI Option	VS-1 Retail	VS-2 Retail	
EliteLab Core HMI	\$367,502.59	\$381,727.59	
LS-TFD-1S.6-PLC	\$423,752.59	\$437,977.59	
LS-TFD-1S.6-PLCA	\$507,502.59	\$521,727.59	
2-Stage 0.2			
HMI Option	VS-1 Retail	VS-2 Retail	VS-3 Retail
EliteLab Core HMI	\$459,468.68	\$473,693.68	\$468,936.28
LS-TFD-2S.2-PLC	\$516,343.68	\$530,568.68	\$525,811.28
LS-TFD-2S.2-PLCA	\$640,718.68	\$654,943.68	\$650,186.28
2-Stage 0.6			
HMI Option	VS-1 Retail	VS-2 Retail	VS-3 Retail
EliteLab Core HMI	\$540,504.85	\$554,729.85	\$549,972.45
LS-TFD-2S.6-PLC	\$608,004.85	\$622,229.85	\$617,472.45
LS-TFD-2S.6-PLCA	\$736,754.85	\$750,979.85	\$746,222.45
3-Stage 0.6			
HMI Option	VS-1 Retail	VS-2 Retail	VS-3 Retail
EliteLab Core HMI	\$812,228.86	\$826,453.86	\$835,921.46
LS-TFD-3S.6-PLC	\$872,228.86	\$886,453.86	\$895,921.46
LS-TFD-3S.6-PLCA	\$1,018,478.86	\$1,032,703.86	\$1,042,171.46

* 3-Stage prices do **not** include a feed tank. See **Section 11** for feed tank options and pricing.



PRICES

5. System Dimensions

Space & Delivery Requirements:

- Units should be at least 2' from any wall
- Ceilings must be high enough to accommodate for wiper basket removal
- Forklift rated for a minimum of 5000lbs, must have extended forks
- Ensure machinery location doorway is large enough for footprint listed below

System	Width (in.)	Depth (in.)	Height (in.)			Clearance (in.)
			Base HMI	PLC Standard	PLC Auto	Motor + Basket
Single Stage 0.2	123.5	52	92	92	132	36
Single Stage 0.6	123.5	64	122	122	157	48
2-Stage 0.2	147.5	52	92	92	132	36
2-Stage 0.6	147.5	64	122	122	157	48
3-Stage 0.6	183.5	64	122	122	157	48

Notes:

- Clearance height is for removing wiper basket for extensive evaporator cleaning; adding this height value to the respective system height results in minimum ceiling height to have full access to system.
- Dimensions do **NOT** include cold trap chiller. Cold trap chillers are located off of skid and are recommended to have their own electrical connection to avoid distance to connection issues.



6. System Utility Specifications

Electrical Requirements:

- Requires a Sub-Panel with a Main Disconnect Breaker on Panel, Sub-Panel will have direct connection via conduit into the control panel of the Skid
- Skid has self-contained electrical connections for all utilities on control panel, with the exception of the cold trap chiller
 - Cold trap chillers are located off of skid and are recommended to have their own electrical connection to avoid distance to connection issues
 - Electrical Specifications for cold trap chillers:
 - **Huber CC-902:** 208V 2 Ph, 60 Hz, 14.5 Amps
 - **Huber Unistat 815:** 208V 3 Ph, 60 Hz, 21.5 Amps
 - **Huber Unistat 815:** 460V 3 Ph, 60 Hz, 11.0 Amps
- Requires Professional Electrician to connect Skid to Sub-panel

System	Electrical				Heat Gen. (BTU/Hr)	
	Voltage	50% Amps	Max Amps*	Panel Max*	@ 50%	@ 100%
Single Stage 0.2	208Y	60	120	150	35,000	70,000
Single Stage 0.6	208Y	75	150	275	47,500	95,000
2-Stage 0.2	208Y	75	150	150	47,500	95,000
2-Stage 0.6	208Y**	110	220	300	66,500	133,000
3-Stage 0.6	208Y**	125	250	300	86,000	172,000

* Max Amps is the maximum amp draw of the system's utilities; Panel Max is the maximum amperage that the system's electrical panel can accept.

