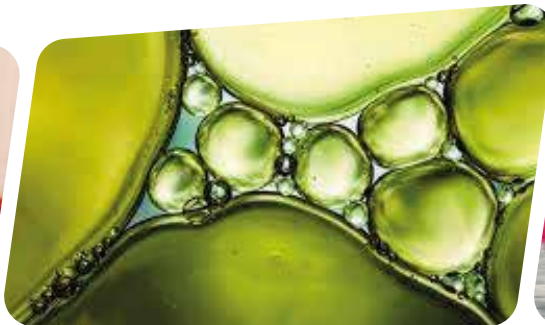




**SUPEREX**  
**SUPERCritical CO<sub>2</sub>**  
**EXTRACTION SYSTEMS**

PRODUCT CATALOGUE



## WHAT IS A SUPERCRITICAL FLUID?

Raising the temperature and pressure of a pure substance causes it to shift into the supercritical state. Every pure substance has a specific critical temperature and pressure.

Supercritical fluids have many advantages over conventional liquid and gaseous solvents, combining the high diffusivity and mass transfer performance of a gas with the high density and solvating power of a liquid. Such physicochemical properties of supercritical fluids (density, viscosity, diffusivity, dielectric constant) change from are easily manipulated by changing pressure and temperature.



If all pure substances have a supercritical phase, why is carbon dioxide (CO<sub>2</sub>) used?

CO<sub>2</sub> possesses numerous advantages such as:

- » Easy accessibility
- » Cost-effectiveness
- » Non-toxicity (GRAS status)
- » Non flammability
- » No harmful residue
- » Efficient recyclability
- » Modest critical temperature (T<sub>c</sub>=31.2°C) and pressure (P<sub>c</sub>=73.8 bar)
  - » Preservation of valuable constituents: Absence of oxygen and light alongside process temperatures as low as 40 °C preserve labile bioactive compounds.
  - » Ubiquity: CO<sub>2</sub> is naturally present in all living organisms and is environmentally sustainable when used correctly.
  - » Selectivity: Non-polar CO<sub>2</sub> selectively extracts many classes of bioactive compounds
  - » Process flexibility: Extract separation into fractions rich in different bioactive substances is possible through dynamically changing process temperature and pressure.



## PARD ENGINEERING AND AUTOMATION INDUSTRY TRADE COMPANY LIMITED (SUPEREX)

SUPEREX is a leading provider of supercritical CO<sub>2</sub> extraction systems, established in 2017 in Konya, Turkey. It is a registered trademark of Pard Engineering Co. Ltd.

We specialize in the development and production of laboratory-scale, pilot-scale, industrial scale and custom supercritical fluid systems under the SuperEx trademark.

Our company has been established as part of a successful R&D Project grant from TÜBİTAK (The Scientific and Technological Research Council of Türkiye). Our expert team of mechanical, mechatronic, process, and chemical engineers has a proven track record of quality and innovation in the field of supercritical fluid processes and other high pressure systems. Despite our recent establishment, our qualifications and over a century of collective experience afford us the flexibility and knowledge to continuously innovate and improve our systems to the satisfaction of our growing customer base.

Our team of experts includes food, biotechnology engineers, mechanical, mechatronic , electrical- electronic engineers as well as welding, turning, and assembly operators, is dedicated to providing our clients with the highest quality equipment and technical service.



Our supercritical CO<sub>2</sub> extraction machines are designed to meet the most demanding requirements and have a proven track record of success in the industry. We constantly research and develop new technologies to improve the efficiency and effectiveness of our machines. The developed methods and equipment are registered as utility models and patents. Today, our company has become one of the sector leaders, serving the local and international market without compromising on quality and reliability.



Our machines are being used by universities, R&D laboratories and many private enterprises in Turkey as well as in various parts of world (e.g. Egypt, Germany, Spain, Serbia). The production capacity and corporate structure of Pard Engineering Co. Ltd. is increasing every year. Our manufacturing plant was moved to its current 2500 m<sup>2</sup> location in 2022. Our goal is to further our reputation as a recognizable global brand by consistently delivering exceptional products and adhering to a customer-focused service philosophy.

