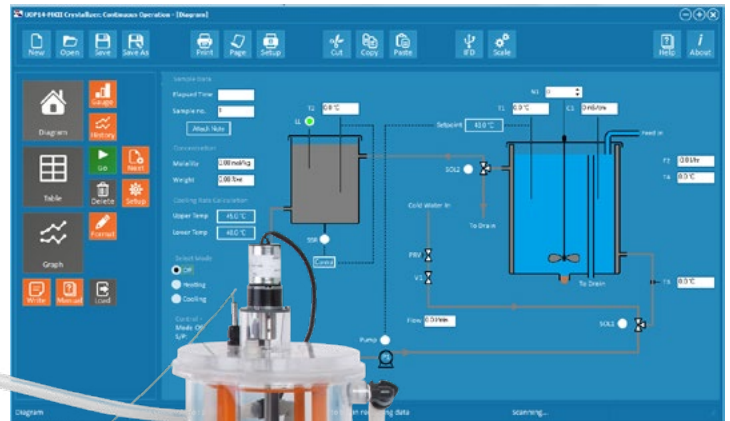


Crystallisation unit – UOP14-MKII

Crystallisation is a valuable process in chemical engineering where the precipitation of a dissolved salt in a liquid mixture is required. The Armfield UOP14-MKII demonstrates this process in the laboratory so that students may gain a thorough understanding of this industrial technique.

Meaningful experiments can be conducted within a typical laboratory period and students benefit from visual observation of the process.

**SIMPLIFIED CONNECTION OF COLD WATER SUPPLY TO UTILISE EITHER MAINS OR A CHILLER
IMPROVED EFFICIENCY BY UTILISING CLOSED-LOOP HOT WATER SYSTEM
OPTIMUM CONTROL OF HEATING AND COOLING CYCLES
NON-CORROSIVE BAFFLE AND IMPELLER BLADES**



Features

- ▶ Clear glass crystallisation vessel with acrylic jacket
- ▶ Control and data logging via PC
- ▶ Modulated control system for improved heating and cooling cycles
- ▶ Simplified connection of cold water supply to utilise either mains or chilled water where applicable
- ▶ Corrosion-resistant vessel internals
- ▶ Raised support frame which enables ease of crystal collection and cleaning

Benefits

- ▶ Enables study and investigation of the crystallisation process
- ▶ Clear acrylic vessel and pipework for visual demonstration of entire process
- ▶ User-friendly control of flow rates and levels within the vessel
- ▶ Corrosion-resistant baffle and impeller blade
- ▶ Convenient cold water supply connection for use with mains supply or chilled water supply via a chiller
- ▶ Raised frame which enables easy cleaning and crystal collection
- ▶ New hot water vessel for improved energy efficiency and improved heating cycle

Description

The UOP14-MKII introduces students to the fundamentals of crystallisation using a solution cooling method. It is a benchtop unit with a clear crystallisation reactor, which enables visualisation of the crystallisation phenomena.

The equipment consists of a jacketed crystallisation vessel provided with temperature control and agitation.

The solution is heated by circulating hot water through the jacket from the hot water vessel in a closed-loop system and the solution is cooled by circulating cold water from mains water supply or a chiller.

At the end of the batch operation, the crystals and mother liquor are collected using the beaker supplied, filtered, washed and then dried in the oven. The dried crystals are then sieved using the set of sieves supplied to analyse the crystal size distribution.

A conductivity sensor is included, which enables crystallisation to be monitored.

Different cooling rates can be investigated by the application of different water flow rates. A needle valve and flow meter are provided to vary the water flow rate quickly and easily to enable investigation of different crystallisation conditions, such as fast and slow cooling rates.

The instruction manual included contains experiments, providing a thorough grounding in the operation of crystallisation systems in the context of unit operations for chemical engineering students.

The equipment is supplied complete with a USB computer interface and data logging software.

The system may also be used in a continuous mode when used with the Armfield Crystallisation Unit UOP14-11 Continuous Feed Accessory.

UOP14-11 Continuous Feed Accessory (optional)

This benchtop item is designed to form a continuous crystallisation system when coupled together with the UOP14-MKII. The module can be used for teaching continuous crystallisation and demonstrating its advantages over the batch process. A variable-speed peristaltic feed pump controls the flow rate of the hot solution pumped from the feed tank to the reactor. The feed solution temperature is maintained by a controller linked to two heating elements.

The UOP14-11 is self-contained and can be added at any time to turn a standard batch crystalliser into a continuous system.

