



# COMMERCIAL CO<sub>2</sub> EXTRACTION SYSTEMS

## LABORATORY QUALITY, INDUSTRIAL RESULTS

**PREPARED FOR:**



DATE: May 2, 2019



## VITALIS EXTRACTION: FEATURE SET & OVERVIEW

LiquidTec™	Vitalis LiquidTec™ combines storage, super-cooling, filtration and new pump technologies to achieve a SFE system with industry-leading flow capacity.
100% Duty Cycle	All parts and components of the Vitalis SFE Systems have been created with targeted 24/7 operation in mind. Further, intelligent design means consumables are quick and easy to replace, maximizing equipment runtime and overall efficiency.
Independent Vessel Control	With independent temperature and pressure control across the pressure vessels, the operator can optimize the extraction and separation process to give fine-tuned profiles in their products. Operation parameters also provide a wide range of extraction conditions for research and development of new products as market demands evolve.
Phase Management	Precise phase control of solvent CO <sub>2</sub> is important when conducting selective extractions. The Vitalis extraction equipment incorporates a phase management system into the extraction process, controlling phase outside of the extraction vessel. This provides absolute control over extraction parameters, allowing the operator to target specific compounds and ensuring that extractions are consistent.
Advanced Separation Technology	The team at Vitalis has focused an immense amount of time and resources toward optimizing the separation process. As a result, the Vitalis systems can preform at very low separation pressures and temperatures, helping to capture fragile terpenes and create an extract rich in flavor and aroma.
High Flow	The Vitalis LiquidTec15™ pump has throughput capacity of up to ~15 kilograms of liquid CO <sub>2</sub> per minute (~900 kilograms per hour).
Vortex Vacuum Generator	The Vitalis vortex vacuum generator is used to create a vacuum within the extraction chamber(s) to help reseal the chamber caps after loading and cleaning.
Parallel Separation Systems	Vitalis SFE Systems boast multiple separation lines, allowing the operator to conduct separate fraction collections for a given extraction run. This feature can also be employed to maintain operations along one flow path while scheduled maintenance is conducted on the other. Together, these features equate to advanced selectivity in extraction and optimized efficiency of system operations.
Ease of Use	Quick Closure Clamps have been chosen for the Vitalis pressure vessels to ensure quick access for maintenance and change-overs.
Thermal Optimization	The Vitalis SFE Systems feature a quick start-up procedure; supercritical parameters can be reached in less than 5 minutes.
HMI & Automated Controls	The Vitalis SFE Systems allow the operator to set temperatures and control pressures from the Human Machine Interface (HMI). This automation helps maintain stable conditions during extraction, limiting variations and spikes. The HMI also collects 21 data points at sensors along the machine, providing analytical reports on batch temperatures and pressures over the course of the extraction and separation cycle. These reports are useful for quality control and product creation.
Closed Loop CO <sub>2</sub> Recirculation	CO <sub>2</sub> used for extraction in the Vitalis SFE System is recovered following each run of the machine. Flow through Vitalis' proprietary CO <sub>2</sub> purification process ensures moisture and any leftover organic material is scrubbed from the CO <sub>2</sub> . This economic and environmentally-friendly process means clean solvent for each and every high-efficiency extraction.



# VITALIS

EXTRACTION TECHNOLOGY

# R-SERIES

R-200-S | R-200-HP | R-400-S | R-400-HP

## CERTIFICATIONS & COMPLIANCE

ASME-U / NB  
CUL / UL  
CSA-CRN



## PHYSICAL SPECIFICATIONS

### R-200-S

System weight:  
8,300 lbs (3,900 kg)  
Footprint:  
24' x 21' x 14'  
Power requirements:  
460 V / 3 Phase  
60 Hz, 115 A

### R-200-HP

System weight:  
9,500 lbs (4,300 kg)  
Footprint:  
24' x 21' x 14'  
Power requirements:  
460 V / 3 Phase  
60 Hz, 95 A



## PUMP

15 kg/min CO<sub>2</sub>  
Positive displacement pump  
Liquid CO<sub>2</sub>  
Low maintenance  
Quick changeover piston seals



## EXTRACTION

Vessel volume: 100 L  
Number of vessels: capacity for 2  
vessels per assembly, total volume of 200 L  
two assemblies can run in tandem, total 400 L  
Extraction temperature range:  
35 - 150 °F (1 - 66 °C)  
Extraction pressure range:  
R-200-S                      R-200-HP  
0 - 3,000 psi                0 - 5,000 psi



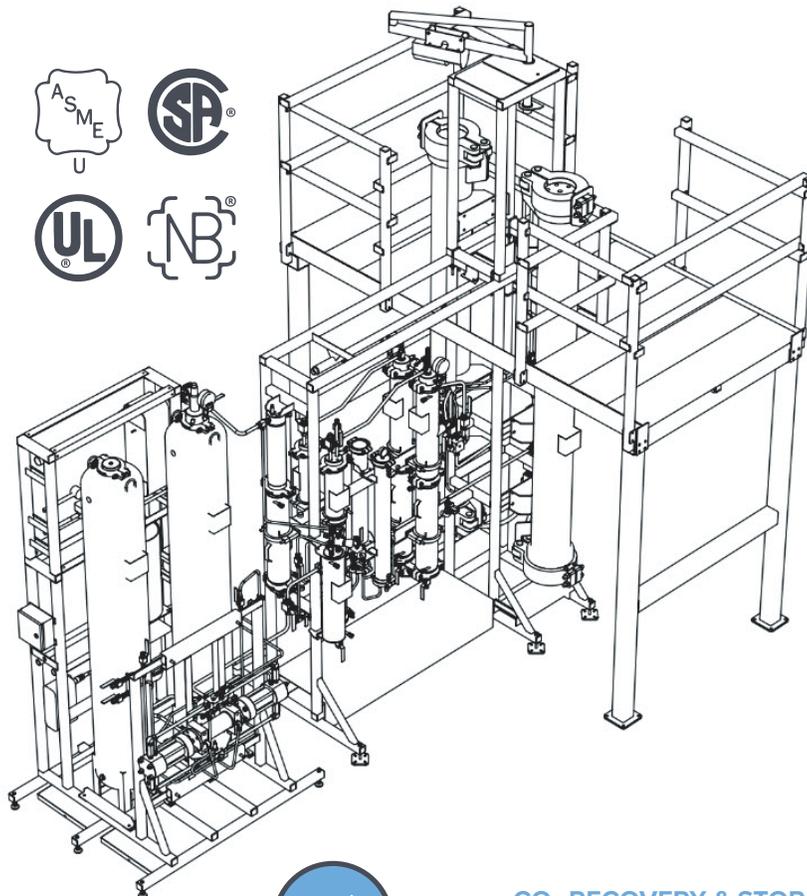
## SEPARATION & COLLECTION

Dual separation lines  
2 cyclonic separators  
2 flash separators  
20 µm secondary separation filter  
Separation temperature range:  
40 - 100 °F (4 - 38 °C)  
terpene profile retention



## CONTINUOUS OPERATION

Dual extraction chambers  
Dual separation lines  
Clog-free operation  
Quick-closure clamps on pressure vessels



## CO<sub>2</sub> RECOVERY & STORAGE

Number of vessels: 2  
Vessel volume (each): 140 L liquid CO<sub>2</sub>  
CO<sub>2</sub> recovery and recycling  
High-efficiency plated heat exchanger



## CONTROL PANEL

Touch screen  
Real-time monitoring with  
multiple data points  
Independent vessel control  
Cloud / Wi-Fi / ethernet  
Live batch recording and data analytics



## WARRANTY

Lifetime warranty on pressure vessels  
One-year extendable warranty on all  
other components  
Advanced Unit Replacement Program  
Next-business-day part replacement

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Vitalis Extraction Technology



@VitalisExtractionTech



VitalisET.com



## CERTIFICATIONS

Vitalis Extraction Systems are designed and manufactured to meet highest-level industry standards.