## OUR PATENTS AND UTILITY MODELS

AN EXTRACTION SYSTEM AND RELATED METHOD TO ENSURE EFFICIENT EXTRACT TAKING / PATENT NUMBER: 2022/008231

FLOW DIRECTION IN SUPERCRITICAL CO<sub>2</sub> FLUID SYSTEMS / UTILITY MODEL / UTILITY MODEL NUMBER: 2021/018840

ENERGY EFFICIENCY IMPROVEMENT SYSTEM IN SUPERCRITICAL FLUID EXTRACTION PLANTS/ PATENT NUMBER: 2022/020748



## SUPEREX F-500

- 500 mL extractor vessel
- Maximum working pressure up to 345 bar (optionally 700 bar)
- Maximum working temperature up to 70 °C (optionally 200 °C)
- Extraction in continuous (dynamic) CO<sub>2</sub> flow mode
- Temperature control with PID algorithm
- Digital fully automatic pressure control
- Optional co-solvent (30 ml min<sup>-1</sup>) pump
- Easy sample loading
- Use of polyester pouches for solid samples
- Changeable flow direction for liquid samples
- Extract collected directly into centrifuge tubes
- Liquid trapping feature in the secondary extract collector
- Observable volumetric flow rate
- Independent electronic and mechanical pressure safety systems
- All contact surfaces are stainless steel (AISI 316 or 316L)
- Exhaustive polishing of inner vessel surfaces to prevent microbial contamination and increase integrity



## SUPEREX LQ Liquefaction Unit

- Optional for F-500 system
- Ensures liquefaction of CO<sub>2</sub> prior to pressurization
- Guarantees maximum efficiency of the pump action
- Increases the usable portion of a liquid CO<sub>2</sub> cylinder by 25%
- Stabilises high CO<sub>2</sub> flow rates



## SUPEREX F-500 Impregnation Module

- All the features of the base F-500 system
- 500 mL+250 mL dual extractor vessels
- Maximum working pressure 345 bar (optionally 700 bar)
- Maximum working temperature up to 70 °C (optionally 200 °C)
- Liquid trapping feature in the secondary extract collector
- The material to be impregnated is loaded into the second vessel
- Possibility to design product-specific loading basket (e.g. for contact lenses)
- Controlled flow between vessels provided by a circulation pump



## SUPEREX F-500 Micronization Module

- All features of the base F-500 system and the Impregnation Module
- Micronization pump and aspiration nozzle for 500 mL vessel
- Stainless steel basket where micronized nanoparticles are collected
- Maximum working pressure 345 bar
- Maximum working temperature 70 °C



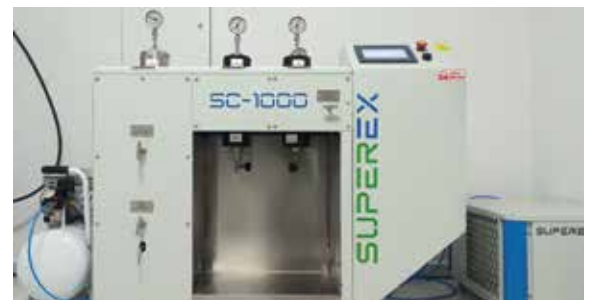
## SUPEREX SC-1000 Supercritical Extraction System



- 1 L extractor vessel
- 2 separator vessels (300 mL)
- CO<sub>2</sub> liquefaction system
- Maximum working pressure 345 bar
- Maximum working temperature 70 °C
- Pressure and temperature control in separators
- CO<sub>2</sub> recycling system (>95% efficient)
- All contact surfaces are stainless steel (AISI 316 or 316L)
- Exhaustive polishing of inner vessel surfaces to prevent microbial contamination and increase integrity
  - Temperature control via PID algorithm
  - Digital fully automatic pressure control
  - Possibility to load samples via a stainless steel basket or a cloth basket
  - Integration of the stainless steel basket into extractor lid to avoid bypass phenomena
    - Gas feeding or cyclone flow feature from the bottom to the separators
    - Gravimetric separators (may also be used as liquid traps)