** Alternative voltage options available upon request.



Water & Drain Connection Requirements:

- Tap water and drain connection required for each Tempered Water Unit
 - Tubing should be at least 3/8" internal diameter
 - Tap water source with pressure of 2-5 Bar (29 to 72.5 psi)
- A tee or manifold should be used to connect water source to multiple water inlets on associated utilities (HB Therm Units)
- Shutoff valve for Tap Water source recommended
- Drain can be wall mounted or floor mounted but should not be more than 12" above the ground
 - Maximum flow of each water discharge is 1.5 GPM (gallons per minute) during purge cycles / peak usage @ 100C max. discharge temperature
 - Normal operation can be as low as 0.0 GPM, depending on set temperatures,
 - Consistent discharge during operation is managed by set temperatures

Water Quality Recommendation:

- Must use soft water, deionized (DI) water, or pH-balanced reverse osmosis (RO) water for cooling
- See Section 3.5 in HB-100Z product manual for specific hydrological data
- Failure to use properly treated water may result in build up of minerals within the utilities themselves or utility lines; which is not covered by warranty.

System	Water				
	Source in GPM	Connections*	Drain in GPM	Connections*	Type (f)
Single Stage 0.2	3.0 / 4.5	2 / 3	3.0 / 4.5	2 / 3	3/8" BSPP
Single Stage 0.6	3.0 / 4.5	2 / 3	3.0 / 4.5	2 / 3	3/8" BSPP
2-Stage 0.2	3.0 / 6.0	2 / 4	3.0 / 6.0	2 / 4	3/8" BSPP
2-Stage 0.6	3.0 / 6.0	2 / 4	3.0 / 6.0	2 / 4	3/8" BSPP
3-Stage 0.6	4.5 / 9.0	3 / 6	4.5 / 9.0	3 / 6	3/8" BSPP

* Slash values indicate optional water connections for heaters. 1.5 GPM per source/drain connection. Connecting water source to oil heaters aids in cool down time during shutdown.



7. Human-Machine Interface (HMI) Options:

1. Base units: All IPS units will include the EliteLab Core HMI:

- 15.5" Touchscreen with mounted Tiny PC, mounting system, and cable management.
 - i. Intel Quad Core I5-6500T 2.5GHz up to 3.1GHz, 16GB DDR4 RAM, 512GB SSD, Windows 10 Professional 64 Bit with latest EliteLab Kiosk version
- The EliteLab Core HMI integrates all Temperature Control Units (TCUs), Pressure Controllers, and Pressure Monitors into one, easy to use interface for control as well as data logging. Users can create presets, review previous run data, as well as set alarms for operation of the distillation unit through the easy-to-use touchscreen interface.
- Included is a 1-year EliteLab license
- All Variable Frequency Drives (VFDs) are individually controlled via their respective control pad; mounted within the electrical panel of the distillation unit.

2. Base Level Programmable Logic Controller (PLC)

- For an additional fee (**see detailed pricing table below**), users can choose to add an Allen-Bradley PLC to their units which consolidates the Variable Frequency Drive (VFD) controllers into one, easy to use touch screen. (This allows for the control of pumps on the 22" touchscreen with easy linking to portable devices. The plant can be easily controlled from any Apple or Android tablet/phone)
- The 22-inch touchscreen interface integrates all of the VFDs into a simple-to-use interface for control, datalogging, and management of the distillation unit.
- The PLC also includes temperature and pressure sensors mounted into the process lines and vacuum system of the distillation system for temperature and pressure logging and analysis.



- PLC also features remote control options through software loaded onto an external tablet or computer.
- PLC features preset and custom alarms for over/under pressurization as well as other parameters for production stability
- TCUs and Pressure Controllers/Monitors will still be controlled as well as logged by the EliteLab Core HMI.