### American Society of Mechanical Engineers (ASME)

ASME is the leading international developer of codes and standards associated with the art, science, and practice of mechanical engineering. Under ASME conformity assessment programs a company is assessed and certified based on demonstrated ability to meet the requirements of an ASME standard.

Vitalis is ASME certified to the following codes of construction:  
**ASME BPV Section VIII Div. 1** (Pressure Vessels)  
**ASME B31.3** (Piping)

All Vitalis code pressure vessels are stamped with the ASME Certification Mark.



### Canadian Registration Number (CRN) / Canadian Standards Association (CSA)

The Canadian Registration Number (CRN) system is a provincially regulated program for reviewing and registering the design of pressure vessels, piping systems and pressure retaining fittings. The system is governed by the general **CSA B51** standard, but every jurisdiction adds their own specific rules to make the standard enforceable.

Vitalis holds current certification and licensing with our local jurisdictional AIA (Authorized Inspection Agency) for the scope of **CSA B51**.

All Vitalis pressure vessels, piping systems and fittings hold valid **CRNs** for operation in Canada.



### National Board

The National Board of Boiler and Pressure Vessel Inspectors (NB) represents states, cities, and provinces in the enforcement of pressure equipment laws and regulations. ASME code vessels operating in the US require registration with NB. Registered vessels are assigned a unique NB number on the vessel nameplate.

Vitalis holds a current **Certificate of Authorization** to register all vessels with the National Board for operation in the United States.

Vitalis also holds an **"R" Stamp** certification with the National Board for repair and alteration of NB registered vessels in accordance with the **NBIC** (National Board Inspection Code).



### Good Manufacturing Practice (GMP)

Good Manufacturing Practices are a set of guidelines that provide guidance for manufacturing, testing, and quality assurance in order to ensure that a manufactured product is safe for human consumption or use. The guidelines provide minimum requirements to ensure products are consistent in quality, from batch to batch, for their intended use.

Vitalis offers a GMP add-on package providing all required components to make systems GMP-compliant.



### Pressure Safety Inspectors, LLC

PSI provides state-level engineering peer review of solvent-based extraction systems, that is, independent, third-party design verification of an entire piece of extraction equipment. Successfully-reviewed systems are issued a model number and considered safe for use, including adherence to the following codes:

- International Fire Code 2018, NFPA 1 Fire Code, 2018 Edition
- NFPA 55 Compressed Gases and Cryogenic Fluids Code, 2013 Edition
- NFPA 58 Liquefied Petroleum Gas Code 2017 Edition
- ASME Boiler and Pressure Vessel Code, Section VIII, 2017
- ASME B31.3 Process Piping, 2012

Vitalis SFE systems have been successfully reviewed by PSI.

All Vitalis equipment bears a model number for reference to this certification, located, per requirements, on the equipment's name plate.

## THE VITALIS DIFFERENCE

<p>Research &amp; Development</p>	<p>Identifying a unique opportunity to contribute profound improvements in the field of extraction technology, Vitalis entered the industry, designing a machine purpose-built to handle the industrial-level demands of the fast-growing cannabis arena.</p> <p>Within the first six months of operation, Vitalis Engineering filed 18 unique claims on new technology developed to create an extraction system that stands alone in quality construction and industrial capacity.</p> <p>Ingenuity at Vitalis continues today, supported by a team of engineers, scientists and operation specialists all committed to excellence. Together spanning many different industries and fields of expertise, their dedication to their work brings unsurpassed support to their clients and best practices to the cannabis industry.</p>
<p>Sustained Multiphase Extraction</p>	<p>Though there are many options for extracting plant material, none offer greater food-safety compliance, target compound specificity and overall versatility than Vitalis supercritical fluid extraction systems.</p> <p>There are two phases of CO<sub>2</sub> commonly used in the extraction process: liquid and supercritical fluid. Liquid CO<sub>2</sub> is able to dissolve and carry industry-relevant compounds and represents a desirable option for targeting delicate terpenes. As CO<sub>2</sub> moves into supercritical phase, it adopts the diffusivity of a gas, while still maintaining the solvent power of a liquid. These characteristics allow the supercritical-CO<sub>2</sub> to move easily across space and into the pores of a material, coaxing target compounds from the plant matrix for isolation. This provides faster extraction rates and access to the entire terpene and cannabinoid profiles.</p> <p>The Vitalis SFE Systems allow the operator to first run a subcritical extraction, allowing a more selective isolation of their target terpenes, followed by a supercritical extraction, ensuring all useful compounds are extracted from their cannabis material. Further, they provide industry-leading supercritical flow to maximize clients' yields and commercial productivity, including options to extract at very high pressures.</p>
<p>Modular and Expandable</p>	<p>Leverage your existing investment to expand your processing capabilities as your organization grows. The Vitalis Q-Series SFE System has a base capacity of 45 L, expandable up to 180 L; the R-Series begins with 200 L of extraction capacity, expandable to 400 L.</p>
<p>Customer Service &amp; Support</p>	<p>Well-known in the industry for providing outstanding customer service and support, Vitalis' commitment to its customers is second to none. Vitalis goes above and beyond to ensure success at your facility, following through steps of pre-commissioning, commissioning, on-site training and 7-day-a-week service and technical support. Additionally, our one-year limited warranty on equipment, and lifetime warranty on pressure vessels will provide piece of mind for your operation. From your first visit to our facility, through final set-up of yours, and forward to your success, Vitalis is with you every step of the way.</p>



Once you've purchased a Vitalis Extraction System, you'll be connected with our project implementation team who will manage your Vitalis project from Order to Commissioning.