### SUPEREX SC Series Optional Features

- Working pressure increase up to 700 bar
- Working temperature increase up to 200 °C
- A chain of 3 pressure controlled separators
- Coriolis mass flow meter ( $\pm 0.1\%$ )
- Activated carbon and molecular sieve filters on the CO<sub>2</sub> recovery line
- CO<sub>2</sub> inlet line particulate filter



## SUPEREX SC-2000 Supercritical Extraction System

- 2 L extractor vessel
- Maximum working pressure 345 Bar
- Maximum working temperature 70 °C
- CO<sub>2</sub> liquefaction system
- All contact surfaces are stainless steel (AISI 316 or 316L)
- Exhaustive polishing of inner vessel surfaces to prevent microbial contamination and increase integrity
- Special design for aroma extraction from liquid samples
- Easy sample loading and system cleaning process
- Three temperature-controlled separators, two with pressure control
- Replaceable cyclone flow or bottom feeding apparatus in separators
- Separators may be used as liquid traps
- Digital automatic Back Pressure Regulator (aBPR)
- CO<sub>2</sub> recycling system (>95% efficient)
- Optional CO<sub>2</sub> recovery feature
- Temperature control with PID algorithm
- Gas feeding or cyclone flow feature from the bottom to the separators



## SUPEREX SC-4000 Supercritical Extraction System



## SUPEREX AERO-1000 Supercritical Drying System



- 1 L extractor vessel
- Large diameter extractor vessel designed for aerogel drying
- 1 separator vessel for solvent recovery
- Specially designed stainless steel baskets for loading sol-gel samples
- Maximum working pressure 138 bar
- Maximum working temperature 70 °C
- Liquefaction unit for stable CO<sub>2</sub> supply
- Temperature control with PID algorithm
- Digital fully automatic pressure control
- Observable flow rate
- Fully programmable CO<sub>2</sub> supply and discharge speeds (1 bar min<sup>-1</sup>) for custom pressure rise-drop curves

