C-Flow

Electrochemical Cells and Systems Brochure

C-Flow
Electrochemical Range

About C-Flow

Who we are and what we do

C-Flow is a range of electrochemical cells and systems produced by C-Tech Innovation, a specialist in electrochemical technology based in the UK. With 50 years' experience in providing technology solutions and equipment, C-Tech has a deep institutional understanding of electrochemistry and the needs of researchers, engineers and technicians working in the field. Dissatisfied with the solutions currently on the market, C-Tech has poured those years of expertise into creating the equipment we wanted to use the most versatile and easy-to-use electrochemical cells and systems in the world.

We call this range C-Flow.

Contents


C-Flow
LAB 1x1
NT PENDING

C-Flow LAB 1x1

C-Flow LAB 1x1 is a hand-assembly laboratory electrochemical cell with a 10 mm x 10 mm electrode area. It has been designed for experimental work with a working volume of 1 ml of electrolyte from inlet to outlet, ideal for working with exotic or expensive solutions.

The C-Flow LAB 1x1 benefits from our many years' experience in designing and supplying cells to industrial, research and educational clients throughout the world.

(PEEK or PTFE is possible on request of special order)

Features

- Quick assembly by hand; no tools needed
- A stand is provided for easy dismantling and assembly
- Accepts any electrode material of any thickness from microns up to 8 mm
- Configurable as divided or undivided flow cell
- Templates provided for easy cutting of membranes and gaskets
- Improved flow distributor and electrode assembly (patent applied for)

Specifications

Electrode dimensions	10 mm x 10 mm
Unit height	110 mm
Unit width	70 mm (95 mm with fittings)
Unit depth	60 mm (135 mm with fittings)
Unit weight	1200 g
End-plates	Laser-cut 304 stainless steel
Cell frames	cPVC
Electrodes	Flat plate carbon
Current collectors	Brass
Electrolyte ports	Thread size: UNF 1/4"-28 of 11mm depth. The supplied fitting is for 1/8" OD tubing


C-Flow
LAB 5x5
NT PENDING

C-Flow LAB 5x5

C-Flow LAB 5x5 is a laboratory electrochemical cell for general purpose R&D use. It has been designed for ease of use, robustness and flexibility. It can be used for teaching and research in electrochemical studies, chemical synthesis and membrane systems.

The LAB 5x5 benefits from our many years' experience in designing and supplying cells to industrial, research and educational clients throughout the world.

(PEEK or PTFE is possible on request of special order)

Features

- Quick assembly by hand; no tools needed
- A stand is provided for easy dismantling and assembly
- Accepts any electrode material of any thickness from microns up to 8 mm
- Configurable as divided or undivided flow cell
- Templates provided for easy cutting of membranes and gaskets
- Improved flow distributor and electrode assembly (patent applied for)

Specifications

Electrode dimensions	50 mm x 50 mm
Unit height	185 mm
Unit width	110 mm
Unit depth	60 mm
Unit weight	4200 g
End-plates	Laser-cut 304 stainless steel
Cell frames	cPVC
Electrodes	Flat plate carbon
Current collectors	Brass
Electrolyte ports	Thread Size 1/4" NPT of 11mm depth. The as supplied fitting is a hose barb 3/8" ID tubing

C-Flow PLT

C-Flow PLT is a new design of electrochemical cell and plant, offering much higher capacities, 4 times the flow rates than possible with current stack designs. A modular pilot plant offers a step change in flexibility and reduced development costs for use by academic and industrial R&D users.

Current designs are stack systems with multiple adjacent bipolar cells in an arrangement similar to a heat exchanger or filter press. Inherent constrictions to the flow of electrolyte into and out of each cell in this design lead to high pressure drops across the equipment, limiting capacity and increasing operating costs. Capital costs also tend to be high.

C-Flow PLT is a high throughput electrochemical plant, with a multiple 625 cm^2 cell system, including power electronics, control system, tanks and pipework, and balance of plant, with a target linear velocity of 1 m s-1 across the electrodes, corresponding to 75 litre per minute of both anolyte and catholyte per cell.