**Here is what the implementation plan for your system will look like:**

## **PHASE 1: PRE-INSTALL**

- ▶ Project kick-off and assignment to a Vitalis Implementation Project Coordinator
- ▶ Review pre-installation documentation
  - ▶ Electrical
  - ▶ Plumbing
  - ▶ Refrigeration
  - ▶ Facility
- ▶ Review key milestones and project timelines
- ▶ Confirm site layout and building dimensions

## **PHASE 2: DELIVERY & INSTALLATION**

- ▶ Vitalis arranges delivery of the following:
  - ▶ Navien Tankless hot water heater (week 2)
  - ▶ Refrigeration unit (week 3)
  - ▶ Extraction unit (week 8)
- ▶ Video walkthrough with Vitalis Project Coordinator
- ▶ Meeting with the Trades:
  - ▶ Vitalis Project Coordinator & Trades call to ensure clarity and open communication
- ▶ On-site personnel and Trades complete the following:
  - ▶ Unpack and place the machine assemblies
  - ▶ Mount and vent the boiler
  - ▶ Plumb the refrigeration unit
  - ▶ Source specified ancillary equipment
  - ▶ After extractor delivery, connect electrical, refrigeration, and plumbing
  - ▶ Run electrical for the Extraction Unit and Refrigeration Unit
- ▶ Video walkthrough with Vitalis Project Coordinator
  - ▶ Verify equipment placement and interconnections
  - ▶ Resolve any potential deficiencies
- ▶ Schedule Vitalis Commissioning team

## **PHASE 3: COMMISSIONING & TRAINING**

- ▶ Vitalis Service Technician arrives on site
  - ▶ Day 1: Connecting CO<sub>2</sub> lines, sensors, and cables
  - ▶ Day 2: Pressure testing and the start of training
  - ▶ Day 3-5: Continued training, and start extracting

## **PHASE 4: ONGOING SUPPORT**

- ▶ Access to 24/7 Vitalis Technical Support team
- ▶ 30 to 45-day on-site follow-up
  - ▶ 2 days additional training and Q&A



## Quotation # S-2409

DESCRIPTION	QUANTITY	UNIT PRICE	TAXES	PRICE
[R200HA-GMP] EXTRACTION SYSTEM, R-SERIES, 200L, 5000psig, ANGLED EXT GMP Vitalis 200L Extraction System: 2 x 100L Extraction Vessels rated at 5,000 psi, Angled Mounting 1 x 15HP Power unit 1 x Control System 1 x Super-Cooling Refrigeration Package 1 x Vitalis LiquidTec15™ Pump System 2 x Heat Exchange Assembly 2 x 140L CO2 Accumulator 2 x Cyclonic (Primary) Separators 2 x Secondary Separators 1 x Tankless Gas Water Heater 1 x CO2 Purification Vessel 1 x CO2 Condenser 1 x Consumables Kit Commissioning & Training GMP Package includes: Mass Flowmeter Sensor and Gauge Package (including Certificates of Calibration) Documentation (including IQ/OQ) Commissioning (extra time on site to complete System Qualification) GMP Software Package	1.000 Unit(s)	1,043,082.30		\$ 1,043,082.30

<b>Total Without Taxes</b>	\$ 1,043,082.30
<b>Total</b>	\$ 1,043,082.30

Currency in: CAD

Plus Applicable Taxes

Quotation valid for 30 days

Milestone Payments

50% Deposit

50% Due on Offer to Ship (Payment must be received prior to unit shipment)



# **Q-SERIES & R-SERIES**

Q-45 | Q-90 | Q-180      R-100 | R-200 | R-400

## **EXTRACTION SYSTEM SPECIFICATIONS**

**Date: April 2019**

**Revision: 00**

# TABLE OF CONTENTS

EXTRACTION & SEPARATION SYSTEM .....	3
POWER UNIT ASSEMBLY .....	5
HEAT EXCHANGE AND TEMPERATURE CONTROL SYSTEM.....	6
ACCUMULATOR AND PUMP ASSEMBLY .....	7
REFRIGERATION SYSTEM .....	8
VITALIS EXTRACTION SYSTEM STATISTICS .....	9
EXTRACTOR ASSEMBLY .....	10
ACCUMULATOR/PUMP ASSEMBLY .....	11
HYDRAULIC POWER UNIT .....	12
CONTROL BOARD ASSEMBLY .....	13
NAVIEN NPE-240S TANKLESS GAS WATER HEATER.....	14
REFRIGERATION UNIT .....	15

# EXTRACTION & SEPARATION SYSTEM

An assembly of vessels including dual separation lines and high capacity extraction vessels with expansion capabilities. The solubility and mass transfer of target compounds in the subcritical and supercritical CO<sub>2</sub> will determine the operating conditions for an extraction; the pressure and temperature conditions of extraction and separation can greatly influence the quality and composition of the final extracts and oil.

## EXTRACTION VESSEL

	Q-Series						R-Series			
	Standard			High-Pressure			Standard		High-Pressure	
	Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
<b>Description</b>	Dual high-pressure extraction vessels with quick-connect clamp and plug assembly									
<b>Mechanism</b>	Immersion of plant material in supercritical CO <sub>2</sub> solubilizes desired components and facilitates mass transfer of target compounds									
<b>Vessel Weight</b>	950 lbs (430 kg)			1,300 lbs (590 kg)			1,380 lbs (625 kg)		1,950 lbs (885 kg)	
<b>Vessel Dimensions</b>	H: 60 in × W: 12 in (H: 154 cm × W: 30 cm)						H: 110 in × W: 12 in (H: 279 cm × W: 30 cm)			
<b>Vessel Material</b>	Extractors: nickel-plated carbon steel Extractor caps: 304/304L stainless steel									
<b>Closure</b>	Hinged clamps with 40 lb (18 kg) stainless steel plug; air-assisted closure mechanism									
<b>Vessel Volume</b>	1 × 45 L	2 × 45 L	4 × 45 L	1 × 45 L	2 × 45 L	4 × 45 L	2 × 100 L	4 × 100 L	2 × 100 L	4 × 100 L
<b>Vessel Capacity</b>	Density dependent: ~28.0 lbs (12.6 kg) at 0.28 kg/L						Density dependent: ~60.0 lbs (27.2 kg) at 0.28 kg/L			
<b>Operating Pressure Range</b>	0 to 2,950 psi (0 to 203 bar)			0 to 4,950 psi (0 to 341 bar)			0 to 2,950 psi (0 to 203 bar)		0 to 4,950 psi (0 to 341 bar)	
<b>Operating Temperature Range</b>	35 to 155 °F (1.7 to 68 °C)			51 to 135 °F (11 to 57°C)			35 to 155 °F (1.7 to 68 °C)		51 to 135 °F (11 to 57°C)	
<b>Time to Reach Operating Temperature</b>	7 minutes to attain 130 °F (54 °C) at 2,100 psi (145 bar)			35 minutes to attain 130 °F (54 °C) at 2,100 psi (145 bar)			7 minutes to attain 130 °F (54 °C) at 2,100 psi (145 bar)		35 minutes to attain 130 °F (54 °C) at 2,100 psi (145 bar)	
<b>Inlet Cap</b>	Flow dispersion geometry and interchangeable filter element									
<b>Discharge Cap</b>	Flow-condensing geometry and interchangeable filter element									
<b>Safety</b>	ASME VIII Pressure Safety Valve									
<b>Certification</b>	ASME (Section VIII Division 1, BPE, Section IX), CSA-CRN									