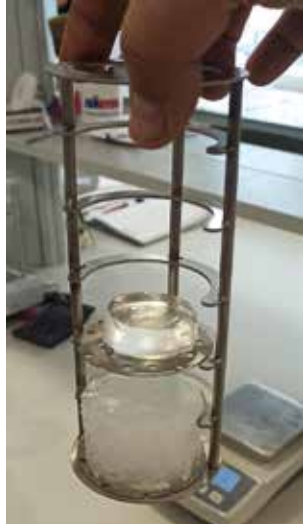


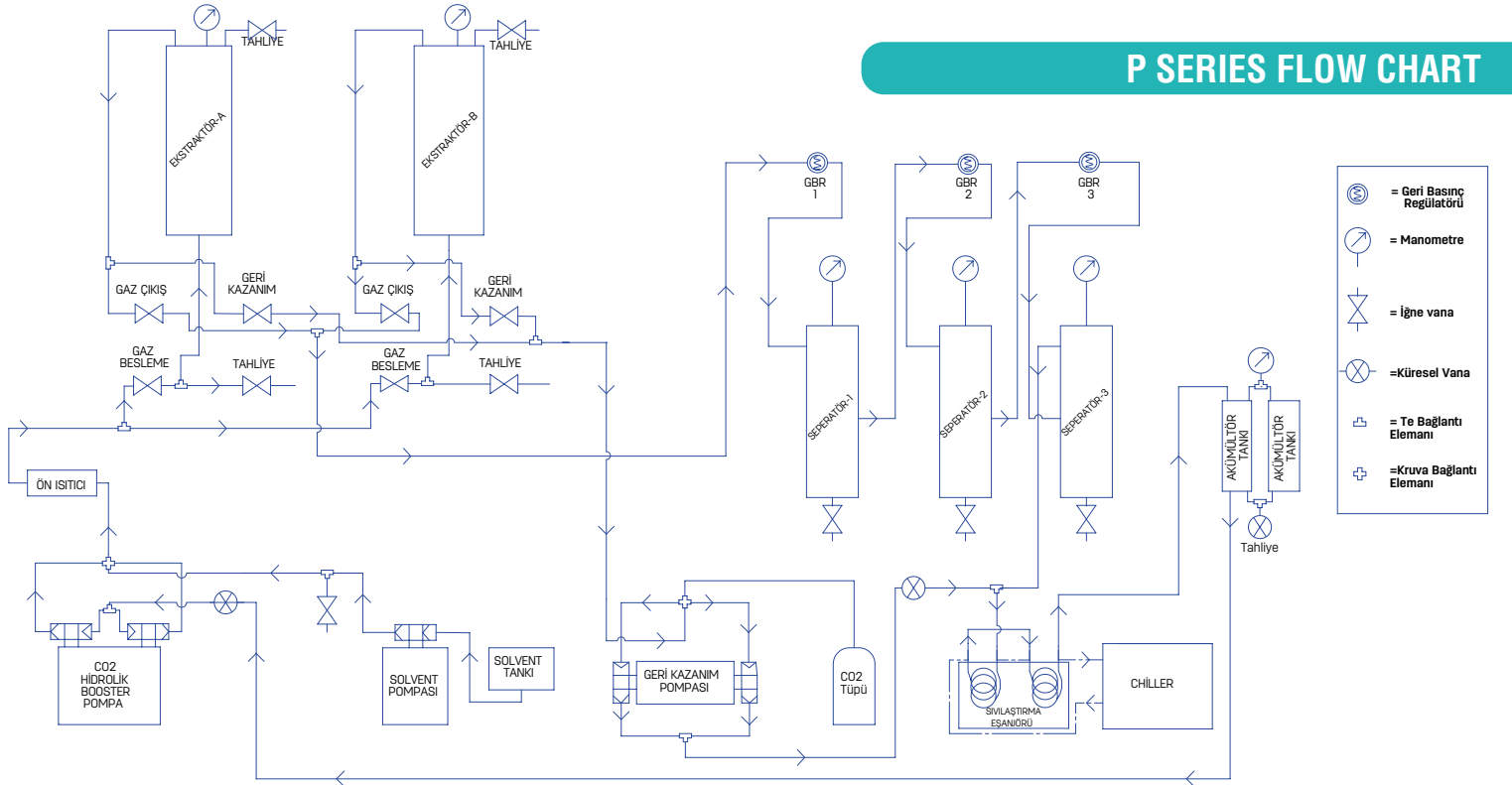
## SUPEREX AERO Series Optional Features

- Maximum working pressure increase up to 700 bar
- Maximum operating temperature increase up to 200 °C
- Further process automation for hydrothermal reaction, aerogel aging, and drying for an integrated workflow

## AERO Series Supercritical Drying System

- 1-100 L extractor vessel
- Possibility to add additional drying vessels
- Large diameter extractor vessel designed for aerogel drying
- Separator for solvent recovery
- Specially designed stainless steel baskets for loading sol-gel samples
- Maximum working pressure 138 bar
- Maximum working temperature 70 °C
- Liquefaction unit for stable CO<sub>2</sub> supply
- Full-automatic drying process (CO<sub>2</sub> feeding and discharge, drying process is fully automatic)
- Remote control via PC and smartphone
- Emergency warning lamp with sound and light, showing system status
- Temperature control with PID algorithm
- Digital fully automatic pressure control
- Observable flow rate
- Adjustable CO<sub>2</sub> supply and discharge feature at low speeds
- Designed for long drying processes up to 48 hours
- Adjustable pressure rise-drop curve







