



**C-Wave**

Continuous Microwave Flow

## C-Wave

Continuous Microwave Flow Reactors



Continuous microwave flow reactors offering a practical solution for continuous microwave chemistry scale up.



## Why C-Tech Innovation

Accredited to ISO 9001:2015

Established in 2001, C-Tech Innovation delivers novel continuous processes based on our core technologies from proof of concept through to full production. With a multi-disciplinary team of project managers, scientists, electrical and mechanical design engineers and technicians who combine to deliver a quality solution for our clients.

With over 10 years' of engineering experience in the delivery of proprietary continuous flow microwave reactors, C-Tech Innovation are at the forefront of taking microwave chemistry out of the laboratory and into production environments.

C-Tech Innovation have developed a continuous system capable of producing pilot quantities of 10-100 litres/hour through to full production scale at greater than 2 tonnes/hour.

## Our Microwave Technology

We design, build and deliver scalable continuous flow microwave reactors capable of rapid heating of a reaction to high temperature and pressure with precise temperature control. At C-Tech we have continuous flow microwave reactors available to our clients for proof of concept and pilot scale trials.

Our technology offers unparalleled speed of heating with precise temperature control. Designed to operate up to 250 °C and to 30 bar pressure which means that reactions can be carried out in solvents at temperatures that are not otherwise feasible. A combination of rapid heating rate and high temperature and pressure mean that reactions can be carried out more cleanly with better yield and fewer by-products.

Microwave chemistry has been used for many years, especially for the synthesis of small quantities of compounds in the Pharmaceutical and Specialty Chemical industries. Continuous flow microwave chemistry offers significant benefits over conventional batch methods, namely:

- **Faster reactions**
- **Fewer undesired side reactions**
- **Higher yields with lower impurity levels**
- **Precise reaction control temperature**
- **High chemical conversion rates**



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## About the C-Wave Product Range

Continuous microwave flow reactors offering a practical solution for continuous microwave chemistry scale up. Achieving a significant reduction in reaction times and increase in yield.

The C-Wave products offer a seamless transition from pilot plant through to production.



### C-Wave PLT

A continuous flow microwave pilot unit for process scale up, supplied as a self-contained unit or for integration into other equipment.

**Pages 4-5**



### C-Wave PRD

A custom built continuous flow microwave reactor for production environments, supplied as a skid mounted self-contained unit.

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# C-Wave PLT



# C-Wave PLT

C-Wave PLT is a continuous microwave reactor designed for R&D and pilot scale development work. It can be supplied as a self-contained unit or for integration into other equipment. It is capable of handling flammable solvents and operating at high pressure. A unit is available for trial.

Continuous microwave chemistry is a better way to carry out many chemical reactions. Rapid and precise heating reduces side reactions and give improved yields. Volumes of reactants in the reactor at any one time are reduced and the power input control is instantaneous so that the whole process is safer and less wasteful.

## Features

- Perfect for process development and scale-up work
- Suitable for a wide range of reaction systems including slurries
- ATEX rated if required
- Pumps and receivers reconfigurable for different fluids and process conditions
- All parts including reaction tube and seals are easily replaced for maintenance
- Runs in automatic control mode to a set temperature or manual mode to defined power input
- Compact self-contained unit suitable for free-standing or under an extraction hood
- Patented design

## Specifications

**Flow rates:** Between 10 ml/min and 1,500 ml/min based on requirements

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**Dimensions:** (with two receiver vessels) W 1900 mm, H 1800 mm, D 650 mm

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**Power:** 0.5 kW to 6 kW

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**Temperature:** 250 °C maximum and control to +/- 1.5 °C

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**Pressure:** Maximum operating pressure 30 bar

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**Compatibility:** Compatible with most acids, bases, solvents, particulates, slurries

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**Wetted parts:** Quartz glass, stainless steel, silicone O-ring reaction tube seal

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**Control:** Touch-screen HMI with set point, alarms, flow control

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**Data logging:** to USB

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**This is an indicative specification and is subject to confirmation at time of request.**

**See more at:** [www.ctechinnovation.com/product/c-wave-plt](http://www.ctechinnovation.com/product/c-wave-plt)

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# C-Wave PRD



# C-Wave PRD

As a world leader in the scale up of continuous flow microwave reactors, C-Tech is proud to offer the C-Wave PRD. A proprietary production continuous flow microwave reactor, it is supplied as a skid mounted self-contained unit, capable of operating up to 250 °C and 30 bar pressure.

Continuous flow microwave chemistry is being used predominantly in laboratories by the Pharmaceutical and Fine/Specialty Chemical Industries. With a broad range of applications in novel synthesis, it facilitates faster reactions with higher yields producing less by-products.

The rapid microwave heating process coupled with precise heating control reduces side-chain reactions and gives much improved yields in a fraction of the time it takes using conventional methods.

## Features

- Fully automated PLC operation with easy to use touch-screen HMI
- Pre-programmed process steps including purge, start-up, run in batch or continuous mode, shut-down and post-purge
- ATEX rated if required
- Self-contained unit in a stainless steel frame
- Faster reactions, fewer by products and improved yields
- Capable of reaction conditions up to 250 °C and 30 bar
- Precise temperature control throughout the whole reaction

## Specifications

**Flow rate:** Up to 2 tonne/hour

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**Power:** Up to 120 kW microwave power

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**Temperature:** 250 °C maximum with control to +/- 1.5 °C

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**Pressure:** Maximum operating pressure 30 bar

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**Compatibility:** Compatible with most acids, bases, solvents, particulates, slurries

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**Wetted parts:** Quartz glass, stainless steel, silicone O-ring seal

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**Control:** PLC with touch-screen HMI for automated use and data logging

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**Safety** Fully safety interlocked

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**Please note due to the bespoke nature of this product this is an indicative specification and is subject to confirmation at time of request.**

**See more at:** [www.ctechinnovation.com/product/c-wave-prd](http://www.ctechinnovation.com/product/c-wave-prd)





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

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