Product Operating Manual

Ultrasonic Microwave Chemical Reactor

Models: CIT-UMCR-SM50/100/200

COL-INT TECH

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WARNINGS:

1. **Do not open the working chamber when microwave is running.**
2. **Keep away as possible from the microwave reactor when it is running.**
3. **Be always careful to hot surfaces or objects after microwave heating, avoid burning hazards.**
4. **Avoid liquid the reactor, especially the electrical box.**
5. **NEVER RUN THE MICROWAVE WITHOUT LOADING.**
6. **If you are pregnant, please consult your doctor before using the microwave equipment.**

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Thank you for purchasing the CIT-UMCR-SM50/100/200 microwave chemical reactor system. Please read this manual carefully before you start any operation on the instrument. Any damage caused by misuse will be full responsibilities of the owner. The liability of Col-Int Tech is limited to the purchase price of the instrument.

Warning: The product information in this manual may change without notice in future because all Col-Int Tech products are being updated constantly. If you have any questions, please visit our website at www.col-int.com or feel free to contact Col-Int Tech by email or phone.

1. Introduction

UMCR-SM50/100/200 (Figure 1) ultrasonic microwave chemical reactors are designed for chemical synthesis or materials treatment with aid of combined microwave and ultrasonication under atmosphere pressure condition in a research lab scale. The reactor vessel ranges from 50-2000mL with adjustable microwave power of 50-1500 watts. High quality borosilicate glass parts give the reactor superior physical and chemical stability. Specially designed ultrasonic horn can avoid disturbance of the microwave heating and provide powerful sonic energy for the reaction experiment. This unique combination offers new opportunities in the discovery of novel materials and chemical synthesis methods. The reactor can be widely used for various chemical conditions/environments. Other advantages also include digital control of microwave and ultrasound output, programmable reaction curve using PLC touch screen central controller, built-in magnetic stirring device, full steel structure to avoid microwave emission and digital sonicator. The reactors are ideal for advanced materials processing, nanoparticle synthesis, organic synthesis and bio-fuel applications as well. They can meet needs of both university researchers and industrial product/process developers.

2. Product Description

2.1 Technical Specifications

Technical parameters of CIT-SM50/100/200 reactors are tabulated below.

Product Name	Ultrasonic Microwave Chemical Reactor
Product Model	CIT-SM50/100/200
Vessel Material	High-quality borosilicate glass (GG3.3)
Vessel Volume	50/100/250/500/1000/1500/2000 ml
Stirring	Electric motor with PTFE paddles, Magnetic stirring
Pressure Control	Not controlled, maximum atmosphere (1 bar)
Condenser	Glass tube condenser using water circulation chiller
Temperature	<400 °C multi-segment programmable
Microwave	1000/1000/1500 watts, digital power control
Sonication	650/1200/1500 watts, pulse/continuous modes
Electricity	AC220V, 50/60Hz, Single-Phase