## SEPARATION AND FILTRATION VESSELS

	Primary Separator	Secondary Separator	High Purity Gas Filter System
<b>Description</b>	First level with TrueCyclonic™ separation, water jackets and independent temperature controls	Second level separation with internal 20-micron filtration, water jacket, and independent temperature controls	Scrubbing mechanism for removing leftover compounds and water vapor from the gas stream
<b>Mechanism</b>	Cyclonic separation induced through pressure drop at flow path restriction point, causing extractant phase transition	Turbulent injection over high-surface-area coalescing filtration	Turbulent injection over high-surface-area coalescing filtration
<b>Pressure Drop</b>	Controlled via needle injection manifold with stream flow and directional control	N/A	N/A
<b>Vessel Material</b>	304/304L stainless steel	304/304L stainless steel	304/304L stainless steel
<b>Collection Vessel Capacity</b>	5 L	5 L	3 L
<b>Total Vessel Length</b>	60-1/4 in (153 cm)	52-3/16 in (134 cm)	50-13/16 in (129 cm)
<b>Closure</b>	ASME VIII Sanitary Tri-Clamp	ASME VIII Sanitary Tri-Clamp	ASME VIII Sanitary Tri-Clamp
<b>Operating Pressure Range</b>	0 to 740 psi (0 to 51 bar)	0 to 740 psi (0 to 51 bar)	0 to 740 psi (0 to 51 bar)
<b>Operating Temperature Range</b>	40 to 120 °F (4.4 to 49 °C)	40 to 120 °F (4.4 to 49 °C)	60 to 130 °F (16 to 54 °C)
<b>Time to Reach Operating Temperature</b>	4 minutes to attain 65 °F (18 °C) at 600 psi (41 bar)	4 minutes to attain 65 °F (18 °C) at 600 psi (41 bar)	N/A
<b>Filtration</b>	N/A	10-micron stainless steel sintered filter element	0.01-micron coalescing filter
<b>Safety</b>	Automatic pressure relief valve preventing over-pressurization	Automatic pressure relief valve preventing over-pressurization	Automatic pressure relief valve preventing over-pressurization
<b>Certification</b>	ASME (Section VIII Division 1, BPE, Section IX), CSA-CRN	ASME (Section VIII Division 1, BPE, Section IX), CSA-CRN	ASME (Section VIII Division 1, BPE, Section IX), CSA-CRN

## EXTRACTION AND SEPARATION SYSTEM OUTPUT

<b>Description</b>	Selecting plant material high in essential oil or a high-yielding oil strain will maximize yields in oil extraction. When CO <sub>2</sub> is passed through the plant material, desired components are dissolved in CO <sub>2</sub> , allowing a concentrated oil to be obtained; the concentrates can be precipitated out by transitioning the CO <sub>2</sub> from liquid to gaseous phase in the separation vessels.
<b>Variable factors</b>	Input: Particle size, shape, surface area, porosity, moisture level and material composition Operation: Temperature, pressure, and flow rate

## VALVE AND DIVERTER ASSEMBLY

<b>Description</b>	Allows the operator to select a separation series flow path
<b>Mechanism</b>	Manual valve closure
<b>Diverter Options</b>	Extraction Vessel by-pass for preventative maintenance Dual Separation lines for optimized workflow efficiency
<b>Auxiliary Port</b>	Use of compressed air to create a vacuum for purging the extraction vessels, separation vessels and system lines of air
<b>Process Piping</b>	¾" process tubing and hoses to reducing clogging and cleaning intervals

## PRESSURE TUBING

<b>Piping Material</b>	316L stainless steel
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# POWER UNIT ASSEMBLY

Engineered to deliver the most reliable and streamline extraction experience; note that the Extraction System has a standard wiring configuration.

## HYDRAULIC POWER UNIT

<b>Description</b>	Hydraulic pumps, a hydraulic control system, an automatic self-reversing flow control valve, a filtration system and a hydraulic heat exchanger
<b>Power</b>	15 HP (11 kW)
<b>Mechanism</b>	Hydraulic pump with dual-piston cylinders
<b>Ambient Temperature Range</b>	-4 to 104 °F (-20 to 40 °C) Note that if the Hydraulic Power Unit is being placed outdoors, it must be covered and not exposed to precipitation. Additionally, a remote operating system must be purchased from Vitalis. Ask your sales representative for pricing.
<b>Duty Cycle</b>	100%
<b>Noise Level</b>	75 dB
<b>Energy Efficiency</b>	Efficiency Certification number CC029A according to US Department of Energy Regulations
<b>Certification</b>	Verified by CSA, UL, and DOE

## ELECTRONIC CONTROL SYSTEM WITH PROCESS TRENDING ANALYTICS

	Q-Series		R-Series	
	Standard	High-Pressure	Standard	High-Pressure
<b>Description</b>	Custom-engineered electronic control system to optimize workflow and track system performance			
<b>Power Supply</b>	460 V, 3 Phase, 60 Hz			
<b>Minimum Circuit Amps</b>	50 A	30 A	50 A	30 A
<b>Enclosure</b>	NEMA 4 Enclosure, Stainless Steel			
<b>Operational Control</b>	HMI Touch Panel			
<b>Programing</b>	Customizable PID and PLC			
<b>Digital Inputs</b>	Pressure: 24 - 48 points; Temperature: 24 - 48 points; Flow; Batch Number; Run Time			
<b>Output</b>	Ethernet, HTML, CSV Log			
<b>Connectivity</b>	Cloud-, Wi-Fi-enabled			
<b>Control Board</b>	Vitalis Proprietary PLC			
<b>Data Analytics</b>	Unlimited batch recording			
<b>Certification</b>	CSA and UL listed			

# HEAT EXCHANGE AND TEMPERATURE CONTROL SYSTEM

Provides the heating capacity for eight independently controlled zones with high-efficiency heat exchangers aboard the Vitalis SFE Extraction System.

## CENTRIFUGAL PUMP

<b>Description</b>	Stainless steel, high efficiency pump
<b>Mechanism</b>	Close coupled, end suction, single stage, closed-impeller, back-pullout centrifugal pump
<b>Power</b>	1 HP
<b>Mass Flow Rate</b>	120 L/min
<b>Maximum Operating Temp</b>	212 °F (100 °C)
<b>Certification</b>	CSA, UL
<b>Maintenance</b>	No scheduled maintenance required

## ON DEMAND WATER HEATING SYSTEM

<b>Description</b>	Premium gas-condensing water heater with additional pump and water storage tank with integrated heat exchange for optimal thermal efficiency
<b>Gas Supply</b>	Natural gas or propane configuration
<b>Power Supply</b>	120 V AC, 60 Hz
<b>Heat Capacity</b>	19,900-199,900 BTU/H
<b>Efficiency Rating</b>	UEF 0.97
<b>Temperature Limit (Recommended)</b>	180 °F (82 °C)
<b>Energy Efficiency</b>	Energy Star
<b>Certifications</b>	AHRI Certification, CSA Certification, NSF Certification, ASME Certification
<b>Maintenance</b>	As outlined in Vitalis User Manual

# ACCUMULATOR AND PUMP ASSEMBLY

## VITALIS LIQUID PUMP

	Q-Series				R-Series			
	Standard		High-Pressure		Standard		High-Pressure	
<b>Description</b>	Proprietary pump engineered for maximum duty cycle and flow rates with oil-free operation							
<b>Mechanism</b>	Dual-piston							
<b>Power</b>	Double rod hydraulic cylinder							
<b>Noise Level</b>	63 dB							
<b>Mass Flow Rate</b> Based on CO <sub>2</sub> at 400 psi and 10 °F (-12 °C)	14.94 kg/min		11.89 kg/min		14.94 kg/min		11.89 kg/min	
<b>Safety</b>	Seal failure relief internal check valves							
<b>Certification</b>	ASME (Section VIII Division 1, BPE, Section IX), CSA-CRN							