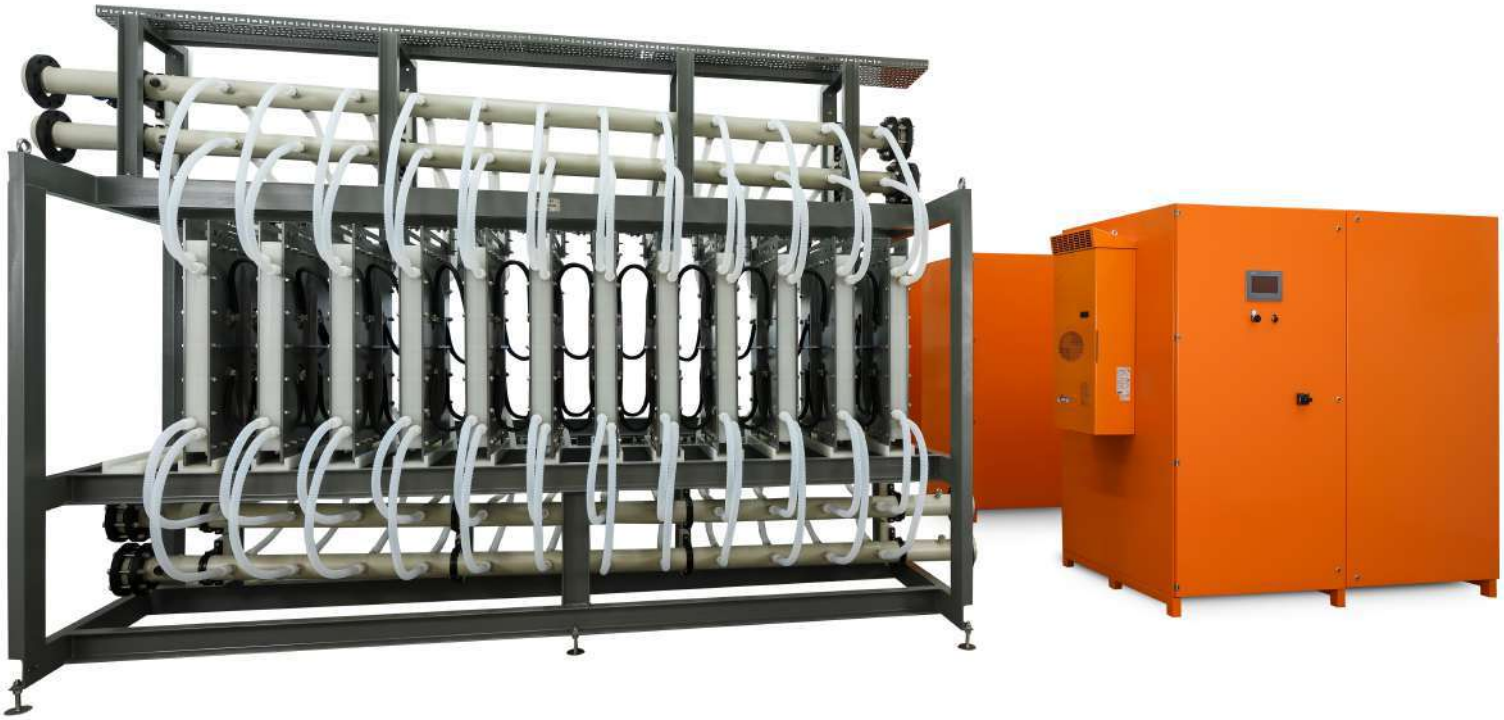
The flow rate is four times that of comparable current cell designs and is a step change increase in the operational capacity of electrochemical pilot plant, approaching production scale volumes but with a much smaller footprint and an order of magnitude difference in cost.

The design is modular with each cell is contained in its own cassette, allowing a high degree of flexibility of operation. Individual cells can be switched in and out for maintenance with dry-break couplings and with no disturbance to other cells. It also allows easy scale up and addition of capacity.

A wide variety of electrochemical processes can be performed using the C-Flow PLT, including the treatment of dilute systems (e.g. waste water, chemical synthesis, viscous liquids requiring a high degree of turbulence (and therefore flow rate, and other syntheses requiring high volumetric flows.

Power electronics can be specified according to customer requirements and application, and can be sized to deliver up to 4,000 A/m^2 to the cells.

C-Flow PLT is suitable for pilot scale or small scale production work.



Vanadium electrolyte production model produced for a customer in 2021

C-Flow PRD

C-Flow PRD takes its form from the C-Flow PLT (pilot) system, and like its smaller brother, the 'PRD' (Production) system uses high throughput electrochemical cells that are superior in performance and flexibility to those available as bipolar stacks.

The modular system allows rapid addition or swapping out of cells for increasing plant capacity and maintenance. Crucially, this can be done on-the-fly, without any plant downtime or lost production time. The nature of the cells allows high fluid velocity and reaction rates, with low pressure drops leading to low operating costs.

Redox Flow Batteries

Redox Flow Batteries are unique energy storage devices particularly suited to commercial on-grid and off-grid applications, due to their scalability, long asset lives, and deep and high cycling capability. Their low risk operation makes them particularly suitable for commercial operations where safety is of paramount importance, and their capability to store large quantities of energy makes them highly suited to renewable applications, realigning the mismatch between supply and demand.

Vanadium redox flow batteries employ an acid based vanadium electrolyte that accounts for up to 30% of the total cost of the system. Until now, the electrolyte has been produced using chemical reductants, a time consuming and inefficient process, resulting in by products that require further treatment.

Plant capacity can be increased or decreased based on your production requirements, and scale-up with additional cells is simple and can be achieved without any major plant changes.

Aimed at industrial settings, the C-Flow PRD can be customised to suit a wide range of electrochemical applications, from treatment of waste waters to synthesis of fine chemicals. C-Tech Innovation can provide a comprehensive design and construction service, and full support following installation, commissioning, and training.

C-Tech has developed a proprietary electrochemical process for the production of electrolyte suitable for use in vanadium redox flow batteries. The direct electrochemical process, performed in the C-Flow PRD plant, is highly efficient and results in zero by-products.

To date C-Tech Innovation have installed production facilities in the UK, USA, and Australia with projects ongoing in South Africa and Europe. We have supplied systems to multiple large-scale manufacturers around the world ranging from 500,000 litres (15MWh) to 8 million litres (250MWh) per annum.

C-Flow is a registered trademark of C-Tech Innovation Ltd

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