2.2 Product Illustrations

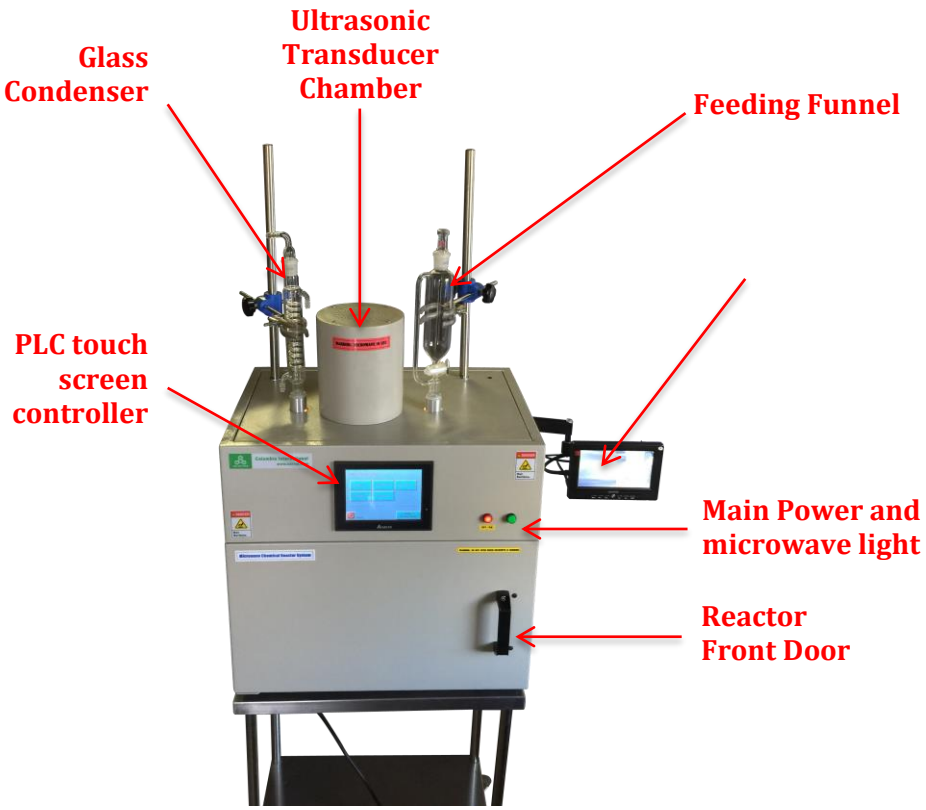


Figure 1: Front view of SM-50/100/200

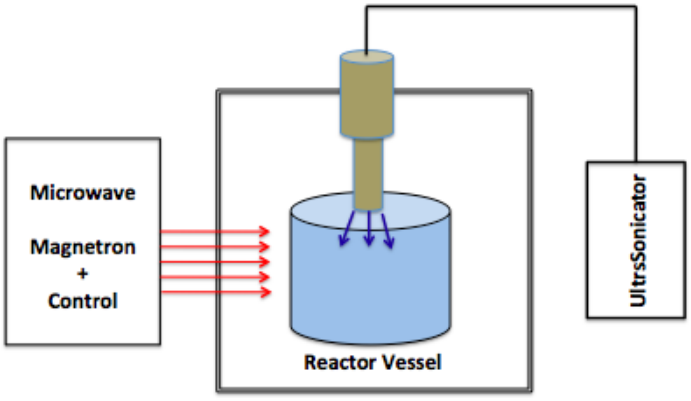


Figure 2: Working Mechanism of UMCR-SM-50/100/200

2.3 Environmental Requirement

The equipment should be installed and operated at a dry, clean and ventilated space. **This equipment is not explosion-proof, so cannot be used under a flammable atmosphere/environment. Using it under flammable environment may cause fire, explosion or other damage.**

3. Operating Manual

3.1 Preparation

First locate a suitable space for the instrument, which should meet the above environmental requirement and also provide enough comfortable space for the operator. It should be installed in a fume hood if organic solvents will be heavily used and good air circulation and ventilation are very important.

Unpack the instrument and move it to the assigned space with care. If any damage is discovered, stop installation, do a quick self-check first and inform Col-Int Tech (services@col-int.com or 1-877-660-2333) immediately. Power supply of AC220V, 50/60Hz is required for this model (voltage transformer is needed for 110V use). In some cases, an automatic voltage stabilizer/regulator is highly recommended. Please check the required input power voltage on the product stick before plug-in.

PLEASE REMOVE ALL PACKING MATERIALS BEFORE THE FIRST RUN OF THE EQUIPMENT. PACKING MATEIRAL MAY CAUSE FIRE OR DAMAGE TO THE INSTRUMENT, WHICH IS NOT COVERED BY WARRANTY.

BOTH MICROWAVE AND SONICATION CANNOT BE TURNNED WITHOUT LOADING, SOME LIQUID WATER SHOULD BE IN THE MICROWAVE CHAMBER, THE SONIC HORN TIP SHOULD BE SUBMERGED 1-3CM UNDER THE LIQUID LEVEL.

3.2 Installation

To set up the reactor, please follow the steps below.

1. Install the two poles for the condenser and feeding funnel
2. Install the sonic head (sonic head chamber on the top)
3. Install the video monitor with frame
4. Install the glass feeding funnel and condenser
5. Connect the condenser and funnel using silicon tubing
6. Connect to AC220V single phase power
7. Turn on the power and check the PLC touch screen controller
8. Now the reactor system is ready for your testing.