## BACK-PRESSURE ASSEMBLY

<b>Description</b>	Provides consistent pressure drop with variable input pressures creating steady state flow and preventing freezing caused by depressurization
<b>Vessel Material</b>	304/304L stainless steel
<b>Operating Pressure Range</b>	0 to 2,000 psi (0 to 138 bar)
<b>Operating Temperature Range</b>	50 to 150 °F (10 to 66 °C)

## CO<sub>2</sub> ACCUMULATOR

	Q-Series						R-Series			
	Standard			High-Pressure			Standard		High-Pressure	
	Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
<b>Description</b>	Following each extraction, the extractant (CO <sub>2</sub> ) is scrubbed of aqueous and organic residues and stored in the CO <sub>2</sub> Accumulator for reuse									
<b>Vessel Material</b>	304/304L stainless steel									
<b>Capacity (Liquid CO<sub>2</sub>)</b>	1 × 100 L	2 × 100 L	4 × 100 L	1 × 100 L	2 × 100 L	4 × 100 L	2 × 140 L	4 × 140 L	2 × 140 L	4 × 140 L
<b>Operating Pressure</b>	0 to 740 psi (0 to 51 bar)									
<b>Operating Temperature</b>	-15 to 10 °F (-26 to -12 °C)									
<b>Safety</b>	ASME VIII Pressure Safety Valves									
<b>Certification</b>	ASME (Section VIII Division 1, BPE, Section IX), CSA-CRN									

## CONDENSING UNIT

<b>Description</b>	Alfa-Laval brazed plate heat exchanger unit used to condense gaseous CO <sub>2</sub> to liquid phase
<b>Surface Area</b>	More than 140 ft <sup>2</sup> (13 m <sup>2</sup> ) of cooling surface area

# REFRIGERATION SYSTEM

The Refrigeration System preforms cooling for the Vitalis Condensing Unit, facilitating the conversion of gaseous CO<sub>2</sub> back to liquid state for storage in the CO<sub>2</sub> Accumulator.

## REFRIGERATION UNIT 30 HP

<b>Description</b>	The condensing unit used in this refrigeration system is equipped with a heat exchanger utilizing a fan to cool and condense incoming refrigerant from vapor to liquid phase; it is also fitted with a compressor to pressurize the vapour and propel it through the cooling mechanism
<b>Power</b>	30 HP Compressor
<b>Operating Temperature of Refrigerant</b>	-20 °F (-29 °C)
<b>Unit Placement</b>	Outdoors (at side of building or on rooftop)
<b>Dimensions</b>	H: 42 in × W: 46 in × L: 151 in (H: 107 cm × W: 117 cm × L: 384 cm)
<b>Equipment Weight</b>	2065 lbs (936.7 kg)
<b>Power Supply</b>	460 V, 3 Phase, 60 Hz
<b>Minimum Circuit Amps</b>	66 A @ 460 V
<b>Duty Cycle</b>	100%
<b>Noise Level</b>	82 to 85 dB
<b>Energy Efficiency</b>	The sub-cooling loop provided in the condenser of the unit increases the system efficiency by 0.5% for each degree of sub-cooling provided, thereby making the compressor's job easier. As the outside air temperature decreases, head pressures are allowed to drop. This action results in increased efficiency, requiring less energy.
<b>Certification</b>	UL/CUL Listed

# VITALIS EXTRACTION SYSTEM STATISTICS

The Vitalis extraction system requires power, natural gas and carbon dioxide for operation.

## POWER REQUIREMENTS

	Q-Series						R-Series			
	Standard			High-Pressure			Standard		High-Pressure	
	Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
<b>Per Hour of Operation</b>	Up to 45 kWh									

## NATURAL GAS REQUIREMENTS

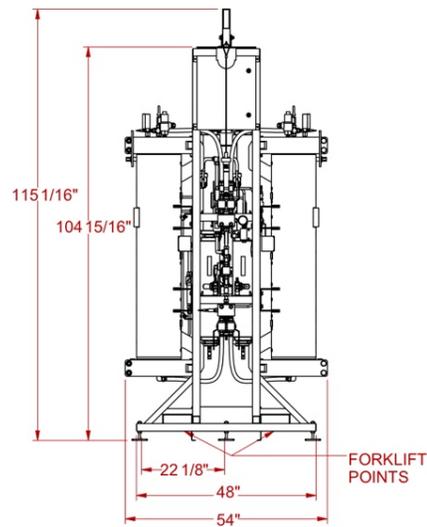
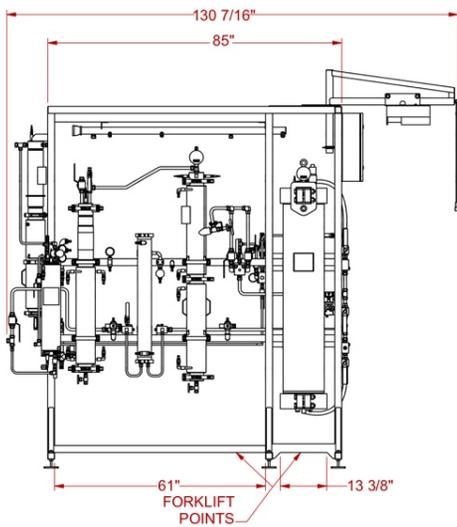
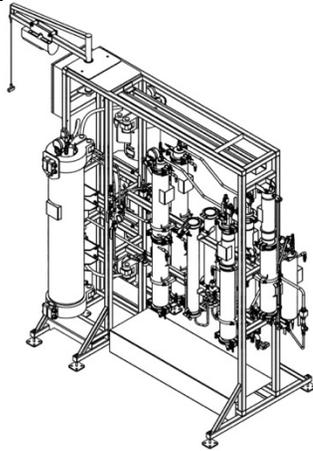
	Q-Series						R-Series			
	Standard			High-Pressure			Standard		High-Pressure	
	Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
<b>Per Hour of Operation</b>	0.30 cu.ft. (8.5 L)									