3. Automated Programmable Logic Controller (PLC) with Level Sensors

- For an additional fee (price-specific to distillation unit), users can choose to add an Automated Allen-Bradley PLC to their units which take the place of the numerous Variable Frequency Drive (VFD) controllers that would typically be mounted into the electrical panel of the unit.
- Fluid level sensors are added to the respective residue/distillate discharge lines to sense the flow rate entering each respective line. After setting a flow rate on the feed pump, the unit will automatically set the flow rates for each respective discharge accordingly without user input.
 - i. This creates repeatability, reduces operating expenses, and greatly increases the ease-of-use of the distillation systems.
 - ii. This is especially useful in multi-stage continuous distillation plants
 - iii. It is important to note that the overall height of the distillation unit will be increased to accommodate for the fluid level sensors.
See the dimensions table in Section 5 for specific heights.
- The 22-inch touchscreen interface integrates all of the VFDs into a simple-to-use interface for control, datalogging, and management of the distillation unit.
- The PLC also includes temperature and pressure sensors mounted into the process lines and vacuum system of the distillation system for temperature and pressure logging and analysis.



- PLC also features remote control options through software loaded onto an external tablet or computer.
- TCUs and Pressure Controllers/Monitors will still be controlled as well as logged by the EliteLab Core HMI.



8. Vacuum System Options

To accommodate variable operational parameters and feed stocks, there are now several vacuum system options available for the CannaBeast product line. The pump options are summarized in the table below:

Single Stage	Dual-Pump Manifold		
	1	2	
VS-1	VB-MD12-NTC	LS-RV-50	
VS-2	VB-MD12-NTC	LS-RV-50BST	
2-Stage	Stage		
	1	2	
VS-1	VB-MD12-NTC	LS-RV-50	
VS-2	VB-MD12-NTC	LS-RV-50BST	
VS-3	LS-RV-50	LS-RV-50BST	
3-Stage	Stage		
	1	2	3
VS-1	VB-MD12-NTC	LS-RV-50	LS-RV-50
VS-2	VB-MD12-NTC	LS-RV-50	LS-RV-50BST
VS-3	VB-MD12-NTC	LS-RV-50BST	LS-RV-50BST

Pump Specifications

Vacuum Pump	Type	Flow Rate (CFM)	Ultimate Pressure	Purpose
VB-MD12-NTC	Dry Diaphragm	7.8	1.5 Torr	Low-Med. Vacuum
LS-RV-50	Rotary Vane	29	4 x 10 ⁻³ Torr	High Vacuum
LS-RV-50BST	Rotary Vane with Roots Blower	220	4 x 10 ⁻³ Torr	High Vacuum & Capacity



9. Vacuum System Summaries

The following information summarizes vacuum system option specifications, benefits, features, and capabilities.

1. VS-1 (All Units)

- a. All vacuum system piping and connections increased in diameter to KF40 and KF50 where applicable to increase molecular conductivity under vacuum as well as increase vacuum efficiency.
- b. Vacuubrand MD12-NTC dry diaphragm vacuum pump:
 - i. 8 heads, 7.8 cfm, 1.5 Torr ultimate vacuum, KF-25 Inlet
 - ii. This pump is used for the first stage of 2 and 3-stage systems, and utilized for first passes on single stage systems.
 - iii. System pressure is controlled via the PAR-C controller, which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
 - iv. This pump and controller are utilized to accurately and precisely remove volatile compounds such as residual solvent, water, terpenes, and other low-boiling point compounds from feed material while not evaporating cannabinoids.
 1. This allows the next pass (single stage units) or next stage (2 or 3-stage units) to achieve higher vacuum levels; thus, reducing the boiling point of cannabinoids to achieve higher potencies, better color, and reduced odor of cannabinoid distillates.
- c. Lab Society RV-50 rotary vane vacuum pump:
 - i. 28.3 cfm, 4×10^{-3} ultimate vacuum, KF-40 Inlet



- ii. This pump is used for the second and/or third stage of 2 and 3-stage systems, and utilized for second/third passes on single stage systems.
- iii. System pressure is controlled via the PAR-C controller (single and 3-stage units), which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
- iv. This pump is utilized for cannabinoid distillation passes (single stage) or high-vacuum distillations on 2 and 3-stage units.
- v. PVM-3 Vacuum monitoring system gives up to three (3) points of vacuum monitoring on 2 and 3-stage systems to accurately monitor system pressure as well as pump pressure.