To install the pole

1. **Open the back cover using the key and screw drive to pull the cover out**
2. **Insert the pole end with screw threads and tighten the screw (make sure the washers in position)**

Figure 3: Back View of the Reactor System

3.3 Run Experiment

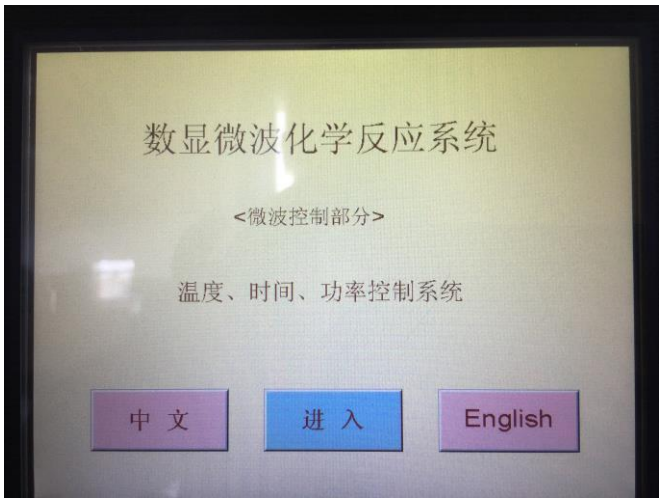
To run an experiment on the reactor, follow the steps below.

1. Check the reactor and make sure it is clean and in good condition
2. Load the reactor vessel in the middle of the chamber
3. Use the PTFE stand to adjust the height position
4. Connect the condenser or feeding funnel if needed. Otherwise, use the steel block to seal the top holes
5. If a condenser is used, connect the vacuum pump and the chilling water
6. Magnetic stirring bar has to be loaded if using magnetic stirring and the vessel has to be on the chamber floor directly (no spacing allowed)
7. Use the PLC controller to program or control the reaction process
8. Turn on the microwave heating and observe the heating process at the beginning and assure the instrument is running properly

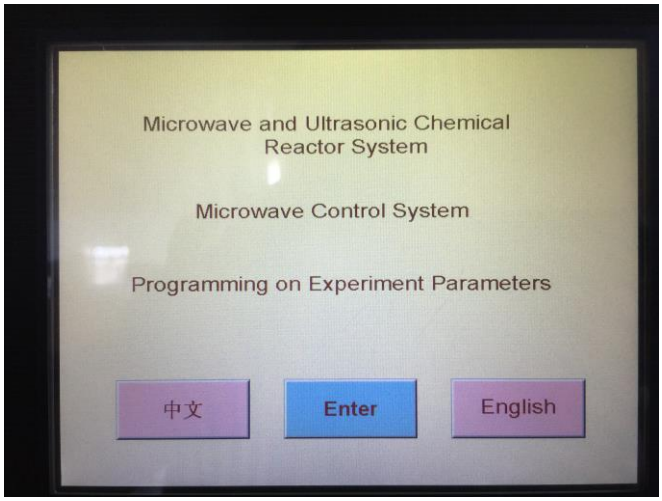
9. Stop the reaction and discharge the solution from the vessel.
   Be careful, the reaction solution may be very hot!!!
10. Clean the reactor vessel for next time use.
11. Disconnect the power.

4. PLC Controller

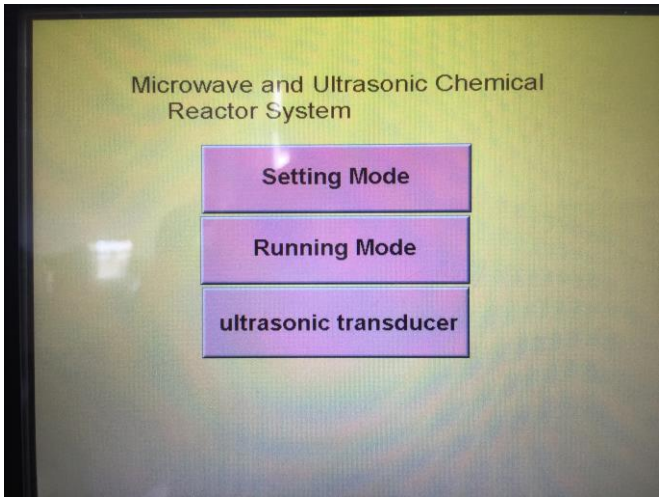
The following picture illustrations show how to use the PLC controller.