## CARBON DIOXIDE REQUIREMENTS

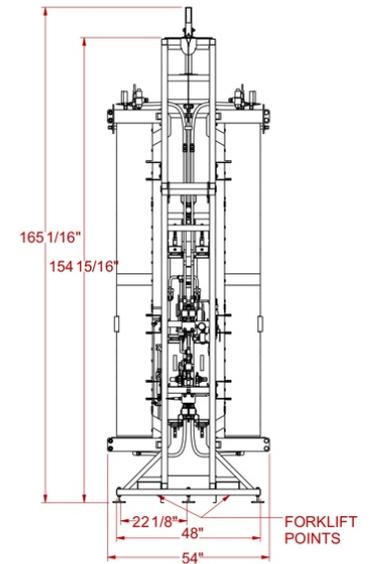
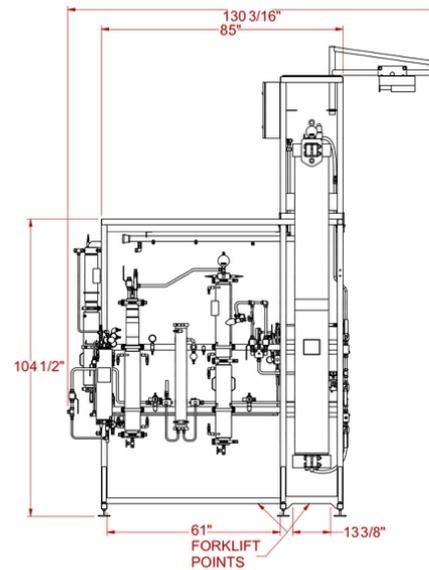
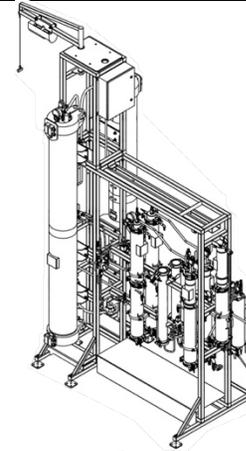
	Q-Series						R-Series			
	Standard			High-Pressure			Standard		High-Pressure	
	Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
<b>Initial Charge of System with CO<sub>2</sub></b>	123 kg	245 kg	489 kg	123 kg	245 kg	489 kg	276 kg	551 kg	276 kg	551 kg
<b>Loss per Extractor per Run</b> Based on CO <sub>2</sub> reclaimed to 500 psi at 70 °F (21 °C)	3.60 kg						6.88 kg			

# EXTRACTOR ASSEMBLY

Q-Series



R-Series



## DIMENSIONS/WEIGHTS (EMPTY)

Q-Series

Standard

High-Pressure

R-Series

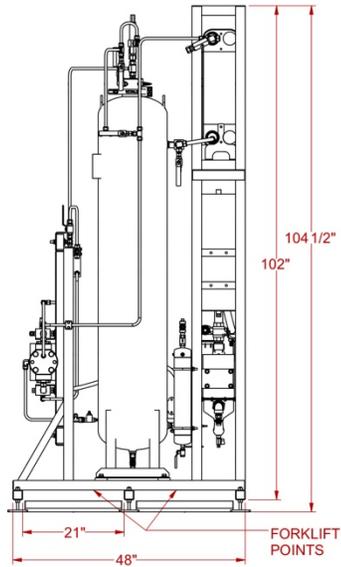
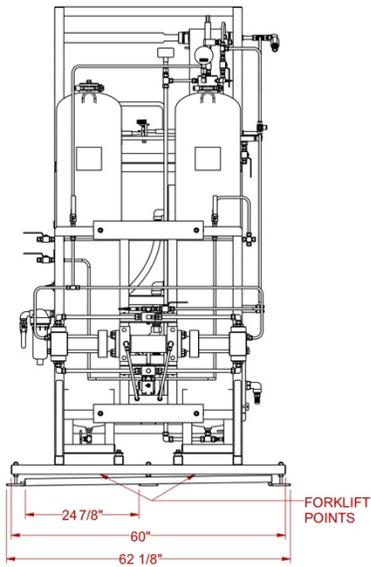
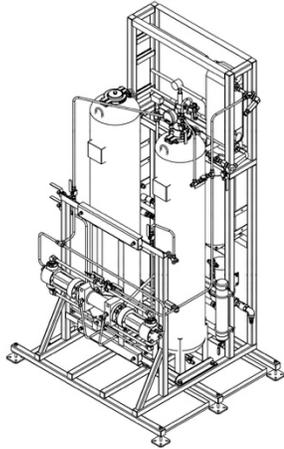
Standard

High-Pressure

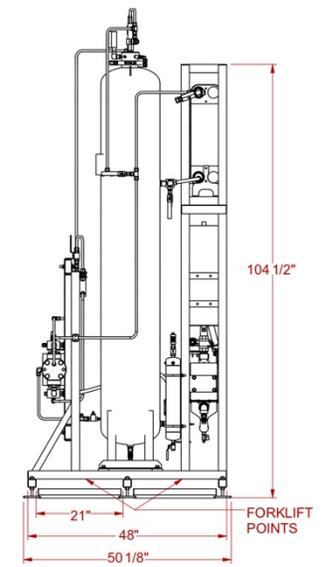
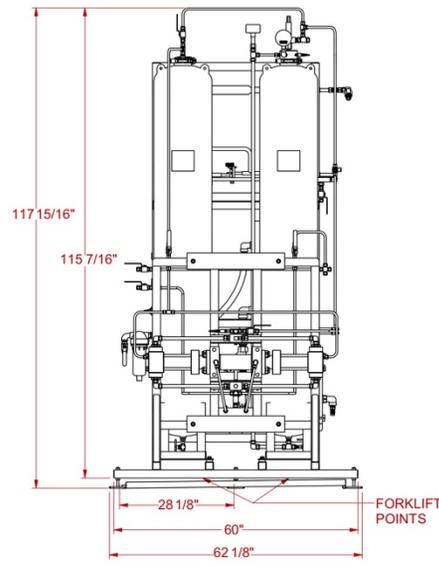
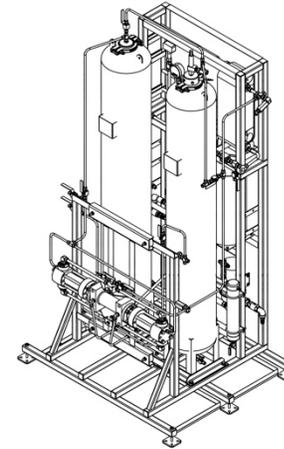
Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
2,460 lbs (1,120 kg)	3,430 lbs (1,560 kg)	6,860 lbs (3120 kg)	2,820 lbs (1,280 kg)	4,160 lbs (1,900 kg)	8,320 lbs (3,780 kg)	4,460 lbs (2,020 kg)	8,910 lbs (4,040 kg)	5,700 lbs (2,590 kg)	11,400 lbs (5,180 kg)