## P SERIES FEATURES

- Extractor vessel volume up to 1000 L
- Special designs developed for pilot and industrial scale production
- 1 patent and 1 utility model for extract efficiency and extraction of fresh products
- 1 patent for increasing energy efficiency in industrial extraction process by up to 60%
- Fully automatic back pressure regulators
- Precise fractionation with 2,3, or more pressure-controlled separators
- Cyclonic or gravimetric separators
- Maximum working pressure of 345 bar as standard
- Maximum operating temperature of 70 °C
- Adjustable high carbon dioxide flow rate up to 100 kg min<sup>-1</sup>
- Fully automated pressure increase, gas flow and pressure reduction processes
- High precision PID temperature control algorithm
- Fully automatic adaptive pressure and flow control
- Fully automatic CO<sub>2</sub> liquefaction and recovery system (up to 99% effective)
- High energy efficiency heat pump (COP=6)



## P Series Optional Features

- Working pressure increase up to 500 bar
- Working temperature increase up to 200 °C
- Additional recovery pump for increased efficiency
- Coriolis mass flow meter
- Activated carbon and molecular sieve filters on the CO<sub>2</sub> recovery line

## REFERENCES



## REPRESENTATIVES

### USA

ACAS (American Chemical & Advanced Separations) Inc.

John W. Dawson

National Sales Manager

e-mail: johndawson16@gmail.com

Address: Davenport, FL

Phone: 914-960-3693

### INDIA

Akshit instruments Pvt. Ltd.

Website: <http://akinstrument.com/>

e-mail: [info@akinstrument.com](mailto:info@akinstrument.com)

Address: 153A, Wadhwa Complex, Laxminagar New Delhi 110092, India.

Phone: 011-4047271

### BALKANS

Proanalytica D.O.O.

Website: [www.proanalytica.com](http://www.proanalytica.com)

e-mail: [komercijala@proanalytica.com](mailto:komercijala@proanalytica.com)

Address: Bulevar umetnosti 27, 11070 Beograd

Phone: +381 11 31 30 542

### VIETNAM

SatiCus Science and Technology Ltd. Co.

Website: [www.saticus.com](http://www.saticus.com)

e-mail: [salomonhuynh@saticus.com](mailto:salomonhuynh@saticus.com)

Address 1: Office 1: A13, Cao Thi Chinh, Phu Thuan Ward,

Dist. 7, HCMC, Viet Nam

Address 2: Office 2: No. 7, Alley 51, Path 51/75, Lang Yen Ward,

Hai Ba Trung Dist., Ha Noi, Viet Nam

Phone: (+84) 909 052 296

### SOUTH AFRICA

Multi Success Supplies Pty Ltd

Website: [www.multiss.co.za](http://www.multiss.co.za)

e-mail: [Sales@multiss.co.za](mailto:Sales@multiss.co.za)

Phone: +27 605507626

### RUSSIA

SDK Prom / СДК Пром

Website: [www.sdkprom.ru/ru/home/](http://www.sdkprom.ru/ru/home/)

e-mail: [superex.as@mail.ru](mailto:superex.as@mail.ru)

Phone: +7 (950) 071 42 77

+90 (551) 995 88 79

Address: 664050, Иркутская область, г. Иркутск, ул. Байкальская, 313-55

### CROATIA

LACH-NER S.R.O.

Website: [www.lach-ner.hr](http://www.lach-ner.hr)

E-mail: [knezevic@lach-ner.com](mailto:knezevic@lach-ner.com)

Address: Ulica grada Vukovara 271/4 10000 Zagreb, Hrvatska

### EGYPT

ChromaTech Co.

Website: [www.chromatechgroup.com](http://www.chromatechgroup.com)

E-mail: [m.salim@chromatechgroup.com](mailto:m.salim@chromatechgroup.com)

[salim.chromatec@gmail.com](mailto:salim.chromatec@gmail.com)

Address: 62A Seleem Al awal St. - El Zayton, Cairo, Egypt

Phone: 02 26385393

01556100072



**PARD**

MÜHENDİSLİK VE OTOMASYON

Fevzi Çakmak District Asım Street No: 92D Karatay/KONYA / TÜRKİYE  
Tel : +90 332 346 46 24

en.superex.com.tr  
info@superex.com.tr

www.pardmuhendislik.com.tr  
pardmuhendislik@gmail.com



en.superex.com.tr  
info@superex.com.tr



www.kosgeb.gov.tr