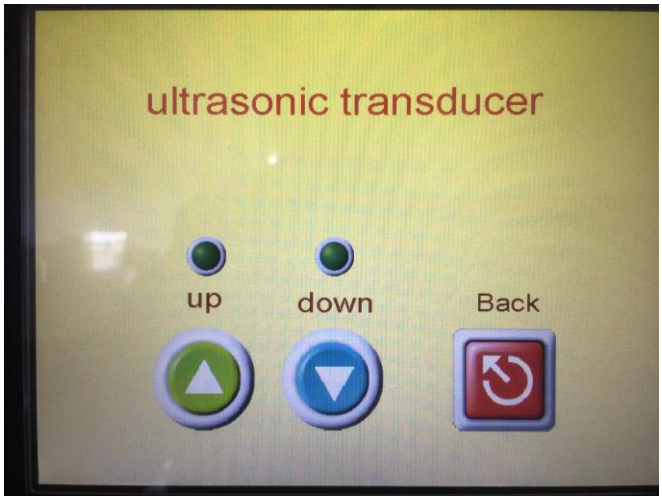
Start page
Choose English to start



Press “Enter” to start the system under English

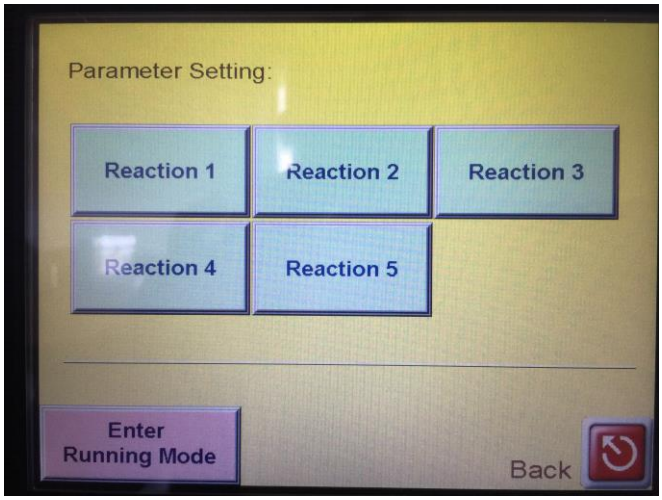


Main Menu
Setting Mode
-Set up the reaction
Running Mode
-Run the reaction
Ultrasonic transducer
-Adjust up/down the sonic head



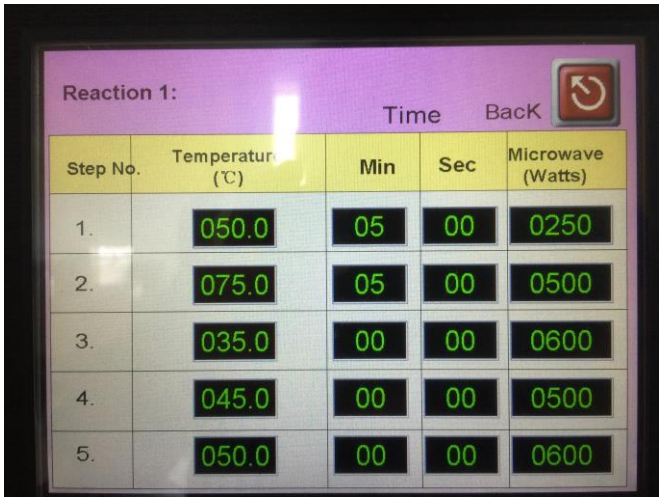
UP
-To raise the sonic head
DOWN
-To lower the sonic head
BACK
-To return the main menu