# ACCUMULATOR/PUMP ASSEMBLY

## Q-Series



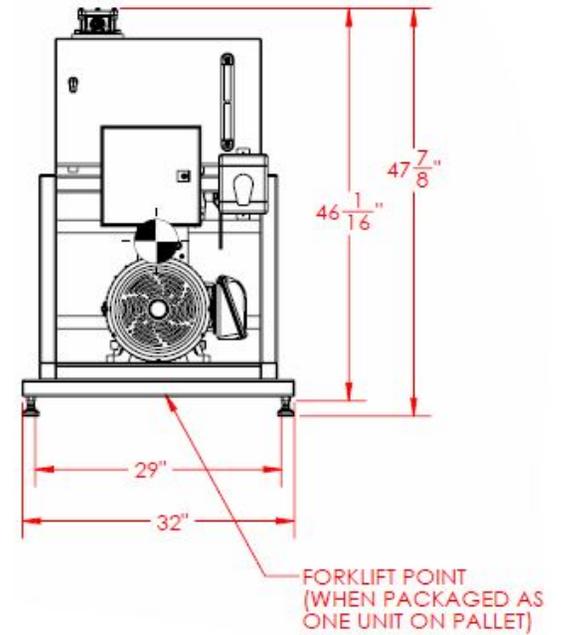
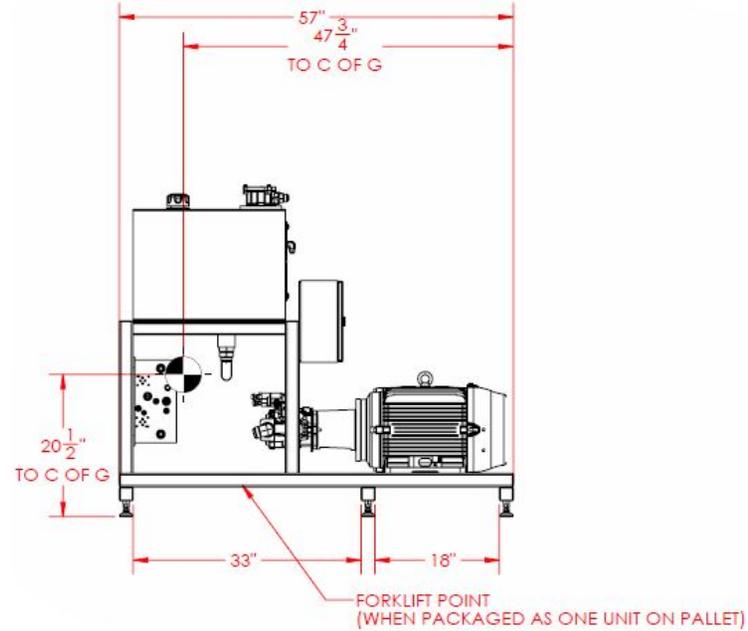
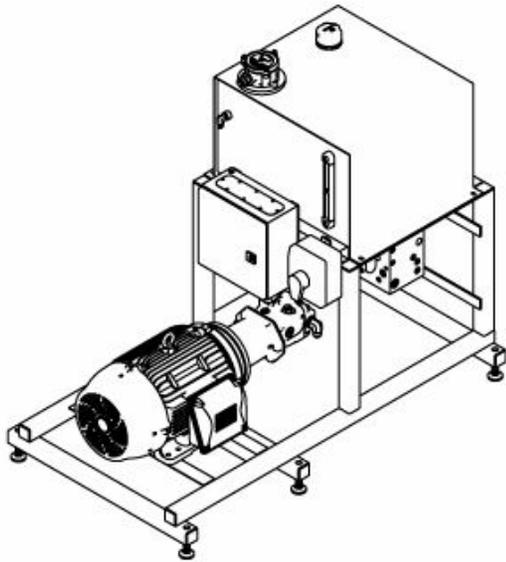
## R-Series



## DIMENSIONS/WEIGHTS (EMPTY)

Q-Series						R-Series			
Standard			High-Pressure			Standard		High-Pressure	
Q-45	Q-90	Q-180	Q-45	Q-90	Q-180	R-200	R-400	R-200	R-400
1,250 lbs (570 kg)	1,620 lbs (740 kg)	3,230 lbs (1,470 kg)	1,260 lbs (580 kg)	1,630 kg (740 kg)	3,250 lbs (1,480 kg)	1,830 lbs (830 kg)	3,660 lbs (1,660 kg)	1,850 lbs (840 kg)	3,600 lbs (1,640 kg)

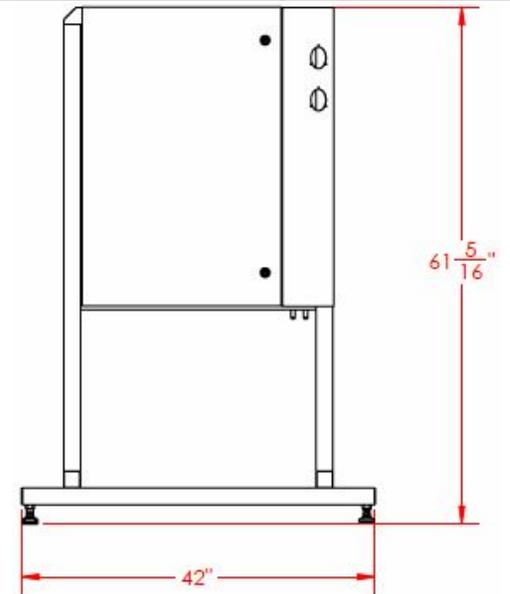
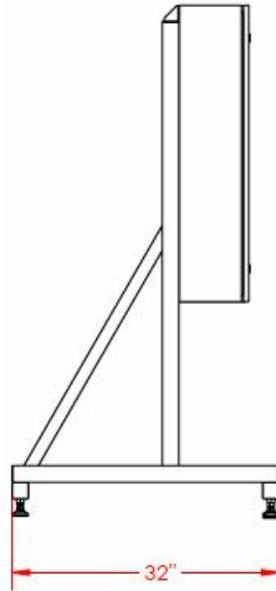
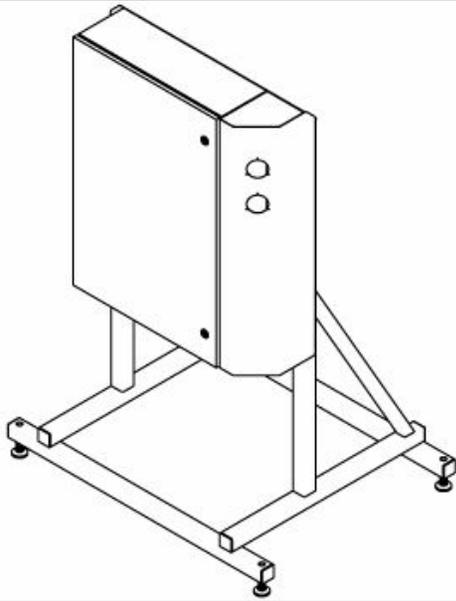
# HYDRAULIC POWER UNIT



## DIMENSIONS/WEIGHT

610 lbs (275 kg)

