



RHOBUST™ FLEX CHROMATOGRAPHY SYSTEM FOR CRUDE FEEDSTOCK PROCESSING

**Scalable Adsorption Chromatography
From Lab Scale to Industrial Scale**



THE COMPANY

Upfront Chromatography A/S develops and manufactures innovative products and technologies for isolation and recovery of biotherapeutics and functional biomolecules directly from bioreactors and industrial side-streams.

For customised separation services, Upfront offers access to its proprietary Rhobust™ universal process platform, combined with extensive technical and regulatory support. From a feasibility study to commissioning of the final installation, Upfront works with its customers to develop adsorbents, ligand chemistry, columns and other hardware to optimise process performance. Upfront's name is behind the world's largest chromatography system installation.



UpFront Chromatography A/S
Lersøe Parkallé 42
DK-2100 Copenhagen, Denmark
Phone: +45 39 17 43 17
Fax: +45 39 27 31 11
e-mail: sales@upfront-dk.com
www.upfront-dk.com

S074



DIRECT CAPTURE BY RHOBUST™

Rhobust™ Flex chromatography system by Upfront is manufactured as scale-down version of existing industrial plant designs using Rhobust™ 2nd Generation Expanded Bed Technology (EBA).

KEY BENEFITS OF RHOBUST™ FLEX :

Increased Yields with Fewer Process steps: Direct Crude Feedstock Processing -

Rotating Fluid Distribution System™ enables crude feedstock to pass freely through the column system, while the adsorbent captures target molecules, without the system clogging. Porous plates/meshes/frits have been designed out of the column system.

Flexibility: From Lab and Pilot to Industrial Scale -

Proven scalability generated on 10cm – 60 cm diameter columns can be directly correlated with 1 cm diameter columns and 150 cm diameter systems. The columns can process from 2L up to 1000L of crude stock.

Easy Operation: No Packing Concerns -

Functional expanded bed naturally forms upon system start-up. Simple dual pump operation driven by Rhobust™ Flex precisely controls expanded bed height.

Increased Plant Capacity: High Throughput -

Dual peristaltic pump operation designed to handle operational flow rates between 300-2000 cm/hr, with low operational backpressures (less than 0.1 bar).

GMP Compatibility -

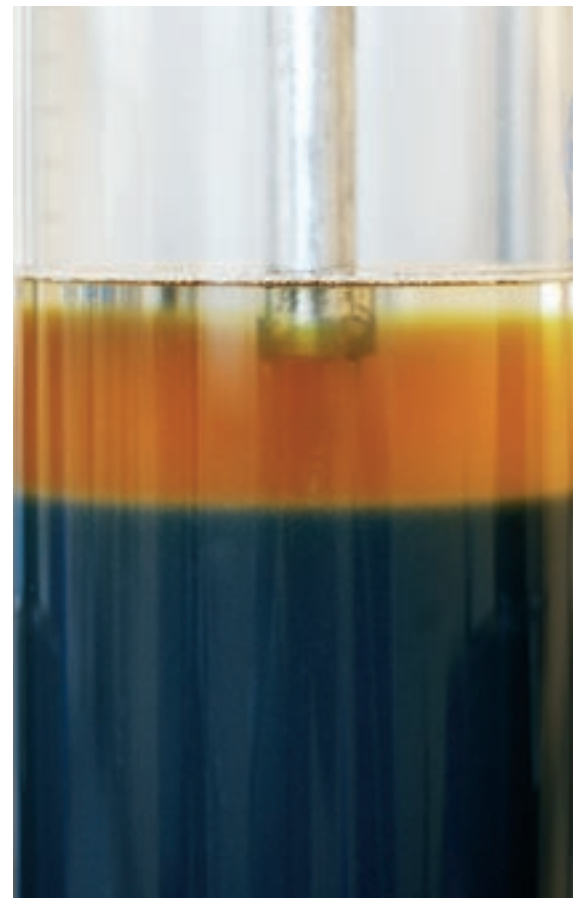
All materials are FDA-approved, data logging systems are 21CFR part 11 compliant, valves and instrumentation are designed for robust and consistent processing.