UOP14-12 Buchner Filtration Accessory (optional)

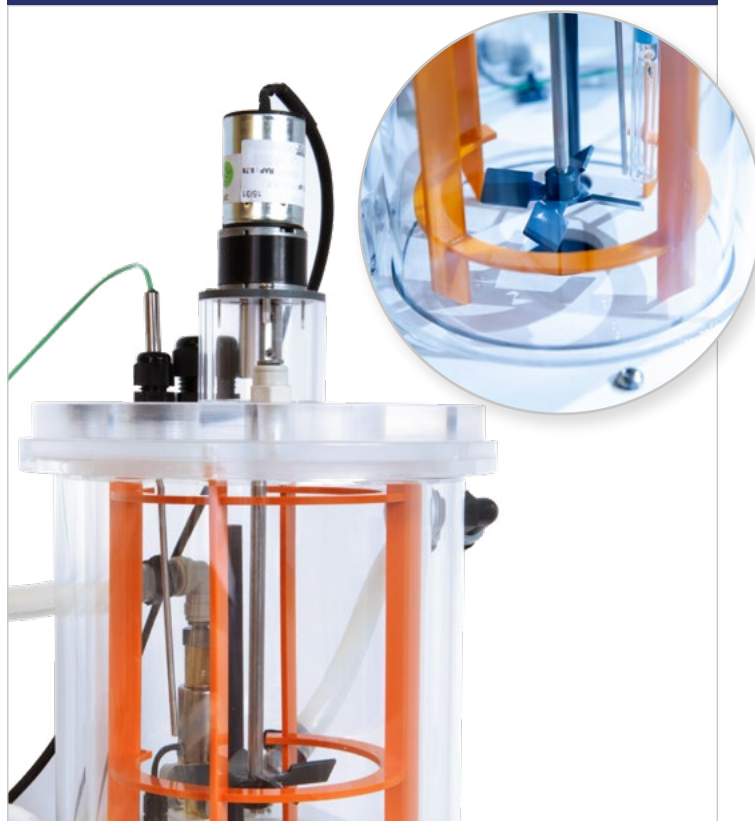
The vacuum filtration unit is available as an optional addition that is used to remove the crystals suspended in the solution. The crystals are filtered through the Buchner funnel with the aid of a vacuum. The Buchner funnel is fitted with a round piece of filter paper attached to the Buchner flask where permeate is collected.

The reduced pressure is obtained using an ejector vacuum pump attached to a cold mains water supply.