2. VS-2 (All Units)

- a. All vacuum system piping and connections increased in diameter to KF40 and KF50 where applicable to increase molecular conductivity under vacuum as well as increase vacuum efficiency.
- b. Vacuubrand MD12-NTC dry diaphragm vacuum pump:
 - i. 8 heads, 7.8 cfm, 1.5 Torr ultimate vacuum, KF-25 inlet
 - ii. This pump is used for the first stage of 2 and 3-stage systems, and utilized for first passes on single stage systems.
 - iii. System pressure is controlled via the PAR-C controller, which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
 - iv. This pump and controller are utilized to accurately and precisely remove volatile compounds such as residual solvent, water, terpenes, and other low-boiling point compounds from feed material while not evaporating cannabinoids.
 - 1. This allows the next pass (single stage units) or next stage (2 or 3-stage units) to achieve higher vacuum levels; thus,



reducing the boiling point of cannabinoids to achieve higher potencies, better color, and reduced odor of cannabinoid distillates.

- c. Lab Society RV-50 rotary vane vacuum pump **(3-stage only)**:
 - i. 28.3 cfm, 4×10^{-3} ultimate vacuum, KF-40 Inlet
 - ii. This pump is used for the second of 3-stage systems.
 - iii. System pressure is controlled via the PAR-C controller, which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
 - iv. This pump is utilized for cannabinoid distillation passes (single stage) or high-vacuum distillations on 2 and 3-stage units.
- d. PVM-3 Vacuum monitoring system gives up to three (3) points of vacuum monitoring on 2 and 3-stage systems to accurately monitor system pressure as well as pump pressure.
- e. Lab Society RV-50 Boost, rotary vane vacuum pump with mounted roots blower:
 - i. RV-50: 28.3 cfm, 4×10^{-3} ultimate vacuum, KF-40 Inlet. Roots Blower:
 - ii. This pump is used for the second stage of 2-stage distillation units and for the third stage of 3-stage systems. On single stage units, this pump is used for second or third passes.
 - 1. On 3-stage systems, a standard RV-50 is utilized on the second stage with a PAR-C to accurately control the vacuum pressure without evaporating cannabinoids.
 - iii. System pressure is controlled via the PAR-C controller (single and 3-stage units), which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
 - iv. This pump is utilized for cannabinoid distillation passes (single stage) or high-vacuum distillations on 2 and 3-stage units.



- v. PVM-3 Vacuum monitoring syst
- vi. em gives up to three (3) points of vacuum monitoring on 2 and 3-stage systems to accurately monitor system pressure as well as pump pressure.

3. VS-3 (2 and 3-Stage Units Only)

- a. All vacuum system piping and connections increased in diameter to KF40 and KF50 where applicable to increase molecular conductivity under vacuum as well as increase vacuum efficiency.
- b. Vacuubrand MD12-NTC dry diaphragm vacuum pump (3-stage only):
 - i. 8 heads, 7.8 cfm, 1.5 Torr ultimate vacuum, KF-25 Inlet
 - ii. This pump is used for the first stage of 3-stage systems.
 - iii. System pressure is controlled via the PAR-C controller, which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
 - iv. This pump and controller are utilized to accurately and precisely remove volatile compounds such as residual solvent, water, terpenes, and other low-boiling point compounds from feed material while not evaporating cannabinoids.
 - 1. This allows the next stage of 3-stage units to achieve higher vacuum levels; thus, reducing the boiling point of cannabinoids to achieve higher potencies, better color, and reduced odor of cannabinoid distillates.
- c. Lab Society RV-50 rotary vane vacuum pump (**2-stage only**):
 - i. 28.3 cfm, 4×10^{-3} ultimate vacuum, KF-40 Inlet
 - ii. This pump is used for the first stage on 2-stage systems.
 - iii. System pressure is controlled via the PAR-C controller (single and 3-stage units), which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.