Safe Operational Conditions: Efficient Cleaning -

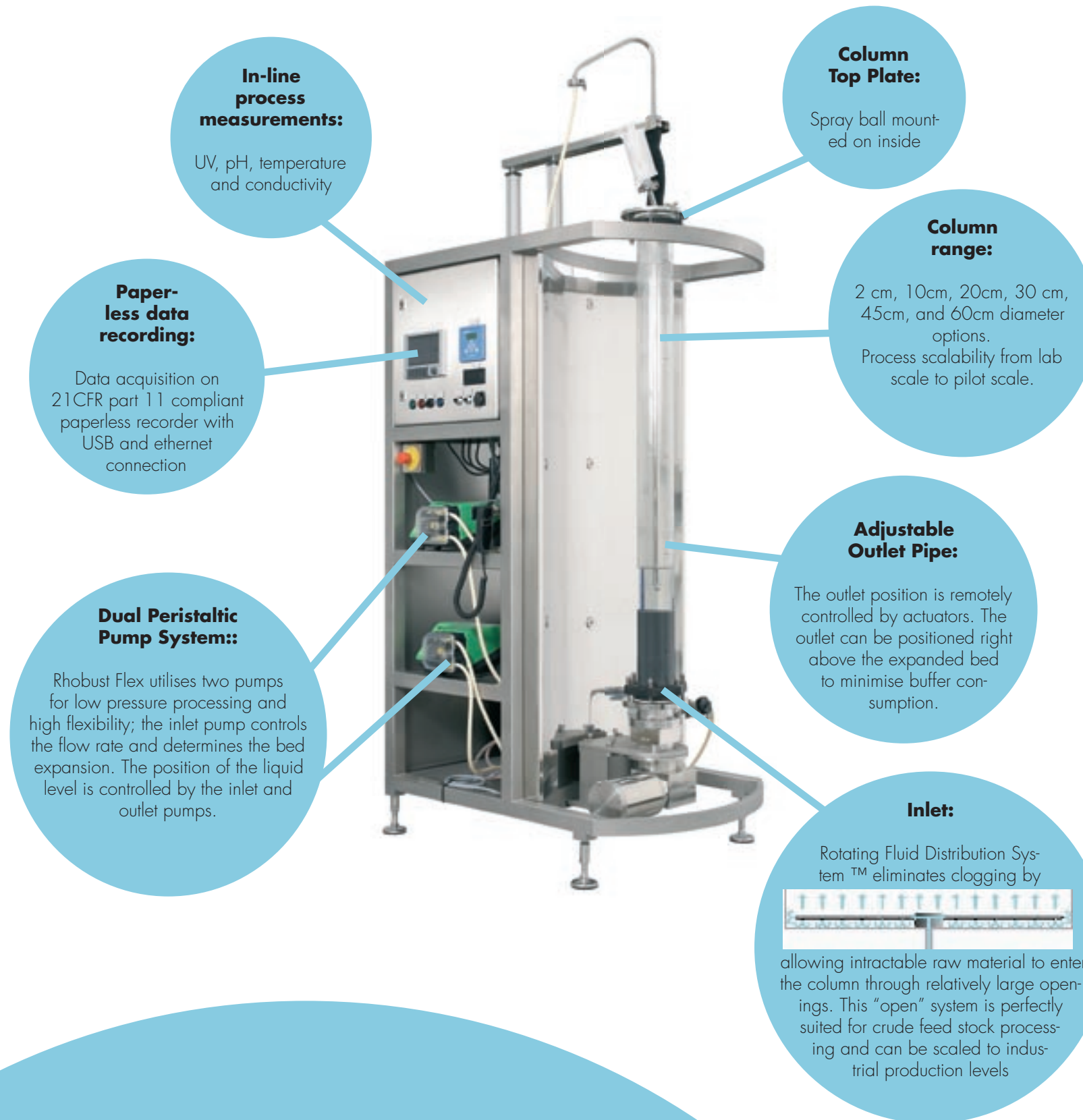
High fluid velocity cleaning of all hardware with 1M NaOH at increased temperatures (60C).

Disposable solutions -

Rhobust™ Flex runs a new range of disposable columns



RHOBUST™ FLEX FEATURES



PROVEN SCALABILITY

The design features of the Rhobust™ columns makes capture of biomolecules from unclarified raw materials a simple, smooth and reliable unit operation. The scale-up of the technology to industrial scale systems has a proven track record of success since 1999. The column range has been designed for operation with the Rhobust™ Flex chromatography system and Rhobust™ high density adsorbents.

Due to the column design features and unique adsorbents, separation processes and results generated on Rhobust™ Flex can be directly correlated with laboratory scale (1 cm/2 cm diameter) columns and industrial scale (150 cm diameter) columns. It makes process scale up a comfortable exercise and estimation of down stream processing economy safe.

Column diameter, cm	2	10	30	45	60
Typical adsorbent volume, liters	0.15	4	35	80	140
Typical feedstock volume, liters	30-200	30-200	250-1800	500-4000	1000 -10,000



2 CM



10 CM



30 CM