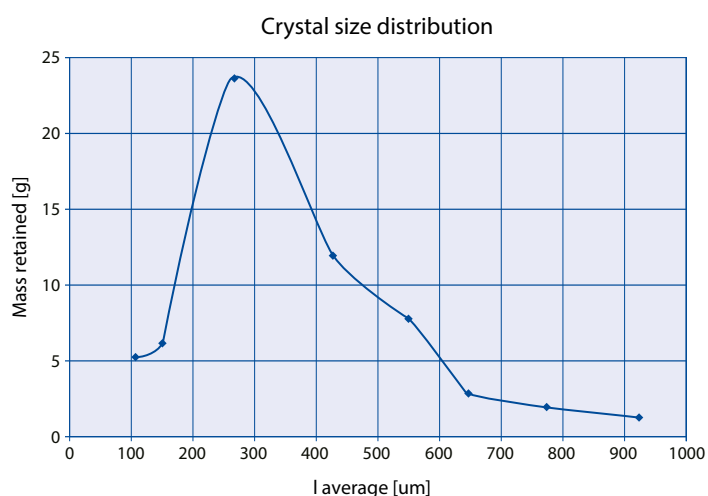
UOP14MkII – Pump assembly



Clear glass crystallisation vessel with acrylic jacket



KCl crystal size distribution



Software Capabilities

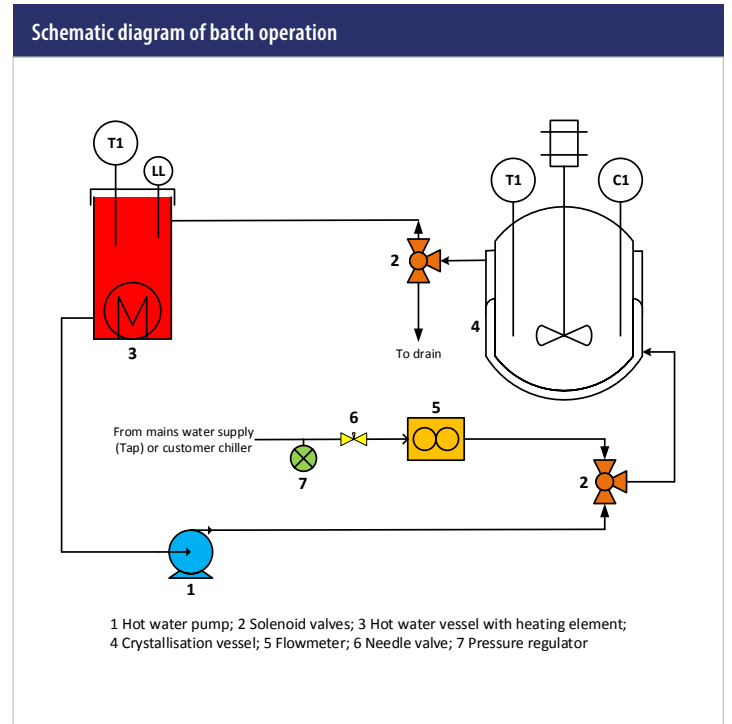
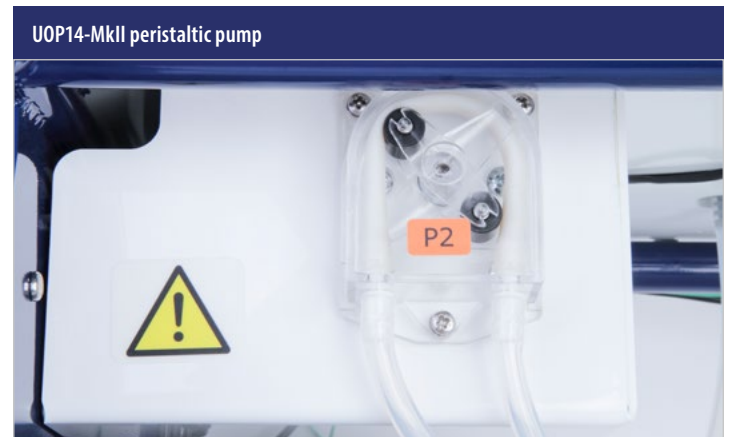
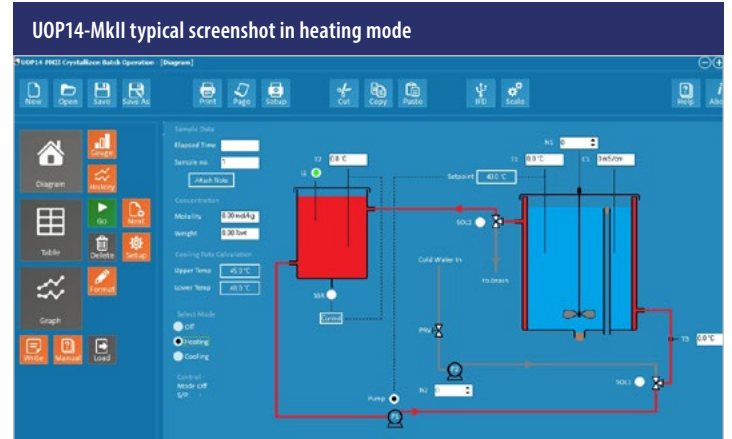
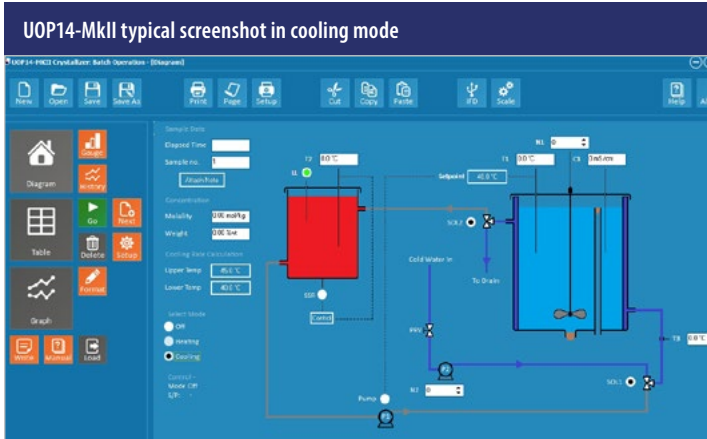
On opening ArmSOFT Desktop software, the user is taken to the process screen, which shows a diagram of the equipment/process. The screen shows readings from the equipment, updated in real-time, in engineering units.

This screen will also show any calculated variables and controls that the user may need. Users can navigate to the other parts of the software using the tabs at the bottom of the screen. The Data tab offers a number of options for processing and displaying the data from the equipment.