- iv. This pump is utilized for high-vacuum distillations on first stages for extremely degassed feed materials
- d. Lab Society RV-50 Boost, rotary vane vacuum pump with mounted roots blower:
 - i. RV-50: 28.3 cfm, 4×10^{-3} ultimate vacuum, KF-40 Inlet. Roots Blower:
 - ii. This pump is used for the second stage of 2-stage distillation units and for the second and third stages of 3-stage systems.
 - 1. On 3-stage systems, a secondary RV-50 booster pump is utilized on the second stage with a PAR-C to accurately control the vacuum pressure without evaporating cannabinoids.
 - iii. System pressure is controlled via the PAR-C controller (single and 3-stage units), which features a compound pressure sensor for controlling vacuum from 20mTorr to 700 Torr accurately and precisely via an electric isolation valve.
 - iv. This pump is utilized for high-vacuum distillations on 2 and 3-stage units.
 - v. PVM-3 Vacuum monitoring system gives up to three (3) points of vacuum monitoring on 2 and 3-stage systems to accurately monitor system pressure as well as pump pressure.



10. System Advantages Summary

Single Stage Units:

Utilizing a single stage distillation unit requires multiple passes through the unit to achieve sellable product. Each pass through the machine requires different operational parameters including temperature, pressure, and speed. The dual-pump manifold gives users the ability to run volatile and/or heads stripping passes with a dry vacuum pump coupled with a pressure controller. This provides the ability to set precise pressures alongside temperatures to make stripping passes optimal and most effective.

After the feed product has been thoroughly stripped and prepped for final, heavy compound distillation, users can clean the system and then utilize the rotary vane pump assembly to reach high vacuum levels effectively without disassembly of the unit. This greatly improves the operational simplicity of the units as well as flexibility to perform various distillation types within one machine.

2-Stage Advantage:

Having multiple stages reduces the need for multiple passes when material is properly prepared for the system by utilizing two (2) stages of short path distillation; thus, continuously collecting two (2) distillate fractions and one (1) residue fraction. The first stage is run at higher pressure (low to medium vacuum) and lower temperature to gently or aggressively remove low to medium boiling point compounds. The second stage is run at high vacuum and higher temperature to achieve proper separation of compounds.

The first evaporator/stage features a high vacuum/high capacity dry vacuum pump and precision compound pressure gauge with pressure control system to give users the ability to run the system at selectable pressures and vacuum depths. Both



stages may be operated at higher pressures to gently remove low boiling point compounds, such as terpenes. For precise heavy compound distillation, the system may be reconfigured to run at standard operational parameters (high vacuum) to precisely cut into feed for desired compounds.

The second stage is separated from the first stage via mechanical seal. This allows the second evaporator/stage to be run at significantly higher vacuum levels via high capacity rotary vane technology. The bore size of all vacuum fittings has been standardized to 40-50mm, increasing molecular conductivity as well as vacuum performance. Other vacuum system configurations* feature booster pumps to maintain vacuum depths and overcome pressure increases.

3-Stage Advantage:

[Detailed information coming soon]



11. Feed Tank Options (3-Stage Distillation Units Only)

[Information coming soon]

12. Lobe Pump Upgrades (0.6m² Distillation Units Only)

1. Replacement for gear pumps (standard) with long-lasting, easy maintenance lobe pumps
 - a. Easy to CIP
 - b. Non-contacting internal mechanism for minimal wear
 - c. Substantially longer lifetime, reduced down-time

13. Clean-In-Place (CIP) Kits

[Information coming soon]

14. Spare Parts Kits

[Information coming soon]