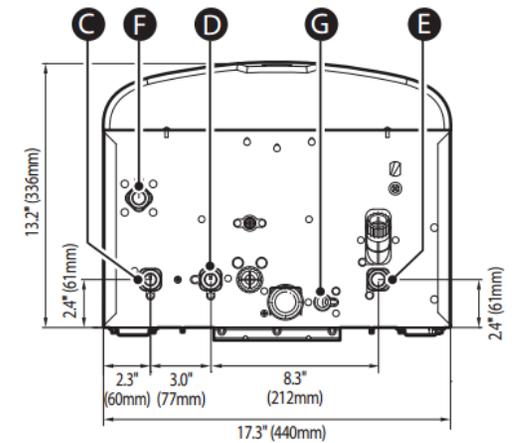
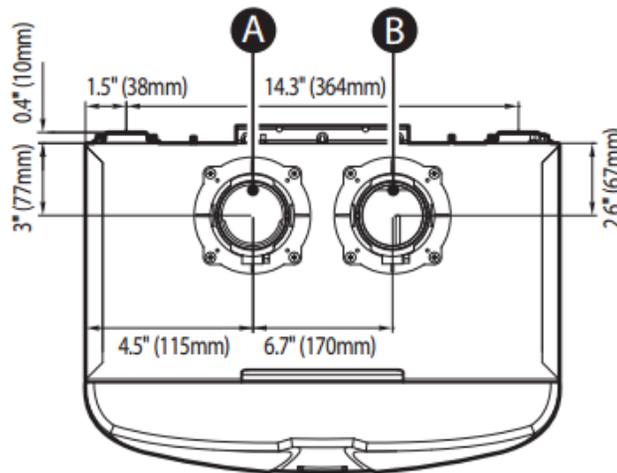
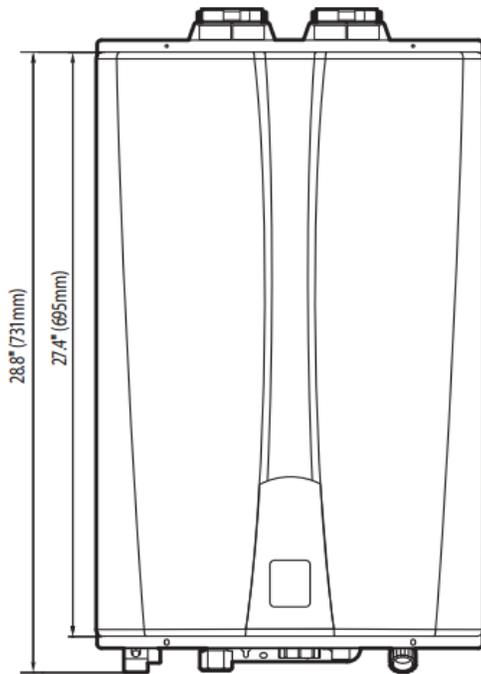
# CONTROL BOARD ASSEMBLY



## DIMENSIONS/SPECIFICATIONS

<b>Weight</b>	350 lbs (160 kg)
<b>Voltage</b>	460V/60A/3ph

# NAVIEN NPE-240S TANKLESS GAS WATER HEATER



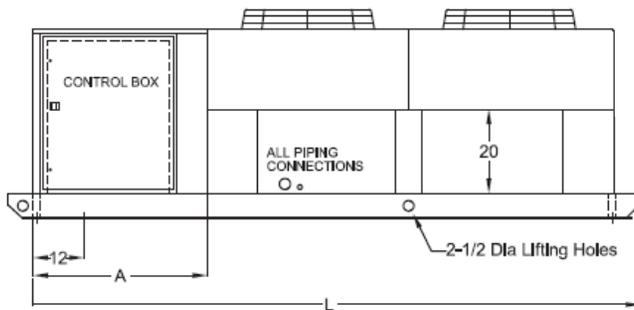
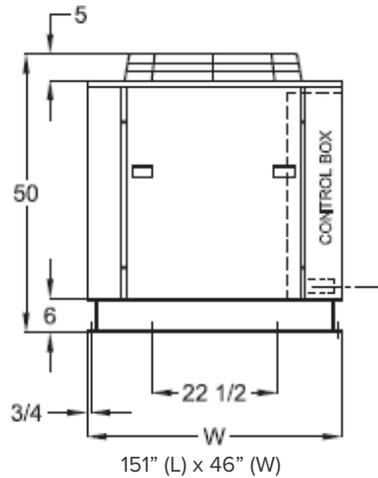
- Connection Size**
- C** Hot Water Outlet  $\Phi$  3/4"
  - D** Recirculation Inlet\*  $\Phi$  3/4"
  - E** Cold Water Inlet  $\Phi$  3/4"
  - F** Gas Inlet  $\Phi$  3/4"
  - G** Condensate Outlet  $\Phi$  1/2"

## DIMENSIONS/SPECIFICATIONS

<b>Weight</b>	84 lbs (38 kg)
<b>Electrical Main Supply</b>	120 V AC, 60 Hz
<b>Maximum Power Consumption</b>	200 W (maximum 2 A)
<b>Heat Capacity</b>	Natural gas or Propane: 19,900 – 199,900 BTU/H

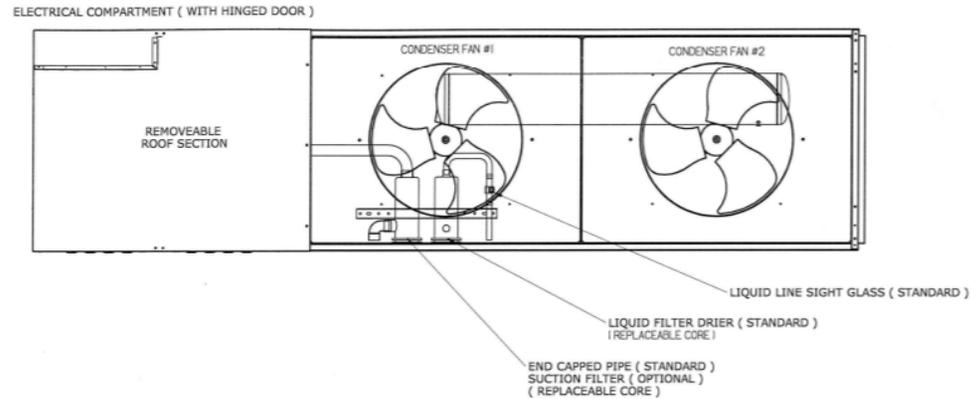
# REFRIGERATION UNIT

United States

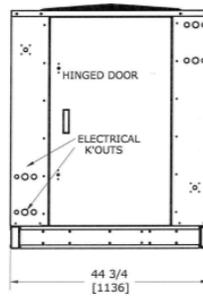


Canada

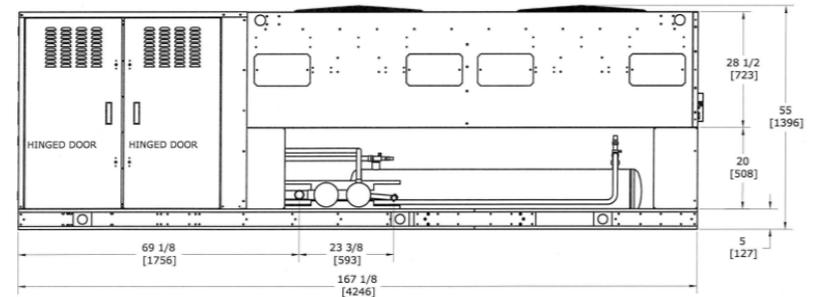
TOP VIEW



COMPRESSOR-END VIEW



SIDE VIEW



## DIMENSIONS/SPECIFICATIONS

United States

RUSSELL

VLD30L44-G

<b>Weight</b>	2,070 lbs (940 kg)
<b>Model</b>	30 HP Unit
<b>Voltage</b>	460V/3ph/60Hz
<b>RLA</b>	44 A
<b>MCA</b>	80 A

## DIMENSIONS/SPECIFICATIONS

Canada

KEEPRITE

KVS030L6-HT3B-A

<b>Weight</b>	2,200 lbs (1,000 kg)
<b>Model</b>	30 HP Unit
<b>Voltage</b>	460V/3ph/60Hz
<b>RLA</b>	44 A
<b>MCA</b>	80 A