Graphs, results table, bar charts, etc are all available via a second set of tabs to the left of the screen. Users can also select data filtering options.

Results can be printed or exported to a generic spreadsheet format which can be opened in a wide range of packages for further analysis.

The software also includes facilities for closed-loop control. The software uses a PID control algorithm to adjust an output in response to changes in one of the inputs. For example, the pump speed may be varied in order to regulate a flow rate.



Requirements

Scale



- ▶ **Single phase mains electrical supply:**
UOP14MkII-A: 220-240V / 1ph / 50Hz, 13A
UOP14MkII-B: 120V / 1ph / 60Hz, 20A
UOP14MkII-G: 220V / 1ph / 60Hz, 13A
- ▶ **Cold water:** 1 l/min @ 1 bar

Demonstration / Experimental Capabilities

- ▶ Understanding the principles of crystallisation
- ▶ Understanding crystallisation driving force
- ▶ Mass and energy balance
- ▶ Batch operation
- ▶ Continuous operation (option: requires UOP14-11)
(Study of continuous crystallisation kinetics UOP14-11)
- ▶ Evaluation of crystallisation efficiency and crystallisation kinetics
- ▶ Study of the effect of different parameters such as agitation rate and cooling rate
- ▶ Crystal size distribution

Essential Accessories/Equipment

- ▶ Software requires a computer running Windows 7 or above with a USB port (Computer not supplied by Armfield).
- ▶ Laboratory oven to dry the crystals sample
- ▶ Potassium chloride
- ▶ Laboratory balance
- ▶ Deionised Water

Related Products

- ▶ UOP8 Tray Dryer

Optional accessories

- ▶ UOP14-11 Continuous Feed Accessory
- ▶ UOP14-12 Buchner Filtration Kit

Ordering codes

- ▶ UOP14-MkII Crystallisation Unit
- ▶ UOP14-11 Continuous Feed Accessory
- ▶ UOP14-12 Buchner Filtration Accessory

Overall dimensions

	UOP14-MKII	UOP14-11	UOP14-12
Length	0.8m	0.69m	0.5m
Width	0.9m	1m	0.5m
Height	0.5m	0.5m	0.5m

Packed and crated shipping specifications

Volume	0.35m ³	0.35m ³	0.125m ³
Gross weight	35Kg max	35Kg max	3Kg max

Ordering specification

UOP14-MkII Crystallisation Unit

- ▶ Benchtop metal frame unit
- ▶ Clear crystalliser vessel
- ▶ Hot water vessel with PID control loop
- ▶ 3 temperature sensors
- ▶ Conductivity probe
- ▶ Non-corrosive baffle and impeller blades
- ▶ USB port for data logging using the Armfield software
- ▶ Set of sieves for determining crystal size distribution
- ▶ Comprehensive instruction manual with detailed laboratory teaching exercises
- ▶ Isolating switch on the console
- ▶ Plastic bung with silicone sleeve
- ▶ Low liquid level sensor on the hot water vessel
- ▶ Hot and cold water pumps
- ▶ 3-litre beaker for collecting crystals and mother liquor

UOP14-11 Continuous Feed Accessory

- ▶ A benchtop unit comprising an ABS plastic plinth with integral electrical console onto which is mounted the stirred acrylic feed tank, with the heater and peristaltic pump
- ▶ A temperature sensor and 2.5kW heater mounted in the feed tank and linked to a PID controller for accurate solution temperature control
- ▶ A peristaltic pump, used to feed solution from the 20-litre feed tank to the reactor

UOP14-12 Buchner Filtration Kit

- ▶ An ejector / vacuum system
- ▶ Filter paper
- ▶ Funnel
- ▶ Rubber tubing
- ▶ Rubber bung
- ▶ Buchner flask

Technical Specifications UOP14-MKII

2-litre jacketed crystallisation vessel

Hot water pump

Flow meter 0.05-3 l/min

3 temperature sensors

Conductivity probe 0-600mS

Low-level liquid sensor

Cold water supply pressure regulator

Heater capacity 2kW

Pressure regulator 0-2 bar

Technical Specifications UOP14-11 (optional)

- Feed pump 0.5-10 l/hr
- 20-litre feed tank vessel
- Temperature controller
- Temperature sensor

Armfield standard warranty applies with this product

Knowledge base

- > 28 years' expertise in research & development technology
- > 50 years' providing engaging engineering teaching equipment

Benefit from our experience, just call or email to discuss your laboratory needs, latest project or application.

An ISO 9001:2015 Company



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Training
Service and maintenance
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