CAUTION: watch the sonic head movement when pressing to avoid damage

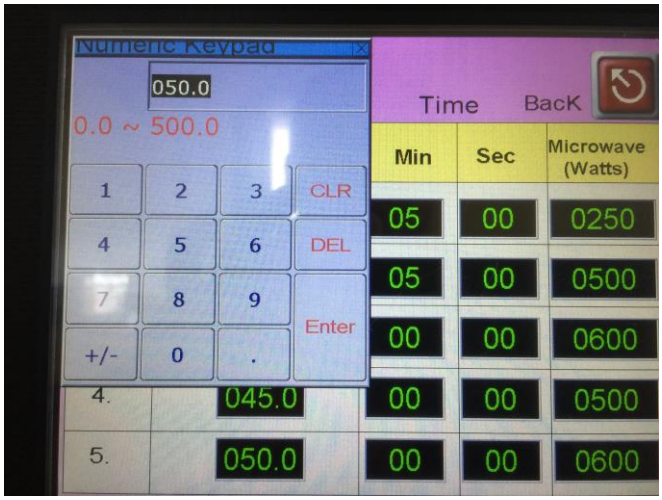


Parameter Setting Page
There are five reaction recipes and the reaction conditions will be saved.
Choose one to set up

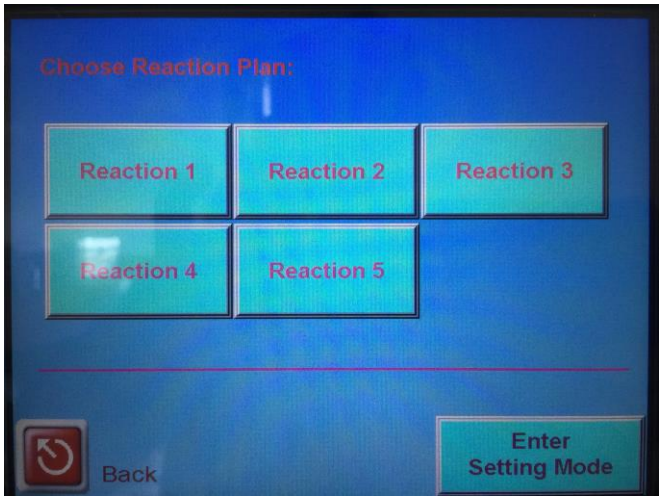
BACK
-Return to the previous page
Enter Running Mode
-Enter the running mode directly



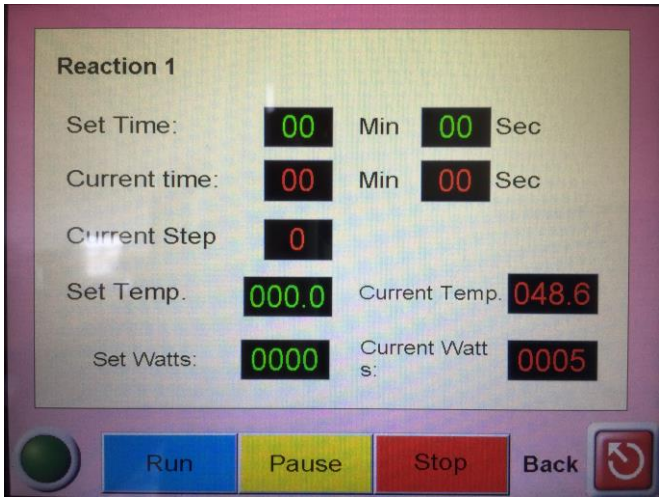
Reaction # 1 Setting
Step No.
-Segments for the reaction
Temperature
-Celsius degrees
Min
-Reaction time in minute
Sec
-Reaction time in second
Microwave (watts)
-Microwave watts to the reaction



Touch any parameter space
A keypad will be popped out
Enter the value and press “Enter” to save it.



Running Mode Page
Choose a reaction recipe to start

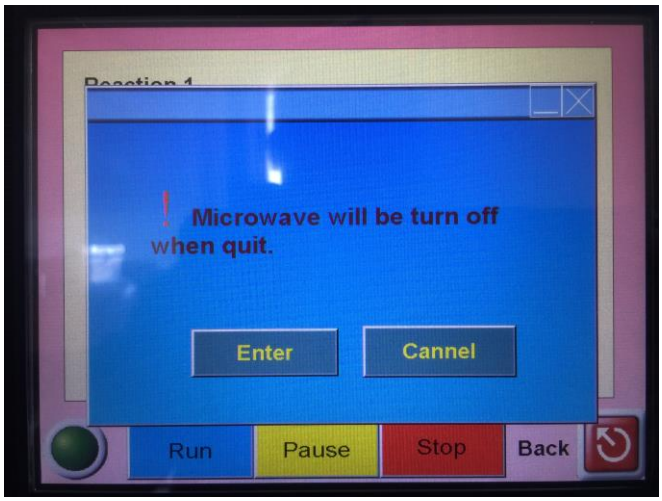


All the reaction parameters are displaced
Set values in green
Measured values in red

PRESS RUN to start the microwave heating

CAUTION: MUST HAVE LOADING IN THE MICROWAVE CHAMBER

Running processs
Measured values are updated
Pause
-To pause the rection
Stop
-To end the reaction



If STOP button is pressed, this warning will be popped out.

PRESS “Enter” to confirm it.

5. Use the Reactor in Other Modes

In addition to use the reactor with the sonication, the flexibility of the system will allow the users to run the reaction with motor stirring or even set it up as a continuous tubing reactor system as illustrated below. Some necessary parts are required to use those reaction modes. Please send inquiries to Col-Int Tech for more details.

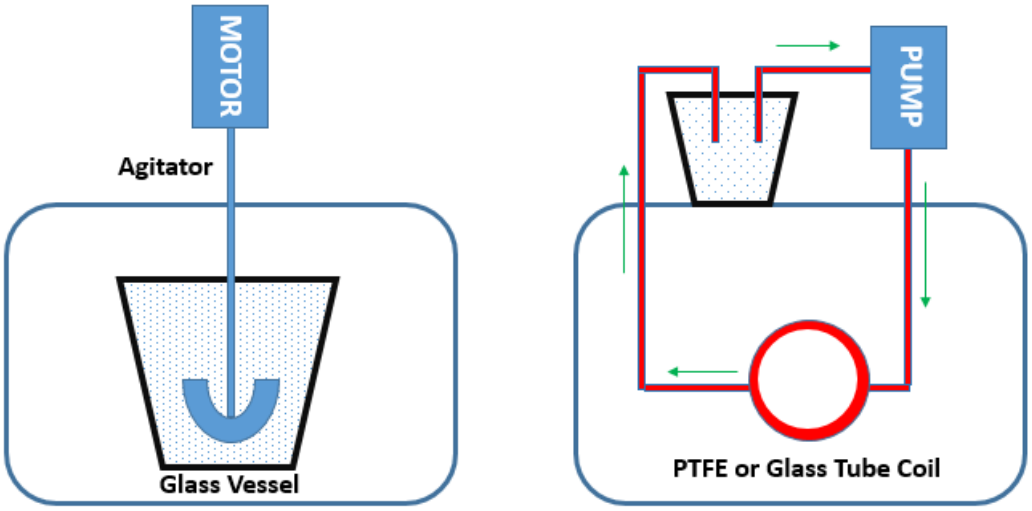


Figure 4: Regular Reactor Mode with Motor Agitator (Left) and Tubing Reactor Mode with Peristaltic Pump (Right)

6. Important Tips

- The instrument is not explosion-proof and should not be used in a flammable environment.
- Disconnect the electric power before any service.
- Be cautious of hot surface to avoid body burning.
- Be cautions of moving parts to avoid body damage.
- Keep away from the microwave as possible
- Keep good air ventilation, especially when organic solvents are used.

7. Warranty

- All Col-Int Tech equipment products are under a limited 12-month warranty.
- Col-Int Tech will replace any defective parts due to manufacturing and workmanship during the warranty period.
- Col-Int Tech is not responsible for any damage by misuse or abusing of the equipment.
- Col-Int Tech is not responsible for any data loss or experimental failure during the use of the equipment.
- Liability of Col-Int Tech is limited to the purchase price of the equipment.
- Col-Int Tech is committed to providing all-life service for all products we sell.
- Please feel free to contact us for any technical questions or services.
- More information about our products and sales terms, please visit us online 24 hours and 7 days at http://www.col-